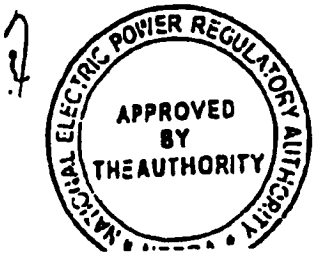
NATIONAL TRANSMISSION AND DESPATCH COMPANY LTD.

THE GRID CODE

June, 2005



INTRODUCTION

Pursuant to Section 35 of NEPRA Act and Article 16 of the NTDC licence, the National Transmission and Dispatch Company is required to ensure that there is in force at all times a Grid Code. Consequently NTDC is required to submit a comprehensive Grid Code for approval of the Authority in accordance with the requirement of Article 16 of its licence. The Grid Code provides for the smooth and effective functioning of NTDC and other NEPRA licensees that are or will be connected to the NTDC's Bulk Transmission System.

The Grid Code is an essential requirement of the regulation of electric network supply and delivery system. In accordance with 'Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997)', all existing and future Users of the electric network supply and delivery system need a relevant Licence from NEPRA; and register as Code Participants with NTDC as per the provisions of Grid Code. One of the NTDC Licence's requirements is that Users of the NTDC's system must comply with the provisions of Grid Code at all times. Failure to do so may result in their licence being suspended or revoked.

The Grid Code sets out the guidelines, rules and procedures to be adopted by all Code Users. The sub-codes of the Grid Code relate to technical and commercial relationships between NTDC and its Users.

The purpose of Grid Code is to provide unambiguous guidelines, rules and procedures, which ensure that all Users of Grid Code understand and abide by the obligations and responsibilities placed upon them under this Grid Code. The Code covers day-to-day and long-term principles, standards, procedures and guidelines for Planning, Operation, Dispatch, and Connection purposes for normal and abnormal NTDC transmission system conditions.

The Grid Code sets out the operating procedures and principles between the National Transmission and Dispatch Company; and all authorised Electricity Operators as defined in NTDC transmission licence collectively referred to as "Users" in the context of this document.

The Grid Code is structured so as to ensure that the NTDC's transmission system can be developed, operated, and maintained in an efficient, safe, reliable and co-ordinated manner from technical and commercial aspects both. The Grid Code is expected to encourage competition between Generators, Distribution Companies, and BPCs as the Market Structure develops.

It seeks to avoid any undue discrimination between various Users themselves; between the entities within a particular User Group type; and in day-to-day working relationship of NTDC with its Users.

In implementing and complying with the Grid Code, neither the NTDC nor its affiliates shall unduly discriminate in any manner between any purchasers, procurers, providers or recipients of electric power or ancillary services providing similar services.

Main Objectives of the Grid Code are:

a) To achieve the Performance Standards (Transmission) to be prescribed under the Act;

b) To facilitate the development, operation, and maintenance of an efficient, co-ordinated, safe, reliable and economical system for the transmission of electric power;

c) To facilitate competition in the provision of electric power; and

d) To cover all material technical aspects relating to Connection, the Operation and Use of the NTDC's transmission system including the operation of electric lines and electric plants connected to the NTDC's transmission system in so far as relevant to the Operation and Use of NTDC's transmission system.

This Grid Code includes the following sub-codes:

a. **Code Management**

Code Management, which sets out procedures to be adopted by all parties in the NTDC process of administering, updating, and amending of the Grid Code.

b. **Data Registration Code**

Data Registration Code, which sets out a unified listing of all data required by NTDC from Users; and by Users from NTDC, from time to time under the Grid Code.

c. **Operation Code**

The Operation Code, which sets out the principles, standards, procedures, and guidelines to be followed by NTDC and its Users to ensure safe and an efficient operation of the NTDC transmission system, for real-time, and for short-term planning of system operations, and for normal and abnormal circumstances.

d. **Connection Code**

A Connection Code, which sets out the principles and procedures to be applied to new connections to the NTDC bulk transmission system. New connections may include new or existing Generators; Distribution Companies, Consumers requiring a direct connection to the NTDC transmission system known as transmission-connected Consumers; and Externally–connected Parties, and Externally-connected Consumers.

e. **Planning Code**

The Planning Code, which deals with Principles, Standards, Processes, and Procedures along with data information exchange requirements between parties to ensure an efficient, economic, and timely development of the NTDC bulk transmission system to meet the forecasted Total System Demand and Margin of Operating Reserve requirements. It also describes in detail the data needs which the Users must fulfill in a timely manner to meet the planning responsibilities of NTDC in an effective manner.

f. **Protection and Metering Code**

The Protection and Metering Code, which places the Protection and Metering requirements upon the Users and NTDC (particularly with reference to the Inter-connection Sites) in terms of Principles, Standards, Design, and Procedures to ensure safe, reliable and effective functioning of NTDC's bulk transmission system.

g. **Scheduling and Dispatch Code**

A Scheduling and Dispatch Code, which sets Out Principles, Processes and Procedures to ensure minimum-cost generation dispatch, the relationship between NTDC and Generators, including the dispatch process and requirements for ancillary services and provisions for frequency control. It also places an obligation upon Users to supply certain data information to the NTDC in a timely manner.

h. **Code Definitions**

The Code Definitions, which provides an explanation of the terms used in this Grid Code.

The relationship between the Grid Code and the Distribution Code is shown on Figure 1 (page 4) of this section.

The Grid Code specifies all the material, technical design, and operational aspects of the interface requirements between NTDC, Distribution Licensees, BPCs, Externally-connected Parties and Consumers, and Special Purpose Transmission Licensees (SPTLs).

The Distribution Code shall be consistent in material particulars with the Grid Code; and it shall ensure strict compliance by the distribution companies and other Users with the provisions of Grid Code including, without limitation, the instructions from time to time of NTDC and/or the System Operator in respect of the Use and Operation of their distribution systems.

Figure 1

RELATIONSHIP BETWEEN THE GRID CODE AND THE DISTRIBUTION CODE

CODE MANAGEMENT

CONTENTS

CODE MANAGEMENT

CM 1 INTRODUCTION & SCOPE

CM 1.1 The Code Management section contains provisions of general application to all provisions of the Grid Code. Their objective is to ensure that the various sections of the Grid Code work in conjunction with each other for the benefit of all Users. This Code Management section applies to all Users including NTDC.

CM 2 UNFORESEEN CIRCUMSTANCES

CM 2.1 If unforeseen circumstances arise which are not included in the Grid Code, NTDC shall promptly consult with all affected Users in an effort to reach an agreement on what should and needs to be done under such circumstances. If agreement cannot be reached in the available time, NTDC shall determine the most appropriate course of action. Whenever NTDC makes a determination, it shall do so having due regard to the views expressed by the Users and, in any event, to what is reasonable under the circumstances. Each User shall comply with such instructions given by NTDC provided those instructions do not contravene the technical parameters of a particular User's System as registered in the Grid Code. NTDC shall promptly refer all such unforeseen circumstances and any determination to the Review Panel for consideration as per CM 3.1 of this sub-code.

CM 3 THE GRID CODE REVIEW PANEL

CM 3.1 NTDC shall establish and maintain the Review Panel, which shall be a standing body and shall undertake the functions detailed in CM 3.3.

CM 3.2 The Panel shall consist of;

(a) a Chairman and up to 3 Members appointed by NTDC;

(b) a person appointed by the Authority;

(c) the following Members;

(i) 2 Persons representing Generators with a total registered capacity in excess of 1000MW;

(ii) 3 Persons representing Generators with a total registered capacity of less than 1000MW but greater than 500MW;

(iii) 4 Persons representing Generators with a total registered capacity of less than 500MW;

(iv) one representative from each Distribution Company Licensed with NEPRA;

(v) a Person representing Transmission-connected Consumers;

(vi) a Person representing Small Power Producers (SPP);

(vii) a Person representing Externally-connected Consumers;

(viii) one representative from Externally-connected Parties; and

(ix) one Member from the Industry or an Academic Institution or PEC.

The representation within each category shall be based on rotation and mutual agreement.

CM 3.3 The Panel shall:

(a) keep the Grid Code and its workings under review;

(b) review all suggestions for amendments to the Grid Code which the Authority or any User may wish to submit to NTDC for consideration by the Panel;

(c) publish recommendations as to amendments to the Grid Code that NTDC or the Panel believes are desirable and the reasons for such recommendations;

(d) submit all the agreed recommendations to NEPRA for approval;

(e) issue guidance on the Grid Code and its implementation, performance and interpretation, when asked to do so by any User;

(f) resolve any matters of dispute between NTDC and its Users/Code Participants;

(g) study and evaluate the suggestions received from different parts of the power market participant; and

(h) consider the modification which are necessary to the Grid Code arising out of any unforeseen circumstances and Force Majeure referred to it by NTDC under CM 2 & CM 8 of this sub-code.

CM 3.4 The Panel shall establish and comply with at all times with its own rules and procedures relating to the "Conduct of its Business", which shall be approved by the Authority.

CM 3.5 NTDC shall consult in writing all Users which are liable to be affected by any proposed amendments to the Grid Code and shall submit all such proposed amendments to the Grid Code to the Panel for discussion prior to such consultation.

CM 4 COMMUNICATIONS BETWEEN NTDC AND USERS

CM 4.1 All operational instructions issued by NTDC between NTDC and Users shall be between the NTDC Control Engineer based at the NPCC, as advised to Users before connection to the Transmission System, and the Users Responsible Engineer based at a Regional Control Centre notified to NTDC before connection to the Transmission System.

CM 4.2 Unless otherwise specified in the Grid Code, all operational communications detailed in CM 4.1 shall be through Control Telephony (dedicated telephone network).

CM 4.3 All non-operational communications (data information and notices) between NTDC and Users shall be inwriting and issued to the appropriate Officers of NTDC, the System Operator, and each User.

CM 4.4 If for any reason NTDC or a User re-locates its Control Centre, NTDC 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.

CM 4.5 All instructions and communications given by Control Telephony are to be recorded by whatever means available, and shall be acceptable by NTDC and Users as evidence of those instructions or communications.

CM 5 MISCELLANEOUS

CM 5.1 Data and Notices

CM 5.1.1 References in the Grid 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 5.1.2 Where applicable all data items shall refer to Nominal Voltage and Frequency.

CM 6 **OWNERSHIP OF FACILITIES, PLANT AND/OR APPARATUS**

The Facilities, Plant and Apparatus of a User shall include Facilities, Plant and Apparatus used by a User under an agreement with a third party.

CM 7 **SYSTEM CONTROL**

Where a User's System (or part thereof) is, by agreement under the control of the System Operator, for the purposes of operation in Real Time, the User's System shall be treated as a part of the NTDC Transmission System.

CM 8 **FORCE MAJURE**

The Force Majeure has been defined in the Section on "Definitions". Code Participants (as defined in the Section on "Definitions") should note that certain provisions of the Grid Code may be suspended in whole or in part pursuant to any directive given by the Authority under Force Majure. NTDC shall inform NEPRA within Seven days of the initiation of Force Majure to be claimed by NTDC for the suspension of some or all provisions of the Grid Code.

CM 9 **MATTERS TO BE AGREED**

Unresolved matters between NTDC and Users after a Review Panel shall be referred to NEPRA for resolution whose decision shall be final and binding on all parties. The Review Panel shall need to refer to the Authority any matters requiring interpretation of the Grid Code provisions.

CM 10 **INFORMATION DISSEMINATION**

The System Operator (SO) shall establish, operate and maintain a Web Site, providing necessary information about the transmission system status, pricing, congestion, operating procedures, technical and operational Committee meetings, and other relevant information and data.

CM 11 **INDEMNITY TO THE NTDC**

Each Code Participant shall keep NTDC and the System Operator indemnified at all times against any claim, action, damage, loss, liability, expenses or outstanding liability which NTDC or the System

Operator pays, suffers, incurs or is liable for in respect of any breach by such person or any of its officer, agent or employee.

CM 12 **PRESERVATION OF CONTRACTS PRIOR TO ENACTMENT OF NEPRA ACT**

During the implementation of agreements executed by the Participants of this Code, prior to the enactment of NEPRA Act and carrying a sovereign guarantee for their performance, nothing contained in this Code shall be applicable to such Participants which is inconsistent with the terms and conditions of their agreements or impairs the rights of these participants thereunder.

CM 13 **CODE ADMINISTRATION**

The NTDC shall be responsible for the enforcement and administration of the Grid Code.

CM 14 **NON-COMPLIANCE**

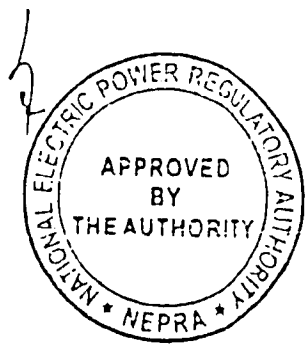
Non-compliance of any of the provisions of this Grid Code by any of the Code participants shall be treated as a violation of the Grid Code and shall be subject to penalties as per NEPRA Fees & Fines Rules (2002)-The First Schedule (Part-I, Sr. No. 5). Non-compliance by NTDC of the Grid Code provisions applicable to NTDC shall be treated as a violation of NTDC licence, and shall be subject to penalties as per NEPRA Fees & Fines Rules (2002).

End of CM

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY
NEPRA

DATA REGISTRATION CODE

CONTENTS



DATA REGISTRATION CODE

DRC 1 INTRODUCTION, OBJECTIVE & SCOPE

DRC 1.1 The Data Registration Code (DRC) presents a unified listing of all data required by NTDC from Users and by Users from NTDC, from time to time under the Grid Code. The data which is specified in each section of the Grid Code is listed and collated here in the DRC. Where there is any inconsistency in the data requirements under any particular sub-code of the Grid Code, the provisions of the Data Registration Code for that particular sub-code of the Grid Code shall prevail.

DRC 1.2 The Scope of this Code applies to Users who in this DRC means:

(a) Generators

(b) Distribution Companies

(c) Transmission Connected Consumers

(d) Any other person with a User System directly or indirectly connected to the NTDC Transmission System to which Power Plants and / or Consumers are connected.

(e) Externally-connected Parties

(f) Externally-connected Consumers

(g) Special Purpose Transmission Licence (SPTL)

DRC 1.3 The DRC identifies the sub-code of the Grid Code under which each item of data is required.

DRC 1.4 The sub-code under which any item of data is required specifies procedures and timings for the supply of such data, for routine updating, and for recording temporary or permanent changes to that data. All timetables for the provision of data are repeated in the DRC.

DRC 1.5 Various sub-codes of the Grid Code also specify information which the Users shall receive from NTDC. This information is summarised in a single Schedule in the DRC (Schedule 1-9).

DRC 1.6 The objective of the DRC is to list and collate all the data to be provided by each category of User to NTDC under the Grid Code, and to list all the data to be provided by NTDC to each category of User under the Grid Code.

DRC 2 **DATA CATEGORIES AND STAGES IN REGISTRATION**

DRC 2.1 Within the DRC each data item is allocated to one of the following four categories (DRC 2.2 & DRC 2.3, DRC 2.4, DRC 2.5, DRC 2.6).

(a) Standard Planning Data (PC)

(b) Detailed Planning Data (PC)

(c) Operational Data (OC)

(d) Scheduling and Dispatch Code Data (SDC)

(e) Connection Code Data (CC)

DRC 2.2 **STANDARD PLANNING DATA (SPD) – PC DATA**

DRC 2.2.1 The Standard Planning Data listed and collated in this DRC is that data listed in Part 1 of the Appendix A to the Planning Code.

DRC 2.2.2 Standard Planning Data shall be provided to NTDC in accordance with PC 5 and PC A.1 - PC A.4 of Appendix A of the Planning Code.

DRC 2.3 **DETAILED PLANNING DATA (DPD) – PC DATA**

DRC 2.3.1 The Detailed Planning Data listed and collated in this DRC is that data listed in Part 2 of the Appendix A to the Planning Code.

DRC 2.3.2 Detailed Planning Data shall be provided to NTDC in accordance with PC 5 and PC A.5 of Appendix A of Planning Code.

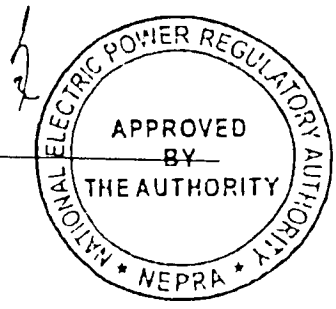
DRC 2.4 **OPERATIONAL DATA – OC DATA**

DRC 2.4.1 Operational Data is data, which is required by the Operation Codes and the Schedule and Despatch Codes. Within the DRC, Operational Data is sub-categorised according to the Code under which it is required namely, OC3, OC4, OC5, OC6, OC7, OC9, and OC12.

DRC 2.4.2 Operational Data is to be supplied in accordance with timetables set down in the relevant Operational Codes.

DRC 2.5 **SCHEDULING AND DISPATCH CODE DATA (SDC DATA)**

This data must be supplied in accordance with Schedules and Appendices attached with the Scheduling and Dispatch Code of the Grid Code.



DRC 2.6 **CONNECTION CODE DATA (CC DATA)**

This data is to be supplied in accordance with Schedules and Appendices attached with the Connection code of the Grid Code.

DRC 3 **PROCEDURES AND RESPONSIBILITIES**

DRC 3.1 **Responsibility for Submission and Updating of Data**

In accordance with the provisions of the various sub-codes of the Grid Code, each User must submit data as summarised in DRC 4 and listed and collated in the schedules attached with each sub-code.

DRC 3.2 **METHODS OF SUBMITTING DATA**

DRC 3.2.1 Wherever possible the data Schedules to the DRC are structured to serve as standard formats for the data submission and such format must be used for the written submission of data to NTDC.

DRC 3.2.2 Data must be submitted to the NTDC, National Power Control Centre (NPCC) or to such other department or address as NTDC may advise from time to time. The name of the person on the behalf of the User who is submitting each schedule of data must be included.

DRC 3.2.3 Where a computer data link exists between a User and NTDC, data may be submitted via this link. NTDC shall, in this situation, provide computer files for completion by the User containing all the data in the corresponding DRC Schedule.

DRC 3.2.4 Other modes of data transfer, through CD and other electronic means of data transfer such as magnetic tape, may be utilised if NTDC gives its prior written consent.

DRC 3.3 **CHANGES TO USER'S DATA**

DRC 3.3.1 Whenever a User becomes aware of a change to an item of data which is registered with NTDC, the User must notify NTDC in accordance with each sub-code of the Grid Code. The method and timing of the notification to NTDC is set out in each sub-code of the Grid Code.

DRC 3.4 **DATA NOT SUPPLIED**

DRC 3.4.1 Users and NTDC are obliged to supply data as set out in the individual sub-codes of the Grid Code and repeated in the DRC. If a User fails to supply data when required by any sub-code of the Grid Code, NTDC shall make an estimation (typical values) of such data if and when, in the NTDC view, it is necessary to do so. If NTDC fails to supply data when required by any sub-code of the Grid Code, the User, to which

that data ought to have been supplied, shall estimate (typical values) 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 plant and apparatus or upon such other information as NTDC or that User, as the case may be, deems appropriate.

DRC 3.4.2 NTDC shall advise a User in writing of any estimated data it intends to use pursuant to DRC 3.4.1 relating directly to that User's facility, plant, and apparatus in the event of data not being supplied.

DRC 3.4.3 A User shall advise NTDC in writing of any estimated data it intends to use pursuant to DRC 3.4.1 in the event of data not being supplied.

DRC 3.4.4 In the event the required data is consistently not supplied or is incomplete or in-accurate by the User, the NTDC shall refer the matter to the "Review Panel", which shall issue necessary instructions to the defaulted party in writing.

Failure to obtain the required data within the specified timeframes from the defaulted party, the NTDC shall consider the matter as a violation of the Grid Code provisions. Suitable measures regarding Grid Code non-compliance are covered in CM 14 of this Grid Code.

DRC 4 DATA TO BE REGISTERED

DRC 4.1 Schedules 1 to 9 attached cover the following data areas.

DRC 4.1.1 SCHEDULE 1 – GENERATING UNIT TECHNICAL DATA. (Directly or Indirectly Connected to NTDC System, Centrally Dispatched such as connected to the NTDC system or 132 kV Transmission System of distribution companies and subject to central dispatch).

Comprising Generating Unit fixed electrical parameters (as covered in respective appendices of the following sub-codes [(OC 4 Appendix 4, Appendix 5, OC 5 Appendix 1, OC 6 Appendix 1, OC 7 Appendix 1); (PC, Part 1 and 2 of Appendix A); and (Appendix 1 of CC 8.3, and CC 8.5)].

DRC 4.1.2 **SCHEDULE 2 – GENERATION PLANNING PARAMETERS AND GENERATION OFFER DATA.** (Directly or Indirectly Connected to NTDC System, Centrally Dispatched such as connected to the NTDC system or 132 kV Transmission System of distribution companies and subject to central dispatch).

Comprising the Generating Plant parameters required for Operational Planning studies and certain data required under Scheduling and Dispatch Code (as covered in Appendix 5 of OC 4).

DRC 4.1.3 SCHEDULE 3 – GENERATING PLANT OUTAGE PROGRAMMES, OUTPUT USABLE AND INLFEXIBILITY INFORMATION (OC 4 - Appendix 1, 2). (Directly or Indirectly Connected to NTDC System, Centrally Dispatched such as connected to the NTDC system or 132 kV Transmission System of distribution companies and subject to central dispatch).

Comprising Generation Outage Planning of the Generating Units subject to central dispatch, Output Usable and inflexibility information at timescales down to the daily Availability Declaration. Also contract information need to be provided where External Interconnections are involved.

DRC 4.1.4 SCHEDULE 4 – INDEPENDENT GENERATING PLANT OUTPUT FORECASTS (Indirectly Connected to NTDC system, not subject to Central Dispatch such as embedded generation and SPPs).

Output predictions for Power Stations not subject to Central Despatch (as covered in Appendix 1 and 2 of OC 4).

DRC 4.1.5 SCHEDULE 5 – USER'S SYSTEM DATA (Directly connected to NTDC System Transmission-connected Consumers, Distribution Licensees, and other Externally-connected Consumers).

Comprising electrical parameters relating to facilities connected to the NTDC Transmission System (as covered in Part 1 of Appendix A of Planning Code).

DRC 4.1.6 SCHEDULE 6 – USERS OUTAGE INFORMATION

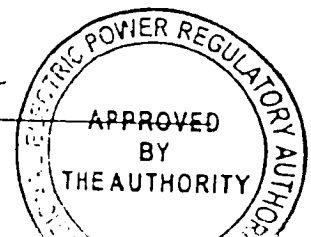
Comprising the information required by NTDC for outages on the Users System (Directly or Indirectly Connected to NTDC System), including outages at Power Plants (Indirectly Connected to NTDC System and not subject to Central Dispatch).

DRC 4.1.7 SCHEDULE 7 – LOAD CHARACTERISTICS (Directly or Indirectly Connected to NTDC System).

Comprising the estimated parameters of load groups in respect of, for example, harmonic content and response to frequency (as covered PC.A.4.8 of Appendix A of Planning Code).

DRC 4.1.8 SCHEDULE 8 – CONNECTION POINT DEMAND AND ACTIVE ENERGY DATA OF USERS DIRECTLY OR INDIRECTLY CONNECTED TO NTDC SYSTEM AND GENERATION SUMMARY (as covered in PC A.4 - Part 1, of the Appendix A of Planning Code).

Comprising information relating to Demand and Active Energy taken from the NTDC Transmission System and a summary of the Independent and Consumer Generating Plant connected to the



Connection Point. (Indirectly Connected to NTDC System, and not subject to Central Dispatch).

DRC 4.1.9 SCHEDULE 9 – DATA SUPPLIED BY NTDC TO USERS (as covered in PC A.4.3, PC A.4.6 of Part 1 of Appendix 1 of the Planning Code; Appendix 3 and 3A, of OC 4, OC 5.A.8 of OC 5, Appendix 1 of OC6, Appendix 1 of OC7, Appendix 1-3 of OC9; and CC 6.1, CC 6.2, CC 8.7, CC 8.8, CC 8.10.1, CC 8.12.4, CC 8.13.2, CC 8.17 of Appendix 1 of Connection Code).

DRC 4.2 The Schedules applicable to each class of User are as follows:

SR. NO.	DESCRIPTION	SUBJECT TO DISPATCH	SCHEDULE
	(Directly Connected)		
i.	Generating Plants directly connected to NTDC system and subject to **Central Dispatch.**	SD	1,2,3,9
ii.	Generating Plants connected to 132/66kV system of Distribution Companies subject to **Central Dispatch.**	SD	1,2,3,9
	(Indirectly Connected)		
i.	Generators indirectly connected, and not subject to **Central Dispatch.**	NSD	1,2,4,6,9
	Users (Directly Connected)		
i.	Distribution Companies	—	5,6,7,8,9
ii.	Consumers directly connected to NTDC system.	—	5,6,7,8,9
iii.	Externally–Connected Parties	—	4,5,6,8,9
	Users (Indirectly Connected)		
i.	BPCs connected to DISCOs distribution system and indirectly connected to NTDC system.	—	6,7,8,9
ii.	Externally–connected Consumers	—	6,7,8,9

Notes:

1. Distribution Companies and Users with a User System directly connected to the NTDC Transmission System must provide data relating to Small Power Producers Plant/Embedded Generators and/or Customer Generating Plant within their Systems when such data is requested by NTDC pursuant to PC A 3 or PC A 5.

2. The data in Schedules 1 and 3 need not be supplied in relation to Small Power Producers (SPPs) connected to the System of a User at a voltage level below the voltage level directly connected to the NTDC Transmission System except in connection with a Master Connection and Use of System Agreement or unless specifically requested by NTDC.

DRC 4.3 **Confidentiality Obligations**

Each Code Participant must use all reasonable endeavours to keep any information confidential which comes into the possession or control of that Code Participant or of which the Code Participant becomes aware of. A Code Participant:

a) must not disclose confidential information to any person except as permitted by the Grid Code;

b) must only use or reproduce confidential information for the purpose for which it was disclosed or another purpose contemplated by the Grid Code;

c) must not permit unauthorized persons to have access to confidential information.

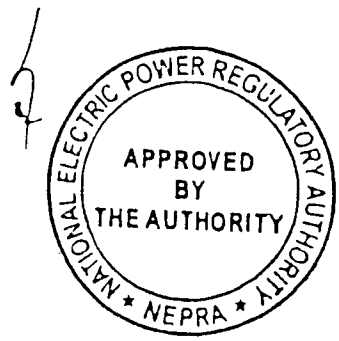
Each Code Participant must use all reasonable endeavours:

a) to prevent unauthorized access to confidential information which is in the possession or control of that Code Participant; and

b) to ensure that any person to whom it discloses confidential information observes the provisions of Grid Code.

The Officers of the NTDC, distribution companies, and other Authorised Electricity Operators and all other Users participating in Transmission Service Pricing must not be involved in or associated in any manner with Competitive Power Trading activities of any other Code Participant.

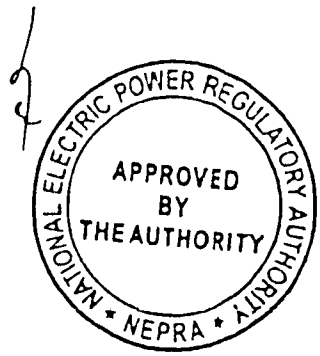
⏭⏭⏭⏭End of DRC⏮⏮⏮⏮



OPERATION CODE No. 1

OPERATING OBJECTIVES AND PRINCIPLES

CONTENTS



OPERATION CODE NO. 1

OPERATING OBJECTIVES AND PRINCIPLES

OC 1.1 INTRODUCTION

The Operating Code specifies the Technical and Operating Criteria, and Procedures to be followed by NTDC and the System Operator and Code Participants in the operation of the power system. NTDC in the capacity of the System Operator[1] shall be responsible for the safe, secure, openly-accessible, cost-effective, equitable, environmentally acceptable, reliable and adequate operation and development of the power system. The Code Participants shall have the obligation to cooperate with the NTDC and the System Operator and follow the technical, design, and operation Criteria and Procedures as identified in this Grid Code necessary for an appropriate and stable operation and protection of the power system.

The functions and responsibilities of NTDC as a System Operator are subject to the conditions as specified in the NTDC licence, and includes Operation, Control and Discipline of the NTDC bulk transmission system (as defined below):

(a) Means one or more systems comprising electrical facilities including, without limitation, electrical wires or circuits, electrical plant, transformers, sub-stations, switches, meters, interconnection facilities or other facilities operating at or above minimum transmission voltage constructed, owned, managed, controlled or operated by the Licensee or by one or more special purpose transmission licensees and used for transmission of electric power from the generation facility to sub-stations or to or from other generation facilities or between sub-stations or to or from any interconnection facilities or from the distribution facilities of one licensee to the distribution facilities of another licensee or from a generation facility to a distribution facility or a bulk-power consumer. The Operating Code describes the procedures by which the System Operator shall carry out its responsibilities along with its performance obligations.

OC 1.2 OPERATING PRINCIPLES

The System Operator shall prepare an Operating Plan prior to bringing scheduled generation on-line for the next day to meet the forecasted load demand. Procedures for implementation of the Plan are described in the Scheduling and Dispatch Code.

[1] The term System Operator refers to the system control functions being performed by the National Power Control Centre of the predecessor WAPDA system as defined in the NTDC licence

The Operating Plan shall include the following Operating Principles:

(a) Adequate margins for operating reserve, voltage regulation and frequency control must be ensured at all times under normal system conditions.

(b) Generation and Transmission facility outage co-ordination and assessment of system security impacts should be carried out prior to real-time operations.

(c) Frequency control and regulation requirements must be provided by all the generators, selected distribution feeders, and all BPCs connected to the NTDC system.

(d) Transmission congestion management and contingency event management must be provided in accordance with the Operating Criteria and Principles laid down in the Operating Sub-Code (OC-4) of this sub-code.

(e) Appropriate and fair spinning reserve allocation must be made among all the on-line generators.

(f) Adequate reactive reserve management and voltage regulation must be carried to meet the Operating Standards stated in OC 4.9.1 of this Code.

(g) Procurement of adequate Ancillary Services must be ensured prior to real-time operations.

(h) Scheduling of generation utilizing economic dispatch principles, and re-dispatch for transmission considerations must be carried by the System Operator during generation scheduling process.

(i) Provision of adequate generation protection and control based on the principles laid down in Protection & Metering Code (PMC) must be provided by NTDC.

(j) Functioning of dual communication systems during system operation and dispatch must be ensured by the System Operator/Grid Code Participants.

(k) Provision of pre-operational plans regarding black start facilities and pre-tested system restoration plan under black out conditions must be ensured by the System Operator.

(l) Minimization of energy imbalances at all times must be ensured by the System Operator.

(m) The System Operator must ensure that all the thermal loadings, voltages, system stability (both steady-state and dynamic) are well within established limits as provided in the Operating Code 4 of this sub-code.

⏭ ⏭ ⏭ ⏭ End of OC 1 ⏮ ⏮ ⏮ ⏮ ⏮

OPERATION CODE No. 2

DEMAND FORECASTS

OC 2.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 2.1.1 This sub-code is concerning Demand Forecasting as related to Operational Timescales with the specific objective of ensuring that the highest levels of security of power supply are maintained for Consumers at all times. The scope of this sub-code applies to all Users connected to the Transmission System, i.e. Generators, Distribution Companies and Consumers directly connected to the Transmission System of NTDC, and other Parties consuming power from the NTDC system.

OC 2.1.2 This sub-code covers Active Demand and Reactive Demand forecasts which are necessary to match generation output with system energy requirements.

OC 2.1.3 In advance of real time operations, demand forecasting shall be consolidated/developed by NTDC on the basis of demand forecasts provided by individual Users.

OC 2.1.4 For real-time operations, NTDC shall conduct its own demand forecasting taking into account information supplied by all the Users, and any other external factors that it may deem necessary.

OC 2.1.5 In this OC 2, the Points of Connection of Users, Generators, Consumers and External-connection shall be considered as a Transmission Connection Points.

OC 2.1.6 In this OC 2, Year 0 means the current NTDC Calendar Year at any time, Year 1 means the next NTDC Calendar Year at any time, Year 2 means the NTDC Calendar Year after Year 1 and so on.

OC 2.1.7 References in OC 2 to data being supplied on an hourly basis refers to it being supplied for each period of 60 minutes ending on the hour.

OC 2.1.8 The term 'Operations' means operations in real time.

OC 2.2 DATA REQUIRED BY NTDC IN THE PRE-OPERATIONAL STAGE

OC 2.2.1 The data is to be supplied to NTDC by:-

Each User directly connected to the NTDC Transmission System in relation to Demand Forecast. This data shall be supplied in writing to NTDC by calendar week 40.

OC 2.3 **DATA REQUIRED BY NTDC FOR THE OPERATIONAL STAGE**

OC 2.3.1 For a period of 4 weeks ahead of the real-time day, the following shall be supplied to NTDC in writing by 10.00 a.m. each Monday. The 4-week period is a rolling period.

Demand Management

Each distribution company and other Code Participants (as instructed by NTDC) shall supply MW profiles, in relation to their peak demand, of the amount and duration of their proposed use of demand management which may result in a demand change of 5MW or more on any Transmission Connection Point (averaged over an hour which may be changed later by the Authority to ½ hourly basis).

OC 2.3.2 For the period of up to eight (8) days ahead of the real-time day, the following shall be supplied to the System Operator in writing by 10:00 a.m. each Wednesday

Demand Management

Each distribution company and other Code Participants (as instructed by the System Operator) shall supply MW profiles, in proportion to their peak demand, of the amount and duration of their proposed use of demand management which may result in a demand change of 5MW or more (averaged over an hour which may be changed by the Authority to ½ hourly basis) on any Transmission Connection Point. The quantum of load to be shed by each Distribution Company shall be at the discretion of NTDC. However, the System Operator shall carryout Load Management in fair manner.

OC 2.3.3 Each Generator shall, if required by NTDC, supply the System Operator with MW schedules for the operation of power plants on an hourly basis in writing by 10.00 a.m. each day (or such other time specified by NTDC from time to time) for the next day.

OC 2.3.4 Under OC 3, each distribution company and other Code Participants as specified by the System Operator shall notify the System Operator of any demand management proposed by itself which may result in a demand change of 5MW or more averaged over an hour on any Transmission Connection Point which is planned after 10.00 a.m. on an operational day, and of any changes to the planned demand management notified to the System Operator prior to 10.00 a.m. as soon as possible after the formulation of the new plans.

GRID CODE

OPERATION CODE No. 3

DEMAND MANAGEMENT

CONTENTS

OPERATION CODE NO. 3

DEMAND MANAGEMENT

OC 3.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 3.1.1 Operation Code No. 3 (OC3) deals with the provisions to be made for the Users including Consumers directly connected to the NTDC Transmission System to facilitate reduction in Demand as per the instructions of NTDC for any reason.

OC 3.1.2 Similarly, the provisions given here apply to Unforeseen Events as well.

OC 3.1.3 The objective of OC3 is to provide facilities and procedures which shall enable NTDC to achieve a reduction in demand that will relieve planned and unforeseen operating conditions on the NTDC transmission system.

OC 3.1.4 OC3 applies to NTDC and to Users:

(a) Distribution Companies;

(b) NTDC in relation to Consumers directly connected to the NTDC Transmission System; and

(c) Externally-connected Consumers

OC 3.2 CODE CLARIFICATION

OC 3.2.1 Demand Management may be achieved by any of the following:

(a) Under-frequency load disconnection.

(b) Consumer Response to direct appeals to limit Demand.

(c) The System Operator Instructions in an Emergency.

OC 3.2.2 In all situations considered in OC3, demand management is exercisable:

(a) by reference to distribution companies system directly connected to the NTDC Transmission System; and

(b) by NTDC in relation to Consumers directly connected to the NTDC Transmission System

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OC 3.2.3 Demand management in all situations relates to the physical organisation of the Total System Demand, and not to any contractual arrangements.

OC 3.2.4 The application of demand management by a distribution company may affect other Consumers of the distribution company within its geographical boundary.

OC 3.2.5 Demand management shall be implemented by distribution companies where the Consumers are within the distribution company's system which are directly connected to the NTDC Transmission System; and by NTDC where Consumers are directly connected to the NTDC transmission System.

OC 3.3 PROCEDURE FOR THE NOTIFICATION OF DEMAND MANAGEMENT INITIATED BY DISTRIBUTION COMPANIES (OTHER THAN FOLLOWING THE INSTRUCTIONS OF NTDC)

OC 3.3.1 By 10.00 a.m. of each day, distribution companies and other Code Participants, as specified by the System Operator, shall provide the System Operator with a summary of any demand reductions of 5MW or greater during the last 24 hours, and of any planned demand reductions within the next 24 hours.

OC 3.3.2 Any changes from the planned demand management shall be communicated to the System Operator as soon as possible.

OC 3.3.4 In the above the summary of planned or historic demand reductions, the information supplied to the System Operator shall include the magnitude, time, location, date and details of the demand management methods employed.

OC 3.4 PROCEDURE FOR THE IMPLEMENTATION OF DEMAND MANAGEMENT ON THE INSTRUCTIONS OF NTDC

OC 3.4.1 The System Operator shall provide as much warning as possible of any unforeseen circumstances which are likely to result in demand management procedures being implemented. This shall ensure that all the distribution companies and all other relevant Code Participants shall be in a state of readiness to implement their planned demand management procedures.

OC 3.4.2 All the relevant Code Participants participating in the demand management are required to be able to respond at a short notice to the System Operator instructions to implement demand management.

OC 3.4.4 The System Operator shall endeavour to limit demand reductions equal to the loss of generation upto a maximum of 30% of the Total System

Demand at the time of implementation of the demand reduction. The System Operator shall, to the extent possible, formulate consistent and fair policy of demand management among DISCOs and other Users.

OC 3.4.4 Distribution companies have an obligation to provide full details of their demand reduction plans to the System Operator on an annual basis ahead of time.

OC 3.4.5 Following the implementation of demand management, distribution companies and any Consumers directly connected to the NTDC Transmission System may only restore their systems to normal operation upon the instructions of the System Operator.

OC 3.4.6 After restoration to normal operating conditions, distribution companies are obliged to supply information to the System Operator, which shall include the magnitude, date and time, location and details of the demand management methods employed.

OC 3.5 AUTOMATIC LOW FREQUENCY DEMAND DISCONNECTION

OC 3.5.1 All Transmission Connection Points shall be provided with low frequency disconnection facilities. This is necessary to ensure that in the event of a large generating unit failure, there is a staged and phased demand disconnection to ensure system stability for connected consumers.

OC 3.5.2 Any low frequency disconnection scheme must take into account of all embedded generation on the low voltage systems of the distribution companies.

OC 3.5.3 When there is a low frequency disconnection, distribution companies and other Code Participants, as specified by the System Operator, are obliged to follow the System Operator instructions when restoring power supplies.

OC 3.6 EMERGENCY MANUAL DISCONNECTION

OC 3.6.1 Each distribution company shall provide the System Operator in writing by week 40 in each calendar year, in respect of the next following year beginning week 40, on each Transmission Connection Point basis the information contained in the Appendix 1 of this sub-code.

OC 3.6.2 In the event of a System Emergency, irrespective of the frequency, the System Operator may instruct distribution companies to disconnect demand at specific Transmission Connection Points on an urgent basis. Quantum of load and specific location of load reduction shall be at the discretion of the System Operator depending on the conditions prevailing at that time. However, the System Operator shall fairly carry

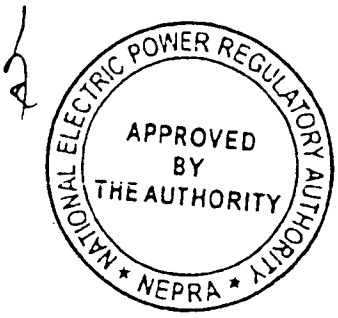
out demand management. This action may be necessary to protect life, limit plant damage and to maintain supplies to the majority of Consumers.

OC 3.6.3 The System Operator shall have a right of involuntarily disconnection of any facility of the Code Participants in the case of system operational emergency when it is determined by the System Operator that transmission system of NTDC might or could become incapable of providing the required services as mandated in its licence.

OC 3.6.4 Distribution companies are obliged to comply with the System Operator instructions when restoring supplies.

OC 3.7 OPERATION OF THE BALANCING MECHANISM DURING DEMAND MANAGEMENT

To be provided as and when notified by the Authority.



OC 3 APPENDIX 1

EMERGENCY MANUAL DEMAND REDUCTION/DISCONNECTION SUMMARY SHEET

Name of Company/Code Participant/Transmission Connected Consumer: _____
Peak Demand [Year] MW

(132 & 66kV Radial Lines, 132/11kV & 66/11kV Transformers)

Transmission Connection Point	Peak (MW)	% of Load Demand Reduction or Disconnection *with respect to Peak MW at the Transmission Connection Point (%)*	Remarks *Duration of Load Management (Hours)*

Note: Data to be provided annually by week 40 to cover the following NTDC calendar year.

⏭⏭⏭⏭⏭ End of OC 3 ⏮⏮⏮⏮⏮

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OPERATION CODE No. 4

OPERATIONAL PLANNING

CONTENTS

OPERATION CODE NO. 4

OPERATIONAL PLANNING

OC 4.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 4.1.1 Operating Code No. 4 details the information including procedures required by the System Operator and Users to ensure efficient co-ordination and harmonisation of the dispatch of all Generation facilities, and User's obligations to enable the NTDC transmission System to operate under normal and emergency conditions, and/or during construction, repair and maintenance outage periods.

OC 4.1.2 To plan ahead, Operational Planning is required for several timescales. The data provided by Generators and DISCOs enables NTDC to match Generation with NTDC Forecast Total System Demand together with an operating reserve of generation to provide a margin to ensure that the Standards of Security of Supply as set out in this Code and the NTDC licence are properly achieved.

OC 4.1.3 The scope of this Code applies to all Grid Code participants, i.e.

(a) National Transmission and Dispatch Company, NTDC;

(b) Generators;

(c) Distribution Companies;

(d) Transmission Connected Consumers;

(e) Externally-connected Consumers; and

(f) Externally-connected Parties.

OC 4.2 NETWORK BOUNDARIES OF EXISTING DISTRIBUTION COMPANIES

Restructured Network

The NTDC shall own and operate the assets of entire 500kV and 220kV transmission and substations.

All Code Participants, including generation connected to 132/66 kV network shall be connected to the NTDC network; and embedded generation shall be connected to the bulk power system through the DISCO's 11kV distribution network.

The DISCOs shall own and operate the assets of 132kV and 66kV sub-transmission lines, 11kV primary distribution network and 400V, secondary distribution system located in their defined Service Territories, and in conformance with the Territory specified in their respective licenses.

Bifurcation of network between NTDC and Generation Companies

The network bifurcation point between NTDC and a Generator's substation shall be the line connections on the NTDC terminal structure at the Generator substation. The NTDC's maintenance jurisdiction shall be up to the tension strings of the same terminal structure towards the line side.

In case a Generator does not own a generating substation then the bifurcation point shall be the line connection on the Generator's terminal structure. In this case, the NTDC maintenance jurisdiction shall be up to the tension strings of the same terminal structure towards gantry side.

For the Generators connected to the 132/66 kV network of distribution companies, the above Principle shall also apply. However, the maintenance shall be carried out by the concerned distribution company after the approval of the NTDC/System Operator.

Bifurcation of network between NTDC and Distribution Companies

The Network Bifurcation Point between NTDC and Distribution Companies 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.

From those NTDC substations where 11kV feeders emanate which, in additional to station auxiliary supply, also feed the Consumers of the respective distribution companies, the point of bifurcation of such feeders shall be the jumpers of 11kV power cable coming from outgoing panels and the 11kV distribution line at the terminal structure.

Within next three years of the implementation of this Code efforts should be made that the distribution companies shift their 11 kV load from 220 kV Grid Stations to 132 kV stations of the distribution companies.

Bifurcation of Network between NTDC and KESC

The network bifurcation point between NTDC and KESC shall be according to the principles established in "Interconnection Agreement" between NTDC and KESC as and when finalized between the parties.

OC 4.2.1 **Point of Connection**

These are points of Connection which shall be in conformance with Clause (xiv) of Section 2 of the NEPRA Act, which states: "the Connection of one company's electrical facilities to another company's

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

OC 4.3 OUTAGE CO-ORDINATION

OC 4.3.1 In order to ensure the uninterrupted, smooth and stable operation of the NTDC Transmission System, several Parties need to interact with each other. In summary these are: -

(a) Each Generator with the System Operator in respect of outages, plant defects, availability etc.

(b) The System Operator with respective Generator in respect of transmission outages and constraints relevant to that Generator.

(c) The System Operator with respective distribution company in respect of outages and constraints on the transmission system, Power Plants, and at Transmission Connection Points.

(d) The System Operator with respective distribution company and each Transmission-connected Consumer in respect of outages and constraints on the NTDC Transmission System, power plants, and at each transmission Connection Point relevant to that distribution company and the transmission connected Consumer.

(e) Each distribution company and each transmission Consumer connected with NTDC in respect of User system outages relevant to NTDC

(f) Each External-connection Operator with the System Operator for outages and constraints on their systems and vice versa.

OC 4.4 PLANNING OF GENERATION OUTAGES

OC 4.4.1 Short Term Planning (Year 0)

OC 4.4.1.1 In this Code, short term is the financial current year, or Year 0 of the NTDC Financial Year. The basis for Operational Planning for Year 0 shall be the revised Year 1 Final Generation Outage Programme prepared by each Generator, and submitted to the System Operator will be on the Financial Year basis.

OC 4.4.1.2 The closer the prepared outage programme is to real-time operations, the more accurate it must be to ensure there is adequate generation to match demand. There shall be several timelines whereby there shall be an exchange of information, on a quarterly basis, between each Generator and the System Operator. In each case the Generator is required to return their most up to date outage proposals, thereby enabling the System Operator to plan generation availability accurately

forecast generation requirements. The precise timetable for the provision and acknowledgement of this information is produced as Appendix 1 (P:45) of this sub-code. Each Generator shall only undertake the Outage Programme only as agreed to in writing by the System Operator.

OC 4.4.2 **Medium Term Planning (Year 1-2)**

OC 4.4.2.1 In this Code, medium term is the two financial years following Year 0, or Years 1 & 2 of the NTDC Financial Year. The basis for Operational Planning for Year 1 & 2 shall be the "revised Year 2 & 3" Final Generation Outage Programme, agreed between each Generator, and the System Operator.

OC 4.4.2.2 At intervals specified in Appendix 2 (P: 46), there shall be an exchange of information concerning the Final Generation Outage Programme between each Generator and the System Operator on a Financial Year basis.

OC 4.4.2.3 The process of iterative discussions and updating of the Final Generation Outage Programme shall be concluded by April, 30th, of each financial year to be notified by the System Operator by May 31st, of each financial year. Year 1 programme shall form the basis of the Year 0 Final Generation Outage Programme.

OC 4.4.3 **Long Term Planning (Year 3-5)**

OC 4.4.3.1 In this Code long term is for the three-year period covering Years 3, 4 & 5 of the NTDC Financial Year.

OC 4.4.3.2 At the beginning of Year 3 for the next three years, Year 3, 4 & 5, each Generator shall provide, in writing, to the System Operator, a provisional Generation Outage Programme showing the best estimate of its Usable Output for the Years 3, 4, and 5 (Appendix-3, P:47).

OC 4.4.3.3 The System Operator shall prepare the annual NTDC Forecast Demand including values for the peak Summer Demand.

The System Operator shall notify respective Generator of any forecasted outages on the NTDC Transmission System, for construction or maintenance work. The process of provisional planning, between NTDC and each Generator, shall terminate by the beginning of the tenth month of Financial Year 3.

OC 4.4.3.4 Every effort shall be made by the System Operator and each Generator to agree on the Final Generation Outage Programme which when summated will meet the NTDC Forecast Total System Demand for the Financial Years 3 to 5. All agreements shall be recorded for future reference. It is acknowledged that this agreement on the Final Generation Outage Programme at this stage is not a commitment on the part of the Generators. In the event that a Generator's outages later on differ from those given in the Final Generation Outage

Programme, or they conflict with the NTDC Transmission System Outage Programme, NTDC is not committed to alter its own NTDC Transmission System outage programme for the sake of Generators.

OC 4.5 PLANNING OF NTDC OUTAGES

OC 4.5.1 Short Term Planning (Year 0)

In this Code short term is the current Financial year, or year 0 of the NTDC Financial Year.

OC 4.5.1.1 Each Generator, distribution company or transmission Consumer may at any time during Year 0 request in writing to the System Operator for changes in the outages requested by them in future years. The System Operator shall determine if the changes are acceptable, and shall reply in writing to each Generator, distribution company or transmission Consumer advising them if the proposed changes are acceptable to the System Operator. However, the System Operator is not committed to alter its own NTDC Transmission System Outage Programme due to changes proposed by the Users.

OC 4.5.1.2 Depending on the NTDC response to OC 4.5.1.1, there may follow a series of discussions between all Parties to determine a mutually acceptable solution for all including the System Operator.

OC 4.5.1.3 The System Operator shall review the Final Outage Programme with respective Code Participants at eighth week (8) before real-time. All parties are obliged to co-operate at this stage in any outage changes requested by the System Operator, Generators, distribution companies, and transmission Consumers.

OC 4.5.1.4 This process of confirming and mutually amending the Final Outage Programme continues in more and more detail right up to the real-time operation. Appendix 4 (P: 48) of this Code details the time scales of the NTDC Transmission Outages and obligations, which each Code Participant must observe to achieve this objective.

OC 4.5.2 Medium Term Planning (Year 1-2)

In this Code, Medium-Term is the two financial years period following Year 0, or Year 1-2 of the NTDC Financial Year.

OC 4.5.2.1 The System Operator is required to update the NTDC Transmission System Outage programme, to take into account of outages, required for NTDC transmission system maintenance purposes.

OC 4.5.2.2 There shall be a series of reviews similar to this given in OC 4.4.2 for Medium-term generation outages. By April, 30th of each Financial Year i.e. Year 0, the System Operator shall publish information on NTDC Outage Programme to all the respective Code Participants. Appendix 5 (P: 48) of this Code details the time scales of Transmission Outages.

which the System Operator and each Code Participant must observe to achieve this objective.

OC 4.5.3 **Long Term Planning (Year 3-5)**

In this Code long term is for the three-year period covering Years 3, 4 & 5 of the NTDC Financial Year

OC 4.5.3.1 The System Operator shall plan the NTDC Transmission System outages for Years 3-5 on the basis of construction and refurbishment requirements; whereas the NTDC Transmission System outage programmes for Years 1–2 are for maintenance requirements.

OC 4.5.3.2 For each of the three Years 3,4, and 5 there will be a number of timelines whereby the System Operator and Users shall exchange information. The time scales for the information exchange are detailed in Appendix 6 (P: 48) to achieve this objective. This process should be complete by the beginning of the eighth month of each Financial Year.

OC 4.5.3.3 At the end of the exchange of information period, the System Operator shall prepare a draft NTDC Transmission System outage plan (Appendix 6) Page 48 for Years 3 to 5. The System Operator shall also issue, in writing, those aspects of the Plan which may cause operational difficulties for Generators, DISCOs or Transmission Connected Consumers. The System Operator shall also indicate where they may need to issue Emergency Instructions to Users in accordance with the Operation Code to allow that the security of supply of the NTDC Transmission System remains within the requirements of the Transmission Licence.

OC 4.6 **DATA REQUIREMENTS**

OC 4.6.1 The Generators are required to submit to NTDC/the System Operator technical information on each of their generating units. The information must include a realistic performance chart for each unit. The information required shall be as set out in Appendix 7 for Generator Performance Charts; and as set out in Appendix 8 for Generation Planning Parameters.

OC 4.6.2 The Generation Planning Parameters supplied to the System Operator/NTDC shall only be used by NTDC/the System Operator for planning purposes and not in connection with the operation of the Balancing Mechanism (to be notified by the Authority).

OC 4.6.3 By 10.00 a.m. one week prior the operational day, each User must inform the System Operator of any changes to circuit details as specified in Planning Code PC A 2.2.4, PC A 2.2.5, PC A 2.2.6, PC A 2.3, PC A 2.4 which may apply on that operational day.

OC 4.7 INSUFFICIENT POWER OPERATING MARGIN

OC 4.7.1 Annually, the System Operator shall calculate the required Active Power Operating Margin required to support the NTDC forecasted Demand. The System Operator shall advise Generators in writing of any periods when there is likelihood of having insufficient power operating margin.

OC 4.7.2 Generators and the System Operator shall review proposed outages at times of inadequate Active Power Operating Margins to ensure that the required Active Power Operating Margin can be achieved.

OC 4.7.3 Outage adjustments required to avoid inadequate Active Power Operating Margin shall be given by the System Operator in writing to Generators.

OC 4.8 FREQUENCY RESPONSE

OC 4.8.1 From 2 to 6 weeks ahead of the operational day, the System Operator shall assess whether there will be sufficient plant mix to operate in "Frequency Sensitive Mode".

(a) **Automatic Generator Control Action**

All Generators (thermal) above 100 MW and reservoir-based Hydro shall provide free Governor Control Action (AGC control) to maintain system frequency within the prescribed limits provided in this Grid Code and the NEPRA Transmission Performance Standards Rules.

(b) **Net Drawls of Power from the Grid**

When the system frequency falls below 49.4 Hz, requisite load shedding (automatic) must be carried out to stabilize the system frequency to an acceptable level (Frequency Sensitive Mode).

The System Operator shall provide automatic load shedding groups, amounts of load to be shed at each Transmission Connection Point, along with the timing of operation of the relays, and pre-set frequency thresholds.

(c) **Operating System Frequency Criteria**

The System Operator shall co-ordinate with all the Generators connected to its Transmission Grid system in order to maintain the declared system frequency at 50 Hz (Cycles/sec) with the following allowable excursions:

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(i) Declared or Target System Frequency shall be 50Hz.

(ii) Frequency Sensitive Mode shall be 49.8 Hz----50.2 Hz. Such a variation is permissible to allow frequency variations while ramping up generation and load pick-up.

(iii) Protected periods of operation of the system at the frequency in the range of 49.5 Hz----- 50.5 Hz (Tolerance Frequency Band).

(iv) Minimum/Maximum Acceptable Frequency Band shall be 49.4 Hz-----50.5 Hz (Load Shedding Threshold or Contingency Frequency Band), which is well within the applicable IEC Standards.

(v) Instantaneous frequency excursions are to be handled in the following manner:

- In the event of a single contingency, the power system frequency must be maintained within "Tolerance Frequency Band" within 5 minutes of the excursion, and to within the "Frequency Sensitive Mode" within 10 minutes of the contingency.

- Instantaneous frequency excursions outside the "Contingency Frequency Band" shall be handled in such a manner that:

  - System frequency returns to "Contingency Frequency Band" within 60 seconds.

  - System frequency returns to "Tolerance Frequency Band" within 5 minutes, and within the "Frequency Sensitive Mode" within 30 minutes.

OC 4.8.2 If the System Operator foresees that there will be insufficient generation operating in Frequency Sensitive Mode, it shall discuss this problem with the Generators, and seek to change the plant mix to ensure there shall be sufficient generation operating in Frequency Sensitive Mode at the forecasted time.

OC 4.8.3 If the System Operator determines that the procedures of OC 4.7 and OC 4.8 are required for the same operating period, then the order shall normally be OC 4.7 first followed by OC 4.8. For the avoidance of doubt, there is nothing in this paragraph which shall prevent either procedure following the other or operating independently.

OC 4.9 **CONTROL OF POWER SYSTEM VOLTAGE**

The System Operator (SO) shall maintain System Operating Voltage of the Total System within the Target Voltage Levels (limits) specified in Table 4-1(P:41). The System Operating Voltage shall be maintained within these specified limits for both normal operating conditions and contingency conditions excluding transient and abnormal system conditions.

These limits shall be maintained by the System Operator at 500 kV, 220 kV, and selected 132 kV busses of the Total System.

(a) **Under (N-0) Normal Operating Conditions;** The bus voltages shall be within the bandwidth of +8% and -5% of Nominal System Voltage (Highest and Lowest Voltages of the Total System under Normal Steady-state Operating Conditions).

(b) **Under (N-1) Contingency Operating Conditions;** The bus voltages shall be within the bandwidth of ±10% of Nominal System Voltage (Highest and Lowest Voltages of the Total System under (N-1) Contingency Operating Conditions excluding Transient Conditions).

TABLE 4-1
OPERATING VOLTAGE LIMTS
(Normal/Contingency Condition)

Voltage Level	Normal Condition		(N-1) Condition	
	Max	Min	Max	Min
500 kV	540	475	550	450
220 kV	238	209	245	198
132 kV	143	125	145	119

These limits of System Operating Voltage are provided strictly for voltage regulation purposes. These limits are not to be construed as NTDC transmission system operating voltages at the Points of Connection, distribution system voltages of the DISCOs/KESC or consumer-end voltages (NTDC/DISCOs/KESC).

OC 4.9.1 **Reactive Power Management**

Distribution companies, KESC, BPC's, and other power consuming entities, as applicable, shall all be responsible for the maintenance of power factor at 132 kV Connection Point grid station busses; such that the power factor at 132 kV busses in the NTDC portion of Connection Point substations shall be maintained within the range of 95% and better during steady-state operating conditions.

Distribution companies, including KESC, shall require BPCs within their Service Territory to install shunt capacitors and/or other power factor correction facilities so that the power factor at their Point of Connection is 95% or better.

In no case, DISCOs and BPCs shall offer leading power factor to NTDC.

OC 4.9.2 **Absolute Minimum Steady State Voltages**

Under extreme system conditions, the situation may arise in which substation voltages can not be increased to the required steady state levels. In this case, an absolute minimum voltage level (90% of Nominal System Voltage) is defined and shall be used as a threshold for the initiation of automatic load shedding. The following minimum voltages shall be followed for the consideration of extreme system conditions, and prevent system Voltage Instability conditions.

500 kV system	450 kV
220 kV system	198 kV
132 kV system	119 kV

OC 4.9.3 **Operating Procedures**

The System Operation shall be divided into two states as follows:

OC 4.9.3.1 **Base Operating Case**

Each day the System Operator shall establish a generation schedule and shall dispatch generation units and transmission resources on an hour by hour basis as per the provisions of Scheduling and Dispatch sub-code. Dispatch Schedule shall provide adequate generation capacity to meet expected load, total operating reserves as per OC5 and ancillary services requirements; and shall not result in transmission congestion or voltage violations during the normal (N-0) state, and in the emergency (N-1) state; and shall not violate voltage level criteria or emergency loading limits on transmission lines or transformers or manifest stability problems.

OC 4.9.3.2 **Emergency Operating Case**

The System Operator shall have available and shall implement when required, generation re-dispatch plans and schedules for likely (N-1) contingency events so that, if the system moves to an expected contingency (N-1) state, the System Operator can follow the re-dispatch and return the system to a Normal State. The System Operator shall have available and shall implement; emergency-operating procedures to deal with system contingencies. The System Operator shall have available at all times and be in a position to implement, system restoration plans for the situation in which the system moves to an islanded state or suffers a cascading break up resulting in a Black Out condition.

OC 4.9.4 **Overhead Conductors Loading Criteria**

NTDC shall establish loading limits for each 500 kV and 220 kV transmission circuit and selected 132 kV circuits that are operated in parallel with NTDC 500 kV and 220 kV lines for reliability reasons

Loading limits shall be established according to normal (N-0) and emergency (N-1) states as well as for Summer and Winter.

Table 4-2 lists the climatic condition parameters to be used in establishing transmission circuit loading capabilities. In addition, the line loading capability shall take into account the required safe minimum clearance above grade at mid span.

Each year, the System Operator shall submit to NEPRA, for information, a list of all transmission circuits under its control. The list shall state the Summer and Winter line loading capacity limits for Normal and Emergency states both.

TABLE 4-2
Rating Parameters For Overhead Conductors

	Summer Rating Bases	Winter Rating Bases
Maximum Conductor Temp.	90^0 C	90^0 C
Outdoor Ambient Temp. (avg.)	40^0 C	(d)
Conductor Temp. Rise	*	*
Max. Emergency Conductor Temp.	None Allowed	None Allowed
Wind Velocity	3 Feet/Second	3 Feet/Second
Age of the Transmission Circuit		
Transmission Line Sag Design		

Criteria stated in the table above apply to NTDC and KESC transmission line conductors designed for operation at 132kV, 220kV and 500kV voltage levels.

Notes to Table:

(a) Summer Months = April through October

(b) Winter Months = November through March

(c) Emergency ratings are limited to (8) hours of continuous operation. Conductors shall not be operated above 100^0 C conductor temperature for more than 960 cumulative hours.

(d) The following average temperature of Winter shall be used fro the respective provinces:

1. Lahore (Punjab) 6.5^0 C
2. Peshawar (NWFP) 5^0 C
3. Quetta (Balochistan) -7^0 C
4. Karachi (Sindh) +5^0 C

* *"Conductor Temperature Rise" shall be calculated based on the Outdoor Ambient Temperature (average) used for each respective Province. Lower or higher Outdoor Ambient Temperature (average) within a Province, different from the values stated in (d) above, may be considered if the variation in such temperature is significant, depending upon the location.*

OC 4.9.5 **Transformer Loading Criteria**

Grid station transformers including three phase and single phase banks that are normally operated at the voltage levels of 220/132kV and 500/220kV shall be loaded under normal and contingency conditions according to applicable IEC, ANSI/IEEE standards and as specified by the respective manufacturers.

OC 4.9.6 **Transmission System Components Loading Criteria**

Transmission system components listed below, that are normally operated at the voltage levels of 220/132kV and 500/220kV, shall be loaded under normal and contingency conditions according to applicable IEC, ANSI/IEEE standards and as specified by the respective manufacturers.

Circuit breakers	Current transformers
Circuit switchers [2]	Potential transformers
Capacitors	Wave traps
Shunt reactors	Substation power buses
Disconnect switches	Substation power cables

OC 4.10 **POWER SYSTEM STABILITY CO-ORDINATION**

Each year, NTDC/ the System Operator shall prepare transient stability studies for expected system event scenarios that could lead to unsatisfactory system dynamic performance and loss of power angle stability (transient instability). The System Operator shall maintain and be able and ready to implement, when required, emergency operating procedures designed to mitigate the extent of disturbance resulting from a system event.

NTDC as a System Operator shall make stability studies to develop emergency operating plans to deal with the consequences of the occurrence of the most probable faults including the following:

(a) Permanent three-phase fault on any primary transmission element; including: transmission circuit, substation bus section, transformer, or circuit breaker. It is assumed that such a fault shall be cleared by the associated circuit breaker action in 5 cycles.

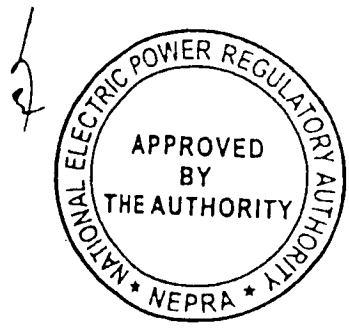
(b) Failure of a circuit breaker to clear a fault ("Stuck Breaker" condition) in 5 cycles, with back up clearing in 9 cycles after fault initiation.

[2] Circuit Switchers are disconnect switches with capability to interrupt load current under non-fault conditions

OC 4 APPENDIX 1 (OC 4.4.1.2)

Short Term Planning Timetable for Generation Outages (Year 0)

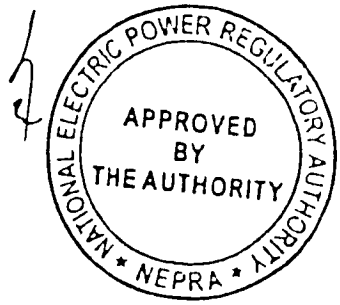
This appendix should be completed by NTDC in consultation with the Generators.



OC 4 APPENDIX 2 (OC 4.4.2.1)

Medium Term Planning Timetable for Generation Outages (Year 1-2)

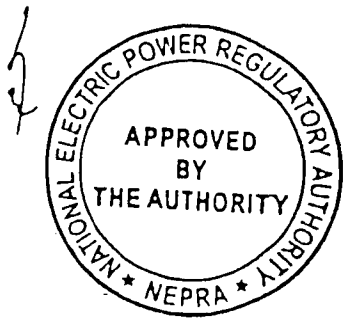
This appendix should be completed by NTDC in consultation with the Generators



OC 4 APPENDIX 3 (OC 4.4.3.2)

Long Term Planning Timetable for Generation Outages (Year 3-5)

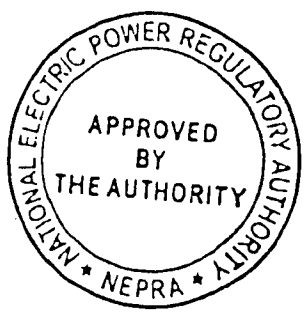
This appendix should be completed by NTDC in consultation with the Generators



OC 4 APPENDIX 4, 5, 6
(OC 4.5.1, OC 4.5.2, OC 4.5.3)

NTDC Transmission Outages (Year 0-5)

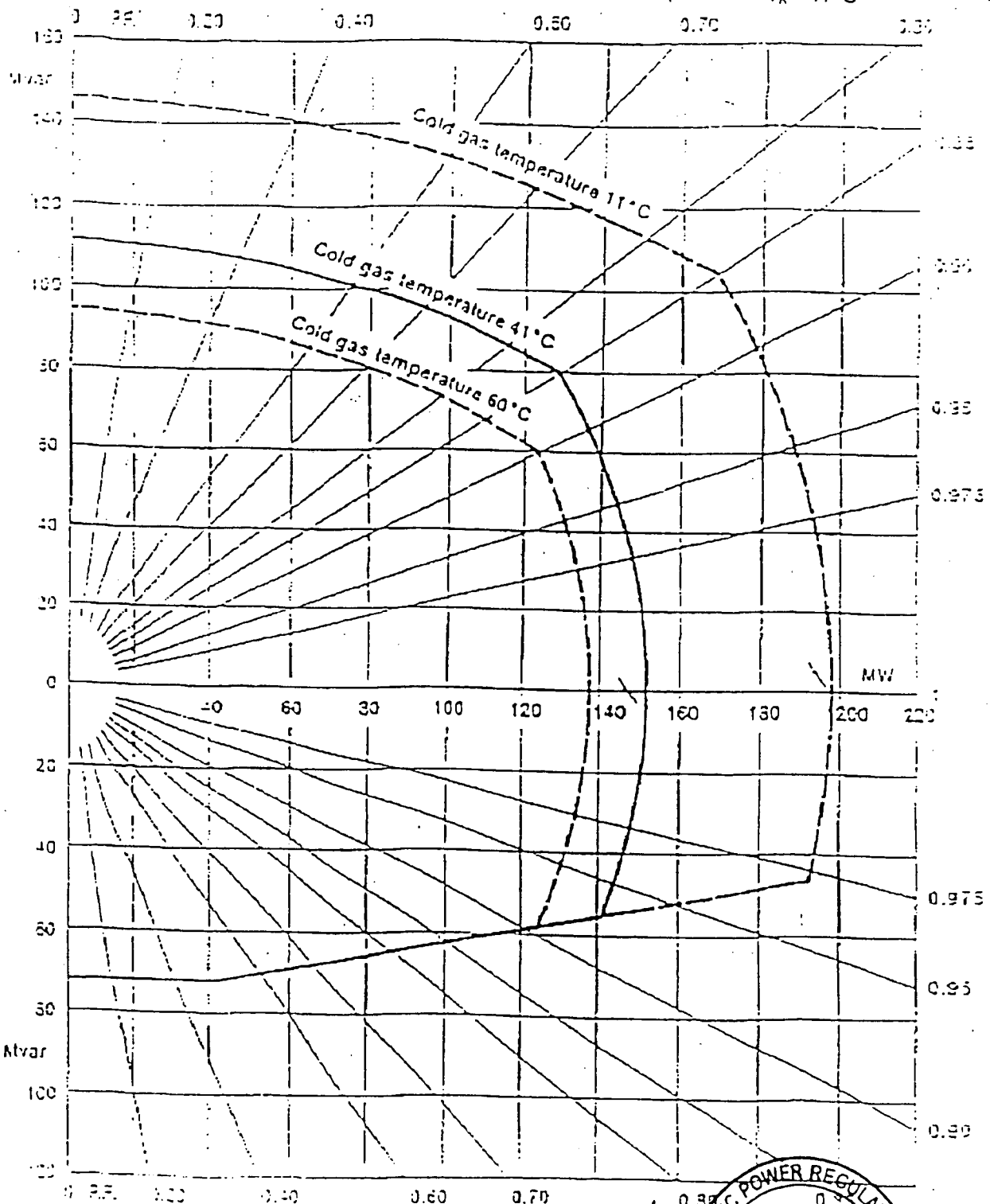
This appendix should be completed by NTDC in consultation with the generators.



OC 4 APPENDIX 7 (OC 4.6.1)

Generator Performance Chart

Rated Apparent Power	S_N = 151.5 MVA	Rated Frequency	f_N = 50 Hz
Rated Active Power	P_N = 128.8 MW	Power Factor	P.F. = 0.85
Rated Armature Voltage	V_N = 11.0 to 1.1 kV	Speed	n_N = 50 s^{-1}
Rated Armature Current	I_N = 7.951 kA	Cold Air Temperature	T_K = 41 °C



OC 4 APPENDIX 8 (OC 4.6.1)

Generation Planning Parameters

OC 4.A.5 **Generation Planning Parameters**

The following parameters are required in respect of each Genset.

OC 4.A.5.1 **Regime Unavailability**

Where applicable the following information must be recorded for each Genset.

(a) Earliest synchronizing time; and

(b) Latest de-synchronizing time.

OC 4.A.5.2 **Synchronizing Intervals**

The Synchronizing intervals between Gensets.

OC 4.A.5.3 **De-Synchronizing Interval**

A fixed value de-synchronizing interval between Gensets.

OC 4.A.5.4 **Synchronizing Generation**

The amount of MW produced at the moment of Synchronizing.

OC 4.A.5.5 **Minimum on Time**

The minimum period on-load between synchronizing and De-synchronizing.

OC 4.A.5.6 **Run-Up Rates**

A run-up characteristic consisting of different stages from Synchronizing Generation to Output Usable.

OC 4.A.5.7 **Run-Down Rates**

A run down characteristic consisting of different stages from Output to De-synchronising.

OC 4.A.5.8 **Notice to Synchronise (NTS)**

The period of time required to Synchronize a Genset.

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OC 4.A.5.9 **Minimum NPCC Shutdown Time**

The minimum interval between De-synchronizing and Synchronizing a Genset.

OC 4.A.5.10 **Maximum Shifting Limit**

The maximum number of times that a Genset may De-synchronize per Operational Day.

OC 4.A.5.11 **Gas Turbine Units Loading Parameters**

(a) Loading rate for fast starting

(b) Loading rate for slow starting

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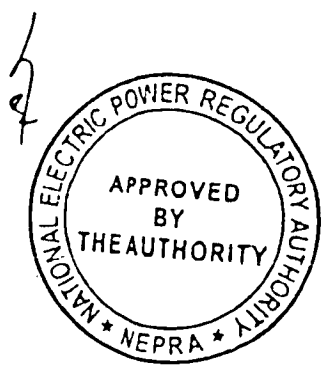


OPERATION CODE No. 5

OPERATING MARGINS

CONTENTS

OPERATION CODE No. 5

OPERATING MARGINS

OC 5.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 5.1.1 Operating Code No. 5 sets out the types and amounts of Reserve, which make up the Operating Margin that the System Operator may make use of under certain operating conditions to cover for the uncertainties in Demand Forecasting and power plant availability/unavailability or sudden outages of generation and transmission facilities.

OC 5.1.2 This sub-code applies to NTDC and to Code Participants which in OC5 means:

(a) Generators under Central Dispatch of NTDC.

(b) Other Users/Code Participants bound by the Grid Code.

OC 5.2 OPERATING MARGIN AND CONTINGENCY RESERVE

OC 5.2.1 The Operating Margin consists of:

(a) **Contingency Reserve.** This is the level of generation over the forecasted Demand which is required in the time scale from real time to real time plus 24 hours so as to cover for uncertainties in Power plant availability and variations in load demand forecast. Contingency Reserve is provided by Generators which are not required to be synchronised, but they can be synchronised within 30 Minutes of the initiation of the Contingency and the fall in frequency.

This is equal to atleast the capacity of largest thermal Generator in the system.

(b) **Operating Reserve.** It is the additional output beyond Contingency Reserve that is available in real time to respond immediately to help correct and contain the falling system frequency following a contingency or loss of generation or the loss of an External connection or any Mismatch between generation and load demand. The Operating Reserve consists of the following:

Spinning Reserve

This is the additional available output of the on-line generators that can be increased, and made available within 10 minutes following the

contingency event of loss of generation or loss of an external inter-connection or mismatch between generation and load demand resulting in fall of frequency.

This is equal to "one-third" of the largest Generator in the System.

OC 5.2.2 The Operating Margin consist of all reserves (Spinning and Contingency Reserve both) available in the Grid, to ensure reliable grid system operation. Enough back-up power should be made available, at all times, to maintain the system frequency within the specified ranges as provided in this Grid Code and NEPRA Rules on Transmission Performance Standards. In case of sudden increase in demand or loss of generation, which cannot be absorbed by the Spinning Reserve, the Contingency Reserve equal to the shortfall shall be brought in service within 30 minutes.

The Spinning Reserve is available in distinct timescales. 1) Primary Response in short-term, following the fall in frequency, is fully sustainable for 30 seconds after achieving its maximum value within 10 seconds following the fall in frequency, 2) Secondary Response is the increase in Active Power output of the on-line Generators that can be increasingly applied in the short-term, following the fall in frequency, and is fully sustainable for 30 minutes after achieving its maximum value within 30 seconds following the fall in frequency.

OC 5.2.3 The amount of Contingency Reserve that is required at the day ahead stage is determined by the System Operator. Time scales may be increased by the System Operator in the light of historical data available as to changes in power plant availability and changes in load demand up to real time. The System Operator shall agree time scales with the Operators of power plants where Contingency Reserve is held on thermal Generators to reach synchronous speed.

OC 5.3 OPERATING RESERVE IN REAL TIME

OC 5.3.1 The amount of Operating Reserve required in real time shall be pre-determined by the System Operator. Any shortfalls in power plant availability, demand level, and the loss of the largest Generator in a power plant and the effect of the loss of or the increase in load demand on an external interconnection are to be taken into account when determining the total amount of Operating Reserve.

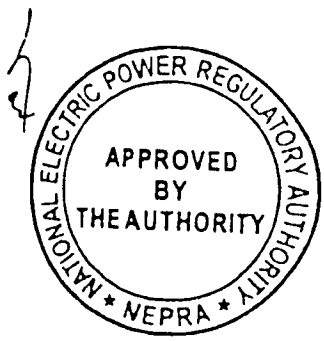
OC 5.4 DATA AVAILABILITY

OC 5.4.1 Data relating to the response capability of Generator which is used to provide Operating Reserve, and Frequency Response shall be made available to the System Operator by the Operators of power plants. The needed information is detailed in the appendix 1 of this sub-code.

OC 5.5 **TIME SCALES AND PLANNING**

OC 5.5.1 By 1500 hours (3 p.m.) each Wednesday the System Operator shall issue each Generator in respect of its power plants a Weekly Operational Policy for the week commencing 10.00 a.m. for the following Monday. The Weekly Operational Policy shall cover Generators that are available from standstill to start by low frequency relay settings of which will be determined from time to time by the System Operator. The Weekly Operational Policy shall specify the location of the Gensets and take into account the low frequency setting of these Gensets. By 10.00 a.m. on the Friday following the receipt of the document, the Generator shall confirm as appropriate, its availability, and seek any changes it wishes to instigate in the document. The System Operator shall update availability in real time in respect of notifications received.

OC 5.5.2 The Weekly Operational Policy shall include an indication of the level of Operational Reserve to be used in connection with operation of the Balancing Mechanism (to be notified by the Authority) in the times scale defined in OC 5.5.1. The document shall also include details of Operational Reserve that may be provided by Externally-connected systems and also indicate the possible level of High Frequency Response to be utilised by the System Operator in connection with the operation of the Balancing Mechanism.



OC 5 APPENDIX 1

OC5.A **Response data for Frequency Changes**

(a) Actual Frequency Response Capability Profile; and

(b) Response values at specific MW loading points in the range of 0-3 seconds, 3-10 seconds, and 10-30 seconds following the fall in frequency.

OC5.A.1 **Primary Response to Frequency Fall**

Primary Response (within 0 – 3 seconds, 3-10 seconds of frequency fall) values for a -0.5Hz upto all the loading points identified in OC 5.A.b.

OC5.A.2 **Secondary Response to Frequency Fall**

Secondary Response (within 10 – 30 seconds of frequency fall) values for a –0.5Hz upto all the loading points identified in the OC 5.A.b.

OC5.A.3 **High Response to Frequency Rise**

High Response values for a +0.5Hz upto all the loading points as detailed in OC 5.A.b.

OC5.A.4 **Generator, Governer and Droop Characteristics**

OC5.A.5 **Unit Control Options**

As provided

OC5.A.6 **Control of Load Demand**

As provided

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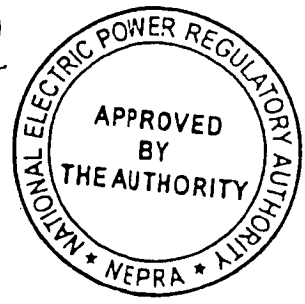
OPERATION CODE No. 6

OPERATIONAL LIAISON

CONTENTS



OPERATION CODE No. 6

OPERATIONAL LIAISON

OC 6.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 6.1.1 Operating Code No. 6 sets out the requirements for the exchange of information relating to Operations and Events on the Total System that may have, or have had, an operational effect on the System of NTDC, Generators, transmission-connected Consumers, distribution companies or the Externally-connected Parties and Consumers. Exchange of information also includes the requirement to advise on equipment, plant, and apparatus tests. The System Warnings shall be issued relating to inadequate plant availability, subsequent load demand control, and to advise of a risk of major system disturbance.

OC 6.2 POWER SYSTEM SECURITY SUPPORT

Code Participants shall have facilities for exchange of information in real time. This information may include:

(a) Status and positioning of circuit breakers.

(b) Tap changer position of 500/220 kV and 220/132 kV power transformers.

(c) Measured values of current, voltage, active and reactive power.

(d) Status and positioning of disconnect and isolating switches.

OC 6.3 COMMUNICATION SYSTEM

NTDC shall provide at least dual high-speed network-wide communication system, to provide for the communications facilities, installed on its system, and the Code Participants facilities.

Communication systems shall provide channels for direct telephone, facsimile and SCADA links (Remote Terminal Unit) between the SO and Code Participants. NTDC communication facility shall be used for communicating with NTDC work crew and grid substation personnel. An electronic recording device shall be provided at the SO to record all dispatch transactions and communication with the work crews.

NTDC shall provide the communication system and extend the facility to the Connection Point with the Code Participants for the network under its jurisdiction.

NTDC shall operate, maintain, expand and upgrade from time to time, this Supervisory Control and Data Acquisition (SCADA) system and a supporting dedicated communication system.

NTDC shall provide all Code Participants with specifications for RTU's, communications system requirements and protocols, and technical assistance required to connect and functionally integrate Code Participants' facilities into the SCADA system.

The SCADA and SCADA Communication System shall be used by NTDC and Code Participants to monitor and control the NTDC transmission network, including 500 kV and 220 kV grid stations, and to dispatch Generators connected to the transmission network. The SCADA system shall also include data from Generators and other Code Participant facilities as required by NTDC.

OC 6.4 **OPERATIONS AND EVENTS**

OC 6.4.1 Information regarding "Operations" and "Events", that have taken place or about to take place or are being planned to take place are to be assessed by the System Operator to identify appropriate and necessary actions to be taken by the owner or respective Operator of a part of the sub-system or the System Operator to eliminate or to minimise their adverse effects, if any. The reason for the Operation or the Cause of an Event need not be communicated to the Parties or Code Participants or Users.

OC 6.4.2 Operation is a planned or unplanned action; by the System Operator; and Operational Effect is the effect that an Operation or an Event, on one part of the System, may have on the Total System or on another part of the System.

OC 6.4.3 Some of the Operations and Events that are required to be reported under this sub-code are:

(a) Operations that form part of a planned outage which has been arranged in accordance with OC 4.

(b) Events which cause plant or apparatus to operate beyond its rated design capability, and present a hazard to personnel.

(c) Adverse weather conditions being experienced.

(d) Failures of protection, control or communication equipment.

(e) Risk of trip on apparatus or plant.

This list is not exhaustive.

OC 6.4.4 Notification of an Operation or Event shall be sufficient for the recipient to assess the effect on its individual System. When it is necessary for

the System Operator to pass on to other Users the information it has received from a particular User relating to an Operation or Event; it shall only pass on the information that it has received, and the name of the source of the information. The Giver of the original information may receive request clarification.

OC 6.4.5 Notification of Operations and Events may be passed on to the Operators of Embedded Generation subject to Central Dispatch when the Operation or Event may have an effect on their System.

OC 6.4.6 Notification of the details of an Event, Major Event and Operation, must be restricted to Parties governed by the Grid Code. Details shall not be passed on to any other third party.

OC 6.4.7 OC 7 deals with the upgrading of an "Event" to a "Major Event" and the subsequent exchange of information.

OC 6.5 NTDC WARNINGS

OC 6.5.1 The System Operator System Warnings are required to give information relating to System conditions and Events. They are intended to alert Operators of Power Plants, transmission-connected Consumers, distribution companies and the Operators of Externally-connected Parties of possible or actual shortages of power generation, and the likely duration to enable these Entities to prepare for subsequent instructions that may be issued by the System Operator. A Warning relating to Demand reduction shall only be issued to Entities that shall receive subsequent Load Demand reduction instructions. If the System Operator considers that the reason for issuance of a System Operator's System Warning shall be restricted to a geographic area or a part of the sub-system, the circulation of the Warning may be appropriately limited.

OC 6.5.2 All Parties shall agree on the office locations to which Notices shall be issued and the means of transmission of the System Warning.

OC 6.5.3 The System Operators System Warnings shall be issued in the form of:

(a) Inadequate system power Operating Margin Warnings which shall detail the period of the warning, the shortfall and the foreseen consequences.

(b) High risk of Load Demand reduction Warnings shall be issued following the issuance of an inadequate system Power Operating Margin Warnings when the need to actually reduce load demand is foreseen. The possible level of load demand reduction shall be indicated.

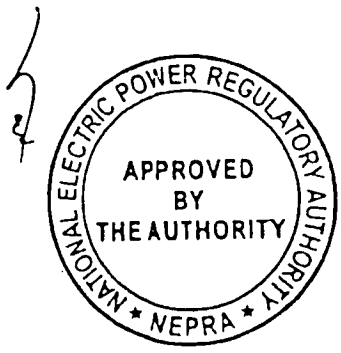
(c) Load Demand control imminent warnings (and may be issued when no other warnings have been issued) shall be issued when Load Demand reduction is expected within next 30 minutes. A Load Demand control imminent Warning is valid for two hours unless rescinded or re-issued.

(d) Risk of system disturbance warning shall be issued when there is a widespread risk of system disturbance. On receipt of such a warning, the recipients shall take action to ensure a rapid response to any problems.

NTDC System Warning procedure is reflected in Appendix 1 of this sub-code.

OC 6.6 **TESTING**

OC 6.6.1 If the System Operator or a transmission-connected Consumer, an Operator of a Generator, or a distribution company or the Operator of an Externally-connected Party intend to carry out testing that may affect NTDC, or testing that the System Operator proposes may cause an Operation or Event, prior agreement must be reached between all Entities concerned. The Notification must include full detail of the testing and dates and timing.



OC 6 Appendix 1

NTDC SYSTEM WARNINGS (TO BE IMPLEMENTED THROUGH FAX OR ANY OTHER ELECTRONIC MEDIA)

NTDC WARNING TYPE	TO: FOR ACTION	CONSEQUENCE	RESPONSE FROM RECIPIENTS / CODE PARTICIPANTS
Inadequate System Margin	Generators, (Centrally Dispatched) DISCOs NTDC Transmission Connected Consumer, Externally-connected Consumers	• Less Generation as compared to Demand of the system and Operating Margin. • Instruction for reducing the Demand	• Increase of Generation by the Generators. • To initiate additional Demand Management if conditions are not improved.
High risk of Demand Reduction	Generators, DISCOs, NTDC Transmission Connected Consumers, Externally-connected Consumers.	----do---- ----do----	----do---- ----do----
Demand Control Imminent	DISCOs, NTDC Transmission Connected Consumers, Externally-connected Consumers.	Possibility of reduction in Demand within a specified time as per instructions of NTDC	----do---- ----do----
Risk of System Disturbance	Generators, DISCOs, NTDC Transmission Connected Consumers, Externally-connected Consumers.	Risk of possible disturbance on whole or partially NTDC system.	Operational staff to be made alert to be able to withstand the disturbance.

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OPERATION CODE No. 7

EVENT INFORMATION EXCHANGE

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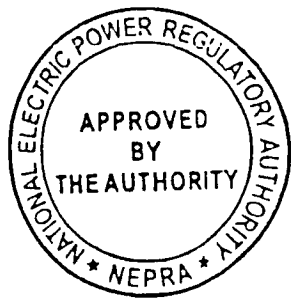

OPERATION CODE No. 7

EVENT INFORMATION EXCHANGE

OC 7.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 7.1.1 Operation Code No. 7 details the procedure for formal exchange of written reports relating to Events that have already occurred on the System. Events on the System formally reported between the System Operator, distribution companies, Operators of Power Plants, transmission-connected Consumers, and Operators of Externally-connected System Parties, are those initially reported as required under Operation Code No 6.

OC 7.2 DECLARATION OF A MAJOR EVENT

OC 7.2.1 Following an Event on the System which has, in the opinion of any Code Participant is likely to have an effect on its system, the affected Code Participant can declare the Event as a "Major Event".

OC 7.3 THE REPORT

OC 7.3.1 Following such a declaration, the owner of the system on which the Major Event occurred is required to provide a written report to the requesting party confirming information given orally under Operation Code No 6.

OC 7.3.2 The report shall contain as a minimum the information detailed in Appendix 1 of this sub-code. The report shall also include any additional information that has come to light following the initial verbal report of the Event.

OC 7.3.3 The recipient of the report shall not pass it on to a third party. The recipient may, however, use the information to prepare a report for another party

OC 7.4 FURTHER ACTION

OC 7.4.1 The recipient of a report of a Major Event may request that a joint investigation be carried.

OC 7 APPENDIX 1

Report of a Major Event

Information (where relevant) to be given

1 Time and date of Major Event

2 Location

3 Plant / Apparatus involved

4 Description of the Major Event

5 Demand / Generation lost

6 Generating Unit Frequency

7 Generating Unit MVAr performance

8 Estimated duration of non-availability of Power Plant or that of Demand interruption.

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OPERATION CODE No. 8

SYSTEM RECOVERY

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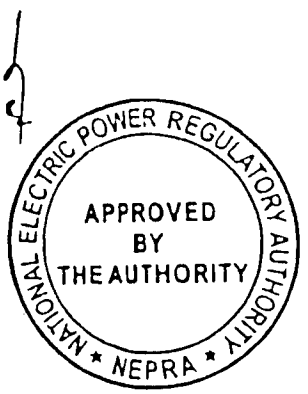

OPERATION CODE NO. 8

SYSTEM RECOVERY

OC 8.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 8.1.1 This sub-code deals with the procedures for the restoration of power supplies following a Total Shutdown or a Partial Shutdown of the System and the re-synchronisation of specific parts of the System that have been Islanded.

OC 8.1.2 This sub-code requires that effective channels of communications must be established between senior management of the NTDC and the System Operator and the Generators, Distribution Companies, Transmission-connected Consumers, Externally-connected Consumers, which are additional to those used for day-to-day system operations.

OC 8.1.3 In order to mitigate the effects of any national emergency, the Federal Government may require NTDC, Operators of power plants and distribution companies to take action to safeguard electric power supplies. Such action may be contrary to the principles and procedures laid down in the Grid Code, and as such, the appropriate section of the Grid Code shall stand suspended.

OC 8.1.4 OC 8 applies to the System Operator, NTDC, distribution companies, Operators of power plants, and Users of the System. Contingency arrangements are required to be established by the System Operator with each Externally-connected Party/Consumers.

OC 8.2 TOTAL AND / OR PARTIAL SHUTDOWN OF SUPPLIES

OC 8.2.1 A Total Shutdown of the System is a situation when there is no internal generation online and operating; and there is no power supply available from external-connections. The restoration of power supply from such a situation is a Black Start Recovery. A Partial Shutdown is when a there is no on-line operating generation or External Connection to a part of the system that has become shutdown; and it is necessary for the System Operator to instruct Black Start Recovery procedures to restore supplies to that part of the system.

OC 8.2.2 During the restoration of power supplies following a Total Shutdown or Partial Shut Down of the System, it may be necessary to operate the system outside normal frequency and voltage limits as stated in OC 4. It may also be necessary for the System Operator to issue instructions that are contrary to the Balancing Mechanism or Code, and also to

normal contractual obligations in order to ensure restoration of supplies.

OC 8.2.3 Following a Total Shutdown of the System designated power plants that have the ability to Start Up without any External Connection to the system shall be instructed to commence Black Start recovery procedures. These procedures, which are to be agreed in advance, may include the restoration of blocks of local load demand that can be restored in agreement with the local distribution company. Local procedures may include the restoration of power supplies via Embedded Generators. The System Operator has the responsibility for the re-energisation of the interconnected transmission system, and the re-synchronisation of the system blocks of islanded blocks of locally restored supplies.

OC 8.2.4 Where system configuration prevents a Generator restoring blocks of Load Demand without the use of the interconnectable transmission system, adjacent distribution companies shall reconfigure their system(s) to provide discrete blocks of local load demand, which shall then be restored on the instruction of the System Operator in liaison with Generator, using segregated parts of the interconnected transmission system.

OC 8.2.5 The complexities and uncertainties relating to the restoration of power supplies following a Total Shutdown or Partial Shutdown of the System dictate that any internal NTDC or the System Operator procedure and any local procedure agreed between NTDC, the System Operator, distribution companies, transmission-connected Consumers and Generators allows for a flexible approach to be adopted in the light of actual circumstance rather than rigid procedure involving prescribed actions.

OC 8.2.6 During the restoration of Load Demand, the System Operator may issue instructions that conflict with a local procedure for the restoration of power supplies. In such an event the System Operator instruction shall override any agreed local procedure.

OC 8.2.7 Procedures for the restoration of power supplies may include the requirement for the Operators of Generators to communicate directly with the distribution companies so that the restoration of blocks of local power supplies can be carried out in a controlled manor to ensure the Generator's stability.

OC 8.2.8 Frequency sensitive automatic load disconnection schemes may be taken out of service during the restoration of Load Demand to prevent unwanted disconnection of load demand.

OC 8.2.9 The System Operator shall instruct the interconnection of islanded networks to form progressively larger and resilient sub-systems until the complete System has been interconnected.

OC 8.2.10 During the restoration of supplies, the System Operator shall agree the reconnection of the System to any Externally-connected Party with the operations of those systems, as allowed for under the relevant licences.

OC 8.3 ISLANDED NETWORK

OC 8.3.1 In the event of a part of the System becoming disconnected from the complete System (islanded), but there has been no resultant Total Shutdown or Partial Shutdown of the system, the System Operator shall instruct the regulation of generation and or Load Demand in the group to enable it to be re-synchronised to the complete System

OC 8.3.2 In order to achieve conditions to permit the re-synchronisation of the islanded network, the System Operator may adopt one of the following approaches: -

(a) The System Operator; the Operators of Generators in the islanded network that have Generators that are connected to the System, or able to be synchronised and connected to the System; and the distribution companies in whose area the islanded network is located may exchange information to enable the System Operator to issue emergency instructions until the islanded network has been re-synchronised. Until the System is re-synchronised, there can be no transfer of Load Demand between the synchronised and un-synchronised parts of the System.

(b) The System Operator shall issue an emergency instruction to the Operator (s) of power plants in the islanded network to float local Load Demand to maintain Target System Frequency until the islanded network has been re-synchronised. During this period, the distribution company is required to advise the System Operator of any anticipated changes in load demand. Transfers into or out of the islanded system are impracticable.

(c) If the supply to a part of the System becomes de-synchronised, then that part of the network may be shutdown and power supplies restored for the synchronised part of the System.

OC 8.3.3 Local procedures of the distribution companies may be agreed to for the each relevant part of the Total System between the System Operator; Operators of Power Plants, in the relevant part of the network, and the relevant distribution companies.

OC 8.3.4 Where the need for Islanded procedure is identified for the first time, and there is no agreement in place, the System Operator, Operators of

Power Plants, and the local distribution companies shall agree on a procedure.

OC 8.4 **INCIDENTS**

OC 8.4.1 When an event occurs, that in the opinion of the System Operator or a distribution company, may have, or have had, a widespread effect on the System, which is outside the normal functions of system control, an incident procedure shall be invoked.

OC 8.4.2 The incident procedure shall not take over any function of control of the System. The procedure shall allow for communication between the management bodies of various affected Code Participants, and the distribution of information within their organisations.

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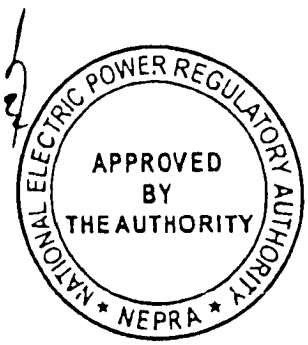

OPERATION CODE No. 9

WORK SAFETY AT THE INTERFACE

CONTENTS

OPERATION CODE No. 9

WORK SAFETY AT THE INTERFACE

OC 9.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 9.1.1 The Operation Code 9 (OC-9) specifies the standard procedures, to be used by NTDC and Users, for the co-ordination, establishment, and maintenance of necessary Safety Precautions, when work is to be carried out at or near the system of NTDC and/or a User/Code Participants. Moreover, it specifies the standard procedures, when there is a need for Safety Precautions on HV apparatus on the other User's System for the work to be carried out safety. It does not apply at the interface points between the Code Participants where Safety Precautions need to be agreed upon solely between the Users or Code Participants. It does not replace the safety rules of any Code participants or Users already approved by the Authority. OC-9 does not seek to impose a particular set of Safety Rules on NTDC or Users or Code Participants. The Safety Rules to be adopted by NDTC or Users shall be developed by themselves and approved by the Authority.

OC 9.1.2 To ensure safe conditions for each and every foreseeable situation during system operation, it is essential that NTDC and the Code Participants operate in accordance with safety rules and procedures as laid down in their approved Safety Codes, and other NEPRA applicable documents.

NTDC shall have a comprehensive approved Power Safety Code in place and available at all times.

OC 9.1.3 In this document, only the following terms have the following meanings:

HV Apparatus means High Voltage electrical circuits forming part of a system, on which safety From the System is required or on which safety precautions are required to allow work to be carried out on the System.

The words mentioned above are defined as follows:
"Safety From the System" means that condition which safeguards the persons, when work is being carried-out at or near a System, from the dangers which are inherent to the System.
"System" means any User System and/or the NTDC System, as the case may be.
"Safety Precautions" means isolation and/or Earthing.

Isolation means the disconnection of apparatus from the remainder of the System in which that apparatus is connected. The integrity of the Isolation being achieved and maintained by the use of an approved isolation device, on which all of the procedures to maintain safety from the System have been carried out. The means of Isolation shall be maintained in accordance with the rules of the owner of the Isolation.

Earthing means the application of a connection between the isolated system and the general mass of earth, by an approved means that is adequate for the purpose, and is required to be in place in a secure condition in accordance with the rules of the owner of the Isolation.

OC 9.1.4 The rules for achieving and maintaining isolation and earthing at every site where this Operating Code No. 9 applies shall be agreed to by all concerned Parties with respect to Connections at that Site. Local safety instructions shall be exchanged by all concerned Entities having an interest in the Connections at a Site.

OC 9.2 SAFETY CO-ORDINATORS

OC 9.2.1 Safety Co-ordinators shall be available at all times for all Sites where this section of the Operation Code is applicable. These Persons are required to be authorised by their employer to achieve Safety Precautions on their Systems, as may be required by other Entities.

OC 9.2.2 When a request is received by an Entity requiring that it make Safety Precautions on its System to enable the requesting Entity to carry out work or testing, the details of the request shall be recorded (a model form has been provided in Appendix 1). The form shall be uniquely numbered. The party making the request shall also record details of the request and subsequent confirmation on a uniquely numbered form. The suffixes shall indicate the appropriate function – (I) for Implementing and (R) for Requesting Safety Precautions. The recoding of details relating to the request shall only be undertaken by a person authorised to act as a Safety Co-ordinator at that Site

OC 9.3 PROCEDURE FOR SAFETY AT THE INTERFACE

OC 9.3.1 Both Code Participants and other concerned Entities shall record the request for Safety Precautions in their system logbooks and the implementing Safety Co-ordinator shall arrange for the Safety Precautions to be made. The implementing Safety Co-ordinator shall confirm when the requested Safety Precautions have been taken to the requesting Safety Co-ordinator.

OC 9.3.2 If earthing is required, both Code Participants shall record the request and the implementing Safety Co-ordinator shall record details in his system logbook of the actions taken to comply request.

OC 9.3.3 Details of the isolation and earthing achieved shall be formally recorded by both Entities and the agreement timed and recorded on the appropriate form. Following issue of the form, the requesting Safety Co-ordinator may proceed to issue safety documentation at the agreed point of the system interface between the Code Participants. Neither Entity may issue a safety document which permits the removal of earth connections nor the application of any source of energy for testing purposes without the agreement of implementing Safety Co-ordinator and then only one such safety document may be issued on that part of the System at any one time.

OC 9.3.4 It is the responsibility of the implementing Safety Co-ordinator to ensure that all Safety Precautions are maintained in place until it is confirmed by the requesting Safety Co-ordinator that they may be removed.

OC 9.3.5 On completion of work and the cancellation of all safety documentation, the requesting and implementating Safety Co-ordinators shall agree to the cancellation of the form; shall co-ordinate the restoration of the system as appropriate; and shall ensure all requests and subsequent confirmations have been recorded in their logbooks.

OC 9.4 **UNFORESEEN CIRCUMSTANCES**

OC 9.4.1 In the event of unforeseen circumstances, where for example due to broken conductor or connection on one system infringing safe working clearances on another system, the Safety Co-ordinators for the systems involved shall agree a procedure following reports from their local Safety Co-ordinators as to the exact point of the problem.

Details in the form of "Record of Inter-system Safety Precautions" Procedures–RISSP-R (Model Form) are provided in Appendix 1.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY
NEPRA

OC 9 Appendix 1 (A)
Inter-System Safety
Record of Inter-Safety Precautions (RISSP - R)
(For Requesting Safety Co-ordinator's Record)

RISSP No. _____

Name and location of the Control Centre: _____

Name of Control Centre Operator: _____

Name and Location of Grid Station/Work Station: _____

PART 1

1.1 (a) Identification of HV Apparatus where isolation and safety from the system is to be achieved.

_____

_____

_____

(b) Details of work to be done. _____

_____

(c) Any other instructions or safety measures to be taken: _____

_____

1.2 Identification and Safety Precautions Established

(Whether on the implementing safety co-ordinator's system or any other users system connected to implementing safety co-ordinator system) Tick mark ✓ in the relevant box.

Identification of HV Apparatus	Location	Isolation	Earthing	Confirm Notices Displayed	Locking Arrangements Provided
(i)	_____	☐	☐	☐	☐
(ii)	_____	☐	☐	☐	☐
(iii)	_____	☐	☐	☐	☐

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY

1.3 Confirmation and Issues

Mr. _____ implementing Safety Co-ordinator at location _____ has confirmed that the safety precautions identified in Para 1.2 have been established and will not be removed until this RISSP is cancelled.

Signature: _____
Name: _____
(Requesting Safety Co-ordinator)

Dated: _____
Time: _____

Date and Time of Commencement of Work _____

Date and Time of Completion of the Work _____

_____
Name & Signature of
Incharge of work
(Authorised Person)

PART 2

CANCELLATION

I have confirmed to Mr. _____ implementing Safety Coordinator at location _____ that all men working on the HV apparatus as identified in Para 1.2 have been withdrawn, and the safety precautions set out in Para 1.2 are no longer required and hence the RISSP is cancelled.

Signature: _____
Name: _____
(Requesting Safety Co-ordinator)

Dated: _____
Time: _____

Date and Time of Re-energizing of Apparatus _____

OC 9 Appendix 1 (B)
Inter-System Safety
Record of Inter-Safety Precautions (RISSP - R)
(For Implementing Safety Co-ordinator's Record)

RISSP No. _____

Name and location of the Control Centre: _____

Name of Control Centre Operator: _____

Name and Location of Grid Station/Work Station: _____

PART 1

1.1 (a) Identification of HV Apparatus where isolation and safety from the system is to be achieved.

_____
_____
_____

(b) Details of work to be done. _____
_____

(c) Any other instructions or safety measures to be taken: _____
_____

1.2 Identification and Safety Precautions Established

(Whether on the implementing safety co-ordinator's system or any other users system connected to implementing safety co-ordinator system) Tick mark ✓ in the relevant box.

Identification of HV Apparatus	Location	Isolation	Earthing	Confirm Notices Displayed	Locking Arrangements Provided
(i)	_____	☐	☐	☐	☐
(ii)	_____	☐	☐	☐	☐
(iii)	_____	☐	☐	☐	☐

1.3 **Confirmation and Issues**

I, _____ implementing Safety Co-ordinator at location _____ has confirmed that the safety precautions identified in Para 1.2 have been established and will not be removed until this RISSP is cancelled

Signature: _____
Name: _____
(Implementing Safety Co-ordinator)

Dated: _____
Time: _____

PART 2

CANCELLATION

Mr. _____ requesting Safety Coordinator at location _____ has confirmed that the safety precautions set out in Para 1.2 are no longer required and hence the RISSP is cancelled.

Signature: _____
Name: _____
(Implementing Safety Co-ordinator)

Date: _____
Time: _____

Date and Time of Re-energizing of Apparatus _____

End of OC 9

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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OPERATION CODE No. 10

PLANT IDENTIFICATION

CONTENTS

OPERATION CODE No. 10

PLANT IDENTIFICATION

OC 10.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 10.1.1 Operation Code No. 10 sets out the requirements for the numbering of HV Apparatus at Sites where the System Operator and a distribution company, transmission-connected consumer or Generator are responsible for the Operation and maintenance of HV Apparatus. The sub-code applies to all Sites where there is a Transmission Connection Point.

OC 10.1.2 The numbering and nomenclature standards to be used for HV Apparatus for each Site where more than one User has an operational interest shall be defined by the System Operator. The System Operator shall apply a common standard to all such Sites that are connected to the System. The numbering to be used at each such location shall be confirmed on the Operation Diagram and in the Connection Agreement for each such Site. The adoption of a common numbering and nomenclature standard shall reduce the risk of human error when instructing operations on the system.

OC 10.2 EXISTING SITES

OC 10.2.1 The numbering and nomenclature at all Sites shall comply with NTDC standards by the date of Transfer. Users of Sites are responsible to ensure that the HV Apparatus conforms to NTDC standards.

OC 10.2.2 The System Operator shall provide Users with details of its numbering and nomenclature standards on request.

OC 10.3 MODIFICATIONS TO SITES

OC 10.3.1 When modifications are planned to the HV Apparatus at a Site, which shall involve modifications or additions to the numbering and nomenclature, at which more than one Code Participant has an operational interest, the Code Participant instigating the modification shall give the other Code Participants atleast six months advance notice of the proposed changes. The proposed modifications to the HV Apparatus and numbering and nomenclature shall be shown on a draft Operation Diagram and included in a draft Connection Agreement for the Site. Agreement to the proposed changes to the numbering and nomenclature shall be agreed in writing within one month of receipt of the notification of change.

OC 10.4 **OVERRIDING PRINCIPLE**

OC 10.4.1 The numbering and nomenclature used at a Site must be clear and unambiguous. No alterations to the HV Apparatus and its numbering and nomenclature that would result in confusion relating to the identity of the HV Apparatus shall be permitted.

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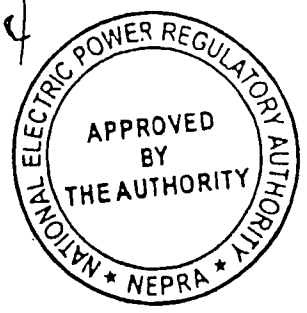

OPERATION CODE No. 11

SYSTEM TESTS

CONTENTS

OPERATION CODE NO. 11

SYSTEM TESTS

OC 11.1 **INTRODUCTION, OBJECTIVE & SCOPE**

OC 11.1.1 Operating Code No. 11 details the procedure for carrying out system tests which involve creation of Unusual, extreme or abnormal system conditions on the Total System, and excludes commissioning or re-commissioning tests, which are carried out on a small defined part of the System. The sub-code covers the System Operator, Transmission-connected Consumers, Operators of Power Plants, distribution companies and the Operators of Externally-connected Parties/Consumers. A system test proposed by a User that shall have no effect on the Transmission System of NTDC is not subject to this sub-code. A system test proposed by the System Operator shall always to subject to this sub-code.

OC 11.1.2 The purpose of this sub-code is to ensure that the safety of the general public and the personnel of the Users is not jeopardised and that the risk to power supplies and facilities of the NTDC and Users, and the integrity and security of the system are maintained at the highest levels possible under such specified conditions.

OC 11.1.3 Tests for distribution company and transmission-connected Consumers facilities

The System Operator shall test distribution company's equipment including 132 kV facilities and protective relaying system for compliance with the Connection Code at the Point of Connection. Test shall include the following:

(a) Verification of equipment ratings at the substation;

(b) Calibration of under-frequency relay used for load shedding;

(c) Operation of circuit breakers, switches and controls;

(d) Verification of relay co-ordination and settings; and

(e) Calibration of electrical transducers used for measurements

Distribution Companies and Transmission-connected Consumers shall submit operating characteristics of their system, relay setting calculation and co-ordination with NTDC protective relaying system, calibration records of electrical transducers and electrical instruments to the System Operator.

OC 11.2 **NOTIFICATION**

OC 11.2.1 When a User has decided that it needs to perform a system test, it shall issue a proposal notice to the System Operator detailing the nature, extent and purpose and the plant and or apparatus involved. The proposal notice shall be issued at least 12 months in advance of the proposed system test. The System Operator shall be satisfied that it has received sufficient time to give full consideration to the proposal.

OC 11.2.2 Following consideration of the information on the proposal notice, the System Operator shall determine which other Users are likely to be affected by the system test and shall, after consultation with the affected Users appoint a suitably qualified test co-ordinator. The same actions shall be taken if the proposal notice has been issued by the System Operator.

OC 11.3 **TEST CO-ORDINATOR AND TEST PANELS**

OC 11.3.1 A preliminary notice shall be issued to all Users affected by the proposed system test, and shall include an invitation to nominate members of a test panel. Time schedules shall be agreed to which are consistent with the System involved, and the nature of the testing to be carried out.

OC 11.3.2 The test panel shall consider the test proposal in relation to the possible safety, economic and operational risks; the possibility of combining the proposed test with other tests and proposed system outages. The test panel shall produce a proposal report which shall include details of the proposed test and the manner in which the proposed system test shall be undertaken and monitored. The proposal shall also consider the cost implications and propose the allocation of costs. The proposal report shall be circulated to all Users affected by the proposed system test. Objections to the proposal report shall be considered to determine if the proposal can be modified to accommodate their objections. In the case of failure to agree, the matter shall be referred to the Grid Code Review Panel whose decision shall be binding upon all the concerned Parties.

OC 11.4 **THE TESTS AND FOLLOW UP ACTION**

OC 11.4.1 Following agreement, the test panel shall prepare a test programme, which shall detail the procedure to be used on the day of the test. If system conditions on the day of the test are not as envisaged or if after consideration of other factors such as severe weather the test co-ordinator may delay, postpone or cancel the system test.

OC 11.4.2 A final report shall be prepared by the Entity proposing test and circulated to members of the test panel detailing the tests carried out, the results and conclusions.

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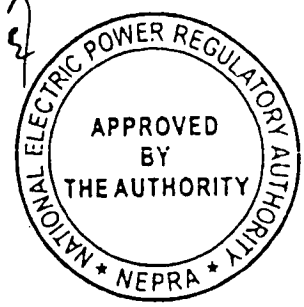
OPERATION CODE No. 12

TESTING AND MONITORING

CONTENTS



OPERATION CODE NO. 12

TESTING AND MONITORING

[All the references in this sub-code to Balancing Code, and Balancing Mechanism shall be interpreted later when the Balancing Mechanism is Notified by the Authority]

OC 12.1 INTRODUCTION, OBJECTIVE & SCOPE

OC 12.1.1 This sub-code details the procedures to be followed by the System Operator to monitor and assess the validity of any Generator's generation capability, and frequency declarations. The System Operator is also required to monitor ancillary services which Users have agreed to provide under their Agreement with NTDC as and when requested by the System Operator.

OC 12.1.2 The System Operator is required, subject to system conditions prevailing on a given day to test any generator to ensure that it complies with the requirements, specifications and obligations of the Connection Code (CC), Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) as applicable, to ensure that they are available and comply with their notified procedures and related provisions. The System Operator shall also undertake Black Start Test procedures to ensure satisfactory operation in the event of an Emergency.

OC 12.1.3 OC 12 applies to NTDC and to Users:

(a) Generators;

(b) Distribution Companies with Non-Embedded and Embedded Generations;

(c) NTDC in relation to Consumers directly connected to the NTDC Transmission System; and

(d) Other distribution licensees having Embedded Generation.

OC 12.2 MONITORING

OC 12.2.1 NTDC is required to monitor the performance of: -

(a) Users compliance with the Scheduling and Dispatch Code;

(b) Users providing the ancillary services they have agreed to provide; and

(c) Evaluate Generators against their expected input or output obtained from the final notification

OC 12.2.2 If there are any persistent failures of OC 12.2.1, (a), (b) & (c) by Users, the System Operator shall notify the User in writing requesting an explanation of the action, the User shall have to comply with their obligations.

OC 12.2.3 The System Operator and the User shall discuss the proposed action and endeavour to reach an agreement on the proposed action. If agreement cannot be reached within 10 working days of notification of the failure by the System Operator to the User, the System Operator or the User shall be entitled to require a test as detailed in OC 12.3.

OC 12.3 **PROCEDURE FOR TESTING**

OC 12.3.1 NTDC may issue an instruction requiring the User to test any one or more of the User's Generators to demonstrate its performance subject to the notification giving the User not less than 48 hours notice to conduct the test if any of the following apply:

(a) If the Generator is unable to operate within the given parameters stated in its Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA), as applicable and GSDP Notice such as Input/output performance;

(b) Meet the requirements to operate in the Frequency Sensitive Mode; and

(c) Meet the reactive power or fast start capability as registered with the System Operator under Scheduling and Dispatch Code and Operating Code.

OC 12.3.2 The System Operator instruction detailed in OC 12.3.1 can only be issued if the User has submitted import and export limits for the relevant Generator for the operational day current at the time the System Operator notification is issued. The User is then obliged to submit to the System Operator import and export limits with a magnitude greater than zero for that Generator for the time and duration for the requested test.

OC 12.3.3 The results of the performance of the User's Generator under test shall be recorded at NPCC Control Centre using voltage and current signals provided to the System Operator by the User.

OC 12.3.4 If the results are recorded on Site chart recorders are to be used and representatives appointed and authorised by the System Operator shall witness the test.

OC 12.3.5 The test shall be initiated by the issue of instructions under SDC2 for the Generator submitted by the User for the day of the test.

OC 12.3.6 In the event that the Generator fails to meet the test criteria specified in the table given below, the User is required to provide the System Operator with a written explanation of the reasons for failure. If the System Operator and the User are unable to agree, the System Operator may require the User to perform a re-test.

The Generator will Pass the Test if the Following Criteria Below is Met

	Parameter to be tested	Grid Code Reference	Pass Criteria
Reactive Capability	Reactive Capability	CC	Generating Unit will pass the test if it is within ±5% of the capability registered with NTDC under OC 4. The duration of the test will be 60 minutes with System voltage at the Transmission Connection Point being maintained by the Generator by adjustment of Reactive Power on the remaining Generating Units, if necessary.
Governor System	Primary, Secondary and High Frequency Response	ASA	The measured response in MW/Hz is within ±5% of the level of response specified in the Ancillary Services Agreement for that Genset.
	Governor Compliance	CC	Measurements indicate that the Governor parameters are within the criteria set out in the appropriate governor standard.
	Limited High Frequency Response	SDC 3	The measured response is within the requirements of SDC 3.
	Output at Reduced System Frequency	CC SDC	For variations in System Frequency exceeding 0.1Hz within a period of less than 10 Seconds, the Active Power output is within ±0.2% of the requirements of CC xxx when monitored at prevailing external air temperatures of up to 25°C.
	Fast Test	ASA	The Fast Start Capability requirements of the Ancillary Services Agreement for that Genset are met
	Black Start	OC 12.5.1	The relevant Generating Unit is Synchronised to the System within two hours of the Auxiliary Supplies being required to start.

The Generator will Pass the Test if the following Criteria is Met

	Parameter to be Tested	Grid Code Reference	Pass Criteria
Dynamic Parameters	Export and Import Limits, QPN, Joint Generator data and Dynamic Parameters	OC 12	The Export and Import, QPN, Joint BM Unit Data and Dynamic Parameters Under test are within 2½% of the declared value being tested
	Synchronisation time	SDC	Synchronisation takes place within ±5 minutes of the time it should have achieved Synchronisation.
	Run-up Rates	OC 12	Achieves the instructed output and, where applicable, the first and or/second intermediate breakpoints, each within ±3 minutes of the time it should have reached such output and breakpoints from Synchronisation calculated from the run-up rates in its Dynamic Parameters.
	Run-down Rates	OC 12	Achieves the instructed output within ±5 minutes of the time, calculated from the run-down rates in its Dynamic Parameters.

The following conditions will apply to each of the above tests:

The duration of the test will be consistent with and sufficient to measure the relevant expected input or output derived from the Final Physical Notification Data.

OC 12.3.7 If in the opinion of the System Operator the Generator again fails the re-test, every effort should be made to resolve the matter. In the event that a dispute arises between the User and the System Operator, either Entity may approach the Review Panel for a determination of the dispute which shall be binding on both Entities.

OC 12.4 DISPUTE RESOLUTION PROCEDURE

OC 12.4.1 If after the procedure described in OC 12.3 it is accepted that a Generator has failed the test or re-test, this Code Participant or the User shall within 10 working days submit to the System Operator a date with a proposal by which the Generator shall be able to comply with the relevant requirements and its obligations under its Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) as applicable, and the Grid Code. The System Operator should not withhold approval or unreasonably delay in the approval of the proposal. If the System Operator does not approve the date and time submitted by the User, the User shall amend such proposal having regard to any comments given by the System Operator and re-submit it for the System Operator's approval.

OC 12.4.2 If the Generator fails the test, the User shall submit revised limits and other data as may be relevant in the case of a Generator as per Revised GSDP Notice for the period of time until the Generator can achieve the Parameters previously registered or demonstrated under SDC 1 (GSDPs).

OC 12.4.3 When the User advises the System Operator that the Generator is able to achieve the previously Generation Scheduling and Dispatch Parameters (GSDPs): the System Operator shall either accept this information or require the User to re-test the Generator to confirm the stated capability. The System Operator shall give 48 hours Notice to the User for a re-test. The test shall be conducted in accordance with OC 12.3, and the provisions of OC 12.4 shall apply to this further test.

OC 12.5 BLACK START (BS) TESTING

OC 12.5.1 General Requirements

(a) The System Operator may request a Generator with a Black Start Station to perform a Black Start (BS) Test with the Black Start Station remaining connected to an alternating current supply or whilst disconnected from all external alternating current supplies, in order to demonstrate that the Black Start Station has Black Start Capability.

(b) If the System Operator requires a Generator with a Black Start Station to undertake a BS Unit Test, the System Operator shall not require the test to be conducted on more than one Generating Unit at the same time, and would not normally

expect any other Generating Unit at the Black Start Station to be directly affected by the Black Start Unit Test.

(c) Normally any Generator shall not be tested more than once in any year and a Black Start Station test shall not be requested by the System Operator more frequently than once every two years.

(d) When the System Operator requests a Generator to perform a Black Start Test, a minimum notice of seven days shall be given to the Generator.

OC 12.5.2 **Procedure for a Black Start (BS) Test**

OC 12.5.2.1 **BS Unit Test**

(a) The relevant Generator shall be synchronised and loaded

(b) All auxiliary supply sources in the Black Start plant where the Generator is located shall be shutdown.

(c) The Generator shall be de-Loaded and de-synchronised, and all alternating current supplies to its auxiliaries shall be disconnected.

(d) The auxiliary supplies in (b) shall be re-started and energise the unit board of the relevant Generator, thereby enabling the Generator to return to synchronous speed.

(e) The relevant Generator shall be synchronised to the system but not loaded unless instructed to do so by the System Operator.

OC 12.5.2.2 **BS Station Test**

(a) All Generators at the Black Start Station other than the Generator on which the Black Start Test is to be undertaken, and all auxiliary supplies to the Back Start Station shall be shutdown.

(b) The relevant Generator shall be synchronised and loaded

(c) The relevant Generator shall be de-Loaded and de-synchronised.

(d) All external alternating current electrical supplies to the generator board of the relevant Generator, and to the station board of the relevant Black Start station shall be disconnected.

(e) The auxiliary supply generator at the Black Start Station shall be started and shall re-energise either directly or via the station board, the unit board of the relevant Generator.

(f) The relevant Generator shall be synchronised to the System but not loaded unless instructed to do so by the System Operator.

OC 12.5.3 **Failure of a Black Start Test**

A failure shall be recorded if the Black Start plant fails to demonstrate it has a Black Start Capability.

OC 12.5.4 In the event of such failure, the Generator must provide the System Operator with a written report detailing the reasons for the failure within ten working days of the failed Black Start Test. If a dispute arises between the System Operator and the Generator, they shall seek to resolve their differences. In the event that there is no resolution, the Generator may require the System Operator to permit a further Black Start Test on 48 hours notice. The relevant test procedures, as set out in OC 12.5.2.1 and OC12.5.2.2 shall apply to the re-test.

OC 12.5.5 If the Black Start plant fails the re-test and a dispute arises between the Generator and the System Operator, either Code Participant may use the disputes resolution procedure as provided through the Review Panel. The findings of the dispute resolution procedure shall be binding on both Code Participants.

OC 12.5.6 If, a Black Start station fails the Black Start Test and subsequent re-test, the Generator shall, within fourteen working days, advise the System Operator in writing of the date and time by which the Generator shall restore the Black Start Capability to that Black Start station. The System Operator shall not unreasonably withhold approval to the Generator's proposal. Should NTDC not approve the Generator's proposal, the Generator shall re-submit the proposals by taking into account the System Operator's comments.

OC 12.5.7 When the Generator advises the System Operator that the Black Start station has been restored to Black Start Capability status, the System Operator shall either accept this information or require a further Black Start Test to demonstrate the validity of the Generator's information. Any further test shall be in accordance with test procedures detailed in OC 12.5.2.1 and OC 12.5.2.2

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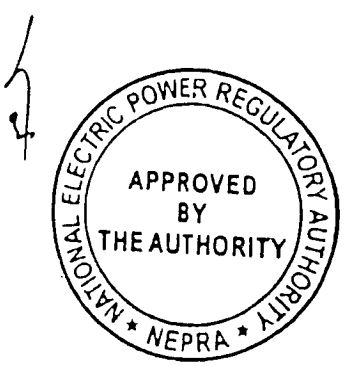


PLANNING CODE

CONTENTS

PLANNING CODE

PC 1 INTRODUCTION, OBJECTIVE & SCOPE

The Planning Code provides requirements for the planning process by which the objectives of system security, adequacy, reliability, and performance shall be satisfied. Some of the objectives are:

(a) To specify the responsibilities of NTDC and other Users in the planning and development of the national transmission grid/NTDC Transmission System;

(b) To specify the planning procedures and technical studies that shall ensure the safety, security, reliability, and stability of the national transmission grid;

(c) To specify the planning data required from Users seeking new Connection or a modification in their existing Connection to the NTDC Network;

(d) To specify the data requirements to be used by NTDC in planning the development of the NTDC's Transmission System.

The Planning Code provides the basis for system reliability goals that are to be achieved and maintained by NTDC and the System Operator. The reliability goals need to be coordinated with policy objectives for the electric power sector as well as with short-term and long-term system planning objectives.

The planning process is based on a philosophy that conforms to the regulatory process, allows for competition, and is coordinated with operational considerations. Requisite information inputs to the planning process from Code Participants shall be provided.

The objective of the Code is to promote NTDC/User interaction for any proposed development of the NTDC or User Systems. It also provides for an exchange of planning information between NTDC and Users and specifies the Licence Standards that the NTDC shall adopt in planning and developing its Transmission System.

The Planning Code (PC) specifies the technical and design criteria, processes and procedures, which NTDC shall apply to ensure that the NTDC Transmission System is able to accommodate User System developments in a timely and cost-effective manner. This Code

specifies the information to be exchanged between NTDC and the Users.

The reinforcement and/or extension of the NTDC Transmission System may be necessary for several reasons, but not be limited to the following:

(a) a development on a User System already connected to the NTDC Transmission System;

(b) the construction of a new Transmission Connection Point or the modification of an existing Transmission Connection Point;

(c) the cumulative effects of developments referred to in (a) and (b).

To accommodate User System developments, reinforcements or extensions of the NTDC Transmission System may involve the following activities:

(a) At one or more Transmission Connection Points;

(b) On transmission lines which join Transmission Connection Points;

(c) On remote transmission lines, which may not be directly connected to the affected Transmission Connection Points.

PC 1.1 The scope of this Code applies to all NTDC Transmission System Users, i.e.

(a) NTDC;

(b) Generators;

(c) DISCOs;

(d) Transmission-connected Consumers; and

(e) Externally Connected Consumers/Parties.

PC 2 PLANNING CRITERIA

This sub-code provides system reliability/planning criteria, standards and guidelines to be followed in the definition of reinforcement/ up-gradation/expansion projects for the 500 kV and 220 kV NTDC Transmission System as well as for portions of the 132 kV DISCO sub-

transmission systems. The objectives and aims of the planning function are stated in terms of steady state, and dynamic performance of the NTDC Transmission System.

PC 2.1 **Contingency Conditions**

Planning for steady-state, shall be based on (N-0) and (N-1) contingency conditions. In the (N-0) state, all transmission system components are expected to be in-service for the base case model.

There shall be two base case scenarios for each year; Summer-peak (High-Water) and Winter-peak (Low-Water). In each case, the (N-0) condition shall be adjusted to account for planned and scheduled generation and transmission facility maintenance Outages. As required by maintenance scheduling requirements, NTDC shall prepare several (N-0) base cases to account for Summer and Winter base cases in a given year.

Single contingency cases (N-1) shall be studied for each base case scenario; an (N-1) contingency shall be defined as the unplanned Forced Outage of any single transmission and grid system facility, plant, or apparatus. For planning studies, a single transmission facility Outage shall be defined to be any one of the following:

(a) Outage of a 500/220/132 kV transmission circuit under the Operational Control of NTDC;

(b) Outage of a Generator's step-up transformer;

(c) Outage of a Grid station transformer;

(d) Outage of a sub-station 500 kV or 220 kV bus; and

(e) Outage of a 500 kV shunt reactor

Planning for dynamic performance (transient instability) shall be based on the occurrence of each of the following contingencies:

(a) Permanent three-phase fault on any 500/220 kV line, and subsequent outage of an associated transmission line.

(b) Failure of a circuit breaker to clear a fault ("Stuck Breaker" condition) in 5 cycles, with back up clearing in 9 cycles after fault initiation.

PC 2.2 **Steady State**

Adequacy evaluation of planning studies for steady-state system performance shall be based on equipment loading, congestion management, fault levels and voltage regulation. Steady-state planning

studies for steady state load flow studies shall be deemed acceptable if they do not result in any voltage violations or overloads based on pre-determined loading limits for Normal (N-0) and Emergency (N-1) contingency conditions.

PC 2.2.1 **Component Loading**

Loading levels for current carrying component (everywhere on the NTDC network) shall be determined in steady-state load flow studies. This includes transmission circuits, transformers, substation bus, circuit breakers, disconnect switches and auxiliary equipment that contributes to the reliability of the system. For the purpose of evaluating load flow studies the following loading criteria shall be observed:

(a) Under normal operating conditions (N-0 condition), all transmission lines and transformers shall be loaded below their Normal Continuous Maximum Ratings;

(b) Under contingency conditions (N-1), all transmission lines and transformers shall be loaded below their Emergency Ratings; and

(c) Within 15 minutes following the change from the (N-0) state to the (N-1) state, after Spinning Reserve (ten minute reserve) has been deployed, the System shall have the capability to first change generation dispatch and second shed load to reduce any transmission line and transformer loading from the Emergency Rating to below the Normal Continuous Maximum Ratings.

In some cases, line loading limits may be adjusted for unique geographical regions. All loading limits shall be determined in accordance with applicable IEC Standards and updated from time to time as new and revised standards are issued. In the event that an IEC Standard with necessary scope does not exist, then applicable standards such as: ANSI, IEEE, JEC, or other internationally recognized institution may be used. In the event of a dispute as to which planning and design Standards are to be used, Review Panel shall have the final decision.

Transmission circuit loading limits shall be based on the following conditions:

(a) Thermal loading limits of the conductor;

(b) Maximum ambient temperature;

(c) Minimum clearance to ground at mid-span under maximum load;

(d) Allowable over load for 15 minutes; and

(e) Transient (power angle) stability and voltage stability limits.

(f) Maximum allowable conductor temperature.

(g) Wind velocity.

Transformer loading limits shall be based on following conditions:

(a) Maximum loading capacity with forced cooling;

(b) Maximum ambient temperature;

(c) Allowable over load for two hours;

(d) Summer (April - October) loading; and

(e) Winter (November – March) loading.

Substation Transformer Capacity Adequacy

The NTDC shall submit an "Annual System Reliability Assessment and Improvement Report" (ASRAIR) to NEPRA on or before April 15th of each year for the next year (including Table 2-1) listing the Total Installed Transformer Capacity in MVA, Firm Transformer Installed Capacity, and Estimated Load Demand for the next year for each 500/220 kV, 500/132 kV, and 220/132 kV Substation. For each substation, the ratio of Estimated Peak Substation Demand to Firm Transformer Capacity shall be calculated and reported. If the ratio of Estimated Peak Substation Demand to Firm Sub-station Capacity is 80% (Single Transformer sub-station) or 100% (more than one Transformer sub-station) then the NTDC shall include a description of its plans, together with cost and in-service date, to either add additional transformer capacity or to shift load from/to other substations. If load is shifted to another substation then the amount of the shifted load will be added to the estimated peak demand for the substation to which the load has been shifted to, and will be used to calculate the ratio.

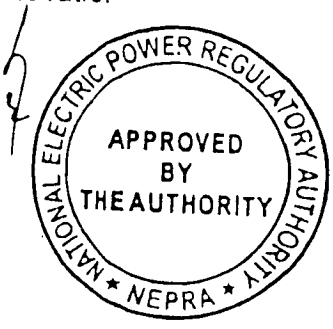


TABLE 2-1 Substation Transformer Capacity Adequacy					
Sub-station Name	Number of Transformers and Total Name plate MVA	Transformer Voltage Ratio KV/kV	Firm Sub-station Capacity (1) (2) (3) MVA	Estimated Peak Substation Demand MVA	Ratio of Peak Substation Demand to Firm Transformer Capacity %

(a) Firm Sub-station Capacity MVA is the Total Installed Transformer Capacity less the largest transformer based on its Nameplate MVA rating;

(b) Transformer MVA loading based on Manufacturer's Nameplate Rating, and IEC standard 60354 Ed 2.0, 1991, Loading Guide for Oil-Immersed Power Transformers; and

(c) In the case of single transformer sub-station, the Firm Capacity of the sub-station is 80% of Transformer's Nameplate Rating.

Elimination of Congestion

Each year NTDC shall, based on the information regarding all congestion conditions that existed for the past year, carry out studies to find solutions to resolve the congestion problems. Steady-state load flow studies shall be made to precisely define the congestion conditions. The results of such studies shall be submitted to NEPRA on an annual basis.

NTDC shall make load flow studies and develop improvement plans to eliminate the congestions that existed in the past year. The description of the plan shall include estimated cost and required commissioning date for the improvement plan.

Load flow calculations shall be made for future years and line loading and transformer loading levels shall be confirmed to be within acceptable loading levels under all possible (N-1) contingency conditions.

Transmission Circuit Availability

Evaluation of the reliability of transmission system components (such as transmission lines, transformers, circuit breakers etc.) shall be determined according to the Outage statistics. Outage statistics shall be based on two measures (1) Frequency of Failure, and (2) Time Duration to make repairs and return the line to service. These measures are to be calculated on an annual basis as described in the Operating Sub Code of the Grid Code and the relevant requirements of the NEPRA Transmission Performance Standards Rules shall be followed in this regard.

PC 2.2.2 **Dynamic System Performance**

NTDC shall make transient stability studies for the existing as well as future System as planned for the following most likely fault conditions. Transient stability studies shall be prepared for Summer (High Water) and Winter peak (Low Water) load conditions for each of the next five years following the Calendar Year.

System stability must be maintained following the disturbances listed below:

(a) Permanent three-phase faults on any primary transmission line and associated components. It is assumed that a fault will be cleared by circuit breaker action in 5 cycles[1];

(b) Failure of a circuit breaker to clear a fault ("Stuck Breaker" condition) in 5 cycles, with back up clearing in 9 cycles after fault initiation.[2]; and

If the System is found to be unstable, then mitigation measures shall be identified and incorporated into the system improvement plans for future years.

PC 2.2.3 **Voltage**

For the purpose of evaluating system planning steady-state load flow study results, the following Voltage shall be used:

(a) Under normal operating conditions (N-0 condition) all bus voltages shall be within the bandwidth of (+5%) to (-5%) of Nominal System Voltage; and

(b) Under contingency conditions (N-1) all bus voltages shall be within the bandwidth of ± 10% of Nominal System Voltage.

[1] Timings of 5 and 9 cycles are based on the sum of relay action, communication time, and circuit breaker operating time. Timings may be revised to reflect technology improvements.

PC 2.2.4 **Short Circuit (Fault Levels)**

Short circuit calculations shall be prepared for each study year, and adequacy of fault interrupting capability and short circuit withstand capacity shall be ensured.

PC 3 **RESPONSIBILITY**

All Code Participants are responsible for participation in the short-term and long-term planning process. The primary responsibility for the planning process is assigned to the Planning Department of NTDC. Other Code Participants include; distribution companies, KESC, GENCOs, Hydel Generators, IPPs, other Generators under Central Dispatch, Externally-connected Parties and Consumers, and Transmission-connected Consumers.

The annual reporting requirements regarding its System Reliability Assessment and Improvement are included in the NERPA Transmission Performance Standards Rules.

PC 4 **FORECASTS AND GENERATION EXPANSION PLAN**

Each year, the NTDC shall prepare and deliver to NEPRA a Ten-Year "Indicative Generation Capacity Expansion Plan (IGCEP)" covering 0-10 Year timeframe. NTDC shall provide this IGCEP or NTDC Plan.

The "Indicative Generation Capacity Plan" (NTDC Plan) shall identify new capacity requirements by capacity, location and commissioning date. This capacity expansion plan shall satisfy Loss of Load Probability[2] criteria, load growth forecast, operating reserve requirements, and other related capacity planning criteria. The plan shall be subject to review and approval by NEPRA.

NTDC shall establish and maintain a marketing group whose function shall be to track and identify potential new industrial, commercial and government projects that can result in the need to construct new generation, substations and transmission facilities.

Information about potential new generating projects and new loads shall be directed to NTDC for use in preparation of load forecasts and transmission expansion plans.

PC 4.1 **Generation Capacity Additions**

The "Indicative Generation Capacity Expansion Plan" (NTDC Plan) shall take into account capacity requirements and upgrades as reported by generation owners. The "NTDC Plan" shall include generation needed to meet estimated load as well as required

[2] LOLP of 1% per NTDC Master Planning Document.

reserves. The NTDC Plan shall produce a year-by-year list of projects and specify capacity, and location, and take into account capacity retirements and major maintenance Outage periods.

The NTDC Plan shall be based on a twenty-year Load Demand and Energy Forecast and shall be prepared according to a Loss of Load Probability (LOLP) methodology established under this Grid Code, and NEPRA Transmission Performance Standards Rules.

An initial target value of LOLP, not to exceed 1% per Year, shall be used. NEPRA shall review and revise the LOLP value from time to time.

The "NTDC Plan" shall be used as an input to the preparation of NTDC's Transmission System Expansion Plan (TSEP).

The NTDC shall be submitted to NEPRA on or before April 15 for the next financial year.

PC 4.2 **Procedures for Transmission System Expansion**

NTDC shall establish a planning process that leads to the recommendation of specific transmission system reinforcements, upgrading, and expansion projects. Specific projects shall be defined according to established planning criteria contained in this Grid Code, and in response to load growth, and the NTDC Plan.

The TSEP shall be presented to NEPRA each year as part of the "Annual System Reliability Assessment and Improvement Report", and shall be in terms of specific projects. The projects shall be identified in terms of: new transmission lines, new transmission circuits, new grid stations, new transformer installations, sub station bus expansions, voltage control projects, circuit breaker upgrading projects, elimination of congestion bottlenecks, and system stability improvement projects.

NTDC shall participate in and coordinate its system planning efforts with the 132 kV planning efforts to be carried out by the distribution companies. In this regard, it is to be expected that there will be some joint projects until the planning and development of the 220 kV and 500 kV System makes the NTDC System independent of the distribution company 132 kV system planning process.

NTDC shall submit to NEPRA for information its proposed plan for its planning process on or before the year of enforcement of the Grid Code. The Plan shall as a minimum address the following points:

Load Forecasting

Three levels of load forecasts should be employed for a time horizon of at least next twenty years for the long-term. The three levels are (1)

High Growth; (2) Medium Growth and (3) Low Growth projections. Factors that are to be taken into account when preparing the load forecasts are: economic activity, population trends, industrialization, weather, distribution companies forecasts, demand side management, load shedding etc.

Project Identification

A Detailed "Transmission Investment Plan" shall be prepared that is based on the "NTDC Twenty-Year Load Forecast", "Indicative Generation Capacity Expansion Plan (IGCEP or NTDC Plan)", and the Transmission System Expansion Plan (TSEP)" based on ASRAI. The Plan shall be broken into several time periods. The Transmission Plan may be prepared for next one, three, five and ten years into the future.

PC 5

PLANNING DATA

Data requirements for planning of future works, which would include the development of new facilities, reinforcements, up-ratings, extensions and augmentation of the existing facilities, and planning for the new Connection Points shall be provided to NTDC each year by all the Users/Code Participants on 1st of January each year.

Demand, Active and Reactive Energy Data

Each Code Participant/User directly connected to the NTDC Transmission System shall provide to NTDC its Load Demand data, historic, current and projected. The required data shall be provided for each sub station in each User/Code Participant's System as applicable.

Each User/Code Participant shall provide forecast data for power demand, Active and Reactive energy and demand requirements on its System. The User/Code Participant shall separately indicate its non-BPC Load Demand on sector-wise basis. BPC's Demand, and the Load Demand of the Second-tier Users of their network, if any.

The Code Participants shall provide the following Load Curves:

(a) Monthly Load Curves of daily peaks; and

(b) Yearly load of monthly peaks

The User/Code Participants shall provide the expected monthly peak Load Demand for each of their Connection Points with the NTDC System.

General Demand Data

(a) NTDC may ask any other data i.e. specific daily Load Curves, energy consumption from the Users/Code Participants. The

Users shall supply all such data individually through quickest means of communication; and

(b) The following information shall be supplied upon request by the NTDC;

(i) details of any individual loads which have characteristics significantly different from the typical categories of domestic, commercial, industrial, and agricultural loads supplied;

(ii) The sensitivity of the Load Demand (Active and Reactive Power) to variations in voltage and Frequency on the NTDC Transmission System at the time of the peak Load Demand (Active Power); and

(iii) Details of any traction loads, arc furnace, welder etc.

(c) **User Technical Data**

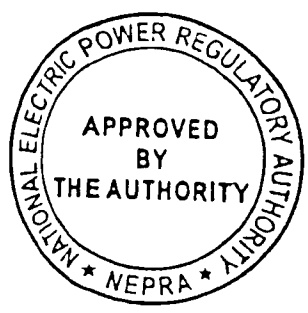
Technical parameters of User Apparatus and Plant connected to the NTDC Transmission System, including the submission of updated technical parameters whenever there is a change of User Apparatus or Plant shall be submitted as and when required.

(d) **NTDC Technical and Network Operator's Data**

NTDC shall have network data relevant to short circuit current contributions.

NTDC is required to make available to Users the network Operator's Data relevant to short circuit current contributions listed in Part 3 of Appendix A (PCA.2.2.10) and Part 2 of Appendix A. NTDC is required to make this technical data available in week 45 of each year to cover for the following NTDC's Calendar Year.

Information to be provided to NTDC by the Users and Network Operators or Vice Versa for planning purposes is covered in Appendix A and B of this sub-code.



Appendix A

PART-1

STANDARD PLANNING DATA

PC.A.1 **GENERAL**

All Users connected directly through existing Connection Points to the NTDC Transmission System or seeking a direct Connection shall provide NTDC data on their Systems which relates to the Connection Site which may have an effect on the performance of NTDC Transmission System.

PC.A.2 **USER'S SYSTEM DATA**

PC.A.2.1 **User's System Layout**

PC.A.A.2.1.1 Each User shall provide a Single Line Diagram, depicting both its existing and proposed arrangement(s) of load current carrying apparatus relating to both existing and proposed Connection Points.

PC.A.2.1.2 The Single Line Diagram must include all parts of the User System operating at EHV and those parts of its sub-transmission system at any NTDC Site. In addition, the Single Line Diagram must include all parts of the User's sub-transmission system operating at a voltage 66kV & above.

At the User's discretion, the Single Line Diagram can also contain additional details of the User's sub-transmission System not already included above, and also details of the transformers connecting the User's sub-transmission system to a lower voltage. With NTDC's agreement, the Single Line Diagram can also contain information about the User's System at a voltage below the voltage of the sub-transmission system.

PC.A.2.1.3 The Single Line Diagram shall also include:

(a) Electrical circuitry identifying overhead lines, underground cables, power transformers reactive compensation equipment and similar equipment etc.

(b) Name of the sub-station with operating voltages

(c) Circuit breakers isolators, current transformers, potential transformers, protection data.

PC A.2.2.4 For each circuit shown on the Single Line Diagram, the User shall provide the following circuit parameters details relating to that part of its system:

Circuit Parameters

(a) Rated voltage (kV)

(b) Operating voltage (kV)

(c) Line Length (km)

(d) Conductor Name

(e) Type of Tower

(f) Positive phase sequence reactance

(g) Positive phase sequence resistance

(h) Positive phase sequence susceptance

(i) Zero phase sequence reactance

(j) Zero phase sequence resistance

(k) Zero phase sequence susceptance

PC.A.2.2.5 For each transformer shown on the Single Line Diagram, the User shall provide the following details:

(a) Rated MVA

(b) Voltage Ratio

(c) Winding arrangement

(d) Positive sequence reactance for all windings

(e) Positive sequence resistance for all windings

(f) Zero sequence reactance for all windings

PC.A.2.2.6 In addition, for all interconnecting transformers between the User's EHV Voltage System and the User's Sub-transmission System the User shall supply the following information:-

(a) Earthing system details i.e. direct, resistance or reactance impedance (if not directly earthed).

(b) Tap changer range

(c) Tap change step size

(d) Tap changer type

PC.A.2.2.7 User shall supply the following information about the User's equipment installed at a Connection Site which is owned, operated or managed by NTDC: -

(a) **Switchgear:** User shall provide the following parameters for the circuit breakers.

(i) Rated Voltage (kV)

(ii) Operating Voltage (kV)

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

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

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

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

(vii) Rated rms continuous current (A)

(viii) DC time constant applied at testing of asymmetrical breaking abilities (Secs.)

(b) **Substation Infrastructure:** User shall provide the following parameters for the installed electrical equipment.

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

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

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

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

(v) Rated duration of short circuit withstand (Secs)

(vi) Rated rms continuous current (A)

(c) Detailed short circuit data for single-point or multi-point connection sites.

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PC.A.2.2.8 **Lumped System Susceptance**

For all parts of the User's Sub-transmission System which are not included in the Single Line Diagram provided under PC.A.2.1.1, each User shall provide the equivalent lumped shunt susceptance at Nominal frequency.

PC.A.2.2.9 **Reactive Compensation Equipment**

For all independently switched reactive compensation equipment, including that shown on the Single Line Diagram, not owned by NTDC and connected to the User's System at 132kV and above, other than power factor correction equipment associated directly with User's Plant and Apparatus, the User shall supply the following information is required.

(a) Type of equipment (e.g. fixed or variable);

(b) Capacitance and/or inductive rating or its operating range in Mvar;

(c) Details of any automatic control logic to enable operating characteristics to be determined;

(d) The Point of Connection to the User's system in terms of electrical location and system voltage; and

(e) Voltage assessment studies of the User system.

PC.A.2.2.10 **Short Circuit Contribution to NTDC Transmission System**

General

(a) To allow NTDC to calculate fault currents, each User is required to provide data and short circuit analysis of its system; calculated in accordance with good industry practice, as set out in the following paragraphs.

(b) The data should be provided for the User's system with all Generating Units synchronized to the User's System. The User must ensure that the pre-fault network conditions reflect a credible system operating arrangement.

(c) The list of data items required, in whole or part, under the following provisions. Each of the relevant following provisions identifies which data items in the list are required for the situation with which that provision deals.

The fault current in sub-paragraphs (a) and (b) of the data list should be based on an ac load flow that takes into account any pre-fault current flow across the Point of Connection being considered. Measurements made under appropriate system conditions may be used by the User to obtain the relevant data.

(d) NTDC may at any time, in writing, specifically request for data to be provided for any alternative system condition, for example minimum plant, and the User will insofar as such request is reasonable, provide the information as soon as reasonably practicable following the request.

PC.A.2.2.11 **Generator Data**

For each Generating Unit with one or more associated Station Transformers, the Generator is required to provide values for the contribution of the power plant auxiliaries (including auxiliary gas turbines or auxiliary diesel engines) to the fault current flowing through the Station Transformer(s).

(a) Root mean square of the symmetrical three-phase short circuit current in feed at the instant of fault;

(b) Root means square of the symmetrical three-phase short circuit after the sub-transient fault current contribution has substantially decayed;

(c) If the associated generating unit step-up-transformer can supply zero phase sequence current from the generating unit side to the NTDC Transmission System;

(d) If the value is not 1.0 p.u;

(e) Root mean square of the pre-fault voltage at which the maximum fault currents were calculated.

PC.A.2.2.12 If the Power Plant has separate Station Transformers, data should be provided for the fault current contribution from each transformer at its high voltage terminals, assuming a fault at that location, as follows: -

Data for the fault in feeds through both Step-up Transformers and Stations Transformers shall be provided for the normal running arrangement when the maximum number of Generating Units in the Power Station are synchronized to the System.

Data Items

(a) The following is the list of data utilized in this part of the Planning Code.

(i) Root mean square of the symmetrical three-phase short circuit current in feed at the instant of fault;

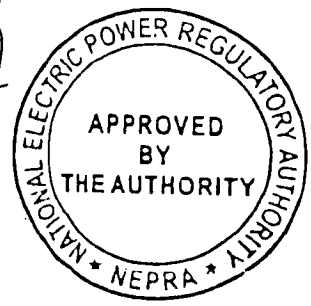
(ii) Root mean square of the symmetrical three-phase short circuit after the sub-transient fault current contribution has substantially decayed;

(iii) The zero sequence source resistance and reactance values of the User's System as seen from the node on the Single Line Diagram provided;

(iv) Root mean square of the pre-fault voltage at which the maximum fault currents were calculated;

(v) The positive sequence X/R ratio at the instant of fault; and

(vi) The negative sequence resistance and reactance values of the User's System seen from the node on the Single Line Diagram



Appendix A

PART-2

STANDARD PLANNING DATA

PC.A.3 GENERATING UNIT DATA

PC.A.3.1 Directly Connected Generators

Each Generator shall provide the following data to NTDC.

(a) Registered Capacity (MW);

(b) Output usable (MW) on a monthly basis;

(c) System constrained capacity (MW);

(d) Minimum Generation (MW);

(e) MW obtained from Generating Units in excess of Registered Capacity;

(f) Generator Performance Chart at the Generating Unit stator terminals; and

(g) Expected running regime(s) at each Power Plant and type of Generating Unit, e.g. Steam Unit, Gas Turbine Unit, Combined Cycle Gas Turbine Unit, (specify by type), etc.

(h) Capability V Curve and Saturation Curve for each Generating Unit.

PC.A.3.2 Rated Parameters Data

NTDC needs the following information for detailed studies: -

(a) For all Generating Units;

(i) Rated MVA

(ii) Rated MW

(iii) Direct-axis and Quadrature-axis sub-transient and transient reactance.

(iv) Rated Leading and Lagging Power Factors.

(v) Synchronous reactances

(vi) Leakage reactance.

(vii) Negative and zero sequence reactances.

(viii) Direct-axis and quadrature-axis short circuit time constraints.

(b) For each synchronous Generating Unit;

(i) Short circuit ratio

(ii) Inertia constant (for whole machine); MW secs/MVA

(c) For each Generating Unit Step-up Transformer;

(i) Rated MVA

(ii) Positive sequence reactance (at max, min, and nominal tap)

(d) Details of the Exciter category, for example whether it is a rotating Exciter or a static Exciter.

PC.A.3.3 **General Generating Unit Data**

(a) Exciter and power system stabilizer data including block diagrams and parameters such as gain, time constraints etc to be used in Standards PSS/E format.

(b) Governor data including block diagrams and parameters such as droop setting time constraints etc. to be used in the standard PSS/E format.

PC.A.3.4 **Network Operator's Data**

(a) Forecast Load Demand data, Network Operator's System Constraints.

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Appendix A

Part 3

STANDARD PLANNING DATA

PC.A.4 DEMAND AND ACTIVE ENERGY DATA

PC.A.4.1 Network Operator's Demand (MW) and Active Energy Requirements (MWHs) – Historic, Current and Forecasted.

PC.A.4.2 Forecasted Daily Demand Profiles (Active Power).

(a) Time of Peak, and Maximum Load Demand (Active Power and Active Energy Data);

(b) Time of NTDC's System Peak Demand as Notified by NTDC (Active Power);

(c) Time of Minimum NTDC Demand (Active Power) as Notified by NTDC; and

(d) Preceding Year's Total NTDC Demand (Active Power) With Time of System Peak with Respect to Each User's System Peak Demand (Active Power)

PC.A.4.3 **NTDC's Load Forecast (System Peak Demand and Active Energy Requirements)**

(a) NTDC's Notification of its Forecasted Annual System Peak Demand (Active Power) and Annual Minimum Demand (Active Power); and

(b) The Total Active Energy of the NTDC in the preceding NTDC Financial Year alongwith a Forecasted Active Energy Requirements for the Current Financial Year.

PC.A.4.4 **Other User's Load Information**

(a) Total User's System Losses; and

(b) Active Demand and Energy Provided by Embedded Generators (Current and Forecasted)

PC.A.4.5 **Connection Point Demand (Active and Reactive Power and Power Factors)**

PC.A.4.5.1 **Timing of the Peak Demand**

(a) Time of the Maximum Demand at the Connection Point as Determined by the Users; and

(b) Time of NTDC's Peak Demand and Minimum Demand.

PC.A.4.5.2 Aggregate Demand of Two Connection Points Running in Parallel.

PC.A.4.6 NTDC System Demand and Energy Forecast Incorporating All the Data Supplied by the Network Users and Network Operators.

PC.A.4.7 Demand Transfer Capability

(a) User's Active and Reactive Power Demand Reflecting a Group or Groups of Demands for both Planned and Unplanned Outage Conditions

PC.A.4.8 General Demand Data

(a) Details of Individual Loads (sector-wise) along with the Load Characteristics

PC.A.4.8.1 **NTDC Demand Sensitivity, and Power Quality Impacts**

Each User to provide load and its characteristics which can have adverse impact on the NTDC system vis-à-vis Power Quality.

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Appendix B

The Single Line Diagrams showing the Details of the User's Connection to the NTDC Transmission System are included in the Appendix E of the Connection Code.

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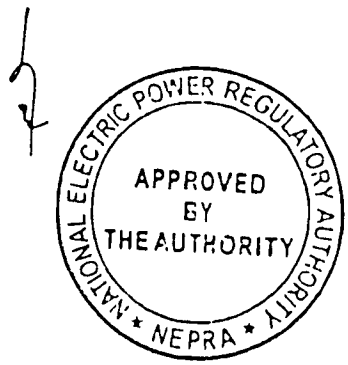


CONNECTION CODE

CONTENTS

CONNECTION CODE

CONTENTS

CONNECTION CODE

CC 1 INTRODUCTION

NTDC shall in good faith negotiate a Connection Agreement with the Entity requesting a Connection Agreement with the NTDC Transmission System in accordance with the provisions of NTDC Transmission Licence.

The Connection Code specifies the minimum technical design criteria and connection requirements, which must be complied with by the Users/Code Participants connected to or seeking connection with the NTDC bulk power transmission system. It also details the application procedure to be adopted by the applicants and prospective Code Participants and the obligations to be fulfilled by Network Owner/System Operator in the capacity of NTDC to arrange and provide connections. NTDC shall approve the connection applications. The procedures contained in this sub-code are applicable to the following Code Participants:

(a) Generators

(b) Distribution Companies

(c) Transmission-connected Consumers

(d) Any other Person with a User System directly or indirectly connected to the NTDC Transmission System to which Power Plants and / or Consumers are connected.

(e) Externally-connected Parties

(f) Externally-connected Consumers

(g) Special Purpose Transmission Licensee (SPTL)

CC 2 PURPOSE AND AIMS

The Connection Code provides the framework for connection to the NTDC Transmission System, and It has primarily the following aims:

(a) to define the uniform principles and guidelines for establishing a connection, and use of the network;

(b) to establish a process to be followed by a prospective Code Participant to establish or modify a connection to NTDC Transmission System;

(c) to manage and prepare the System and the Point of Connection for the applicant seeking connection to the NTDC's present and future Transmission System;

(d) to identify technical and financial requirements of the connection.

CC 3 PRINCIPLES

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

(a) All prospective Users and applicants shall have an opportunity to form a new connection to the network, and have access to the services provided by the NTDC;

(b) The terms and conditions on which connection to the NTDC's Transmission System and provision of network services is to be granted are to be set out in the Connection Agreement between NTDC and applicants;

(c) A uniform treatment shall be applied by NTDC in identifying terms and conditions for new connection for each applicant; and

(d) Same principles shall hold while modifying an existing connection for the Code Participants along with Annual System Reliability and Assessment Report (ASRA).

CC 4 ESTABLISHING OR MODIFYING CONNECTION

Under the requirements of the Transmission Licence, existing and proposed Users may assess opportunities for connection to the NTDC Transmission System in two ways:

(a) By reference to the Annual "NTDC Plan (IGCEP)", "Transmission Plant (TESP)" and "NTDC Investment Plan" as described in the Planning Code (PC) and "NTDC Investment Plan" prepared by NTDC in accordance with the requirements of its Transmission Licence.

(b) An Offer by NTDC to enter into a Transmission Service Contract for Connection to the NTDC Transmission System for the following:

  (i) Existing Transmission Connection Points.

  (ii) New Transmission Connection Points.

  (iii) Modifications at an existing Transmission Connection Point.

A Connection Agreement is required for every Transmission Connection Point for each User at that Connection Point. Therefore, for any of the above connection options, existing and potential Users are required to enter into a Connection Agreement or to modify existing Connection Agreements.

CC 4.1 **Process and Procedures**

The existing or prospective Code Participants seeking new connection or modifying the existing connection shall comply with the following process and procedures [also shown in Annexure F (figure 1)].

(a) Generators, distribution companies, BPCs and SPTL shall submit the connection application to NTDC if connecting directly to the NTDC's Transmission System. Whereas, Generators and BPC connecting indirectly shall submit their applications to the respective distribution companies and NTDC simultaneously. The distribution companies shall evaluate their application for providing the connection, and shall forward to NTDC/System Operator after review and approval for registration as a Code Participant.

CC 4.2 **Intention Application**

An existing or prospective Code Participant wishing to modify its existing connection or connect to the Transmission System of NTDC for the first time shall first prepare an intention application. The application must indicate:

(a) The type of facilities it intends to establish (generator, distribution company, BPC, etc.);

(b) Magnitude of Load Demand for the facility and load profile;

(c) Proposed Point of Connection;

(d) Tentative schedule for connection; and

(e) Proposed activity

NTDC shall 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 suitability of the proposed Point of Connection;

(c) Linear Load Flow analysis and fault level studies in accordance with the Planning Code by NTDC on behalf of applicant;

(d) List out functional design requirements, Performance Standards requirements, and specification; and communicate to the applicant in the next communication;

(e) Preliminary cost analysis for connection and estimated connection and registration fee;

(f) Indicate if additional information is required from the applicant; and,

(g) Consultation of NTDC with other Code Participants to obtain their input regarding impact on their facilities due to this connection application.

If the NTDC requires additional information from the applicant, the applicant must be advised within 30 business days (preliminary evaluation time period) to provide such information and the application for connection must include such information as may be required by NTDC from time to time. If NTDC does not require such information, the applicant must be offered within the preliminary evaluation time period formally to apply for connection to the network.

In case the applicant has been requested to provide additional information, it must provide such information within 10 business days after receipt of request from NTDC.

The NTDC shall provide the information/data related to its Transmission System to applicant, which should help the applicant prepare its application. The required information is listed, but not limited to, as follows:

(a) A list of the technical data as discussed in CC 5.4 and CC 6 to be included with the application for connection which may vary depending on the connection requirements; and the type, rating and location of the facility to be connected. Required technical data are listed in CC 5.4 and CC 6 of this Connection Code.

(b) The preliminary estimate for connection fee and registration fee. Fees shall be determined and shall be payable on submission of application for connection, and shall cover the following:

(i) Reasonable costs of all works anticipated to arise from investigating the application to connect and preparing the associated offer to connect. This should include additional capital cost related to the new connection, and to make the connecting transmission system at par with the system before the connection.

(ii) If one or more Code Participants are already connected to the proposed Point of Connection, the new Connection may affect quality of supply to other Code Participants. The cost required to mitigate such effects shall be estimated by the NTDC and the applicant shall pay this

cost at time of submission of its application. The cost shall be paid at the time of issuance of demand note.

(iii) If the applicant wishes to be connected to the NTDC Transmission System, the connection shall be of in-out arrangement. If the transmission line is loaded near its operating limits and expected to affect the quality of supply of the bulk power system, the applicant shall bear the full cost of upgrading the connected section of transmission line to which the applicant wishes to make the connection to. The cost shall be paid at the time of issuance of demand note.

NTDC shall use its reasonable endeavor to advise the applicant of all risks and obligations in respect of the proposed connection associated with planning and compliance with environmental laws of the Environmental Protection Agency (EPA) of Pakistan not contained in this Code

The costs of assets (these assets do not include the existing assets of Transmission Connection Points) at the Point of Connection including material, civil works, cost of land and other ancillary costs shall be borne by the applicant. However, the NTDC shall provide a preliminary cost estimate for the new connection.

CC 4.3 **Application for Connection or Modification**

On receipt of "Offer for Connection" from NTDC, the applicant must submit the formal application within 30 business days from the date of offer for connection. The application must accompany the following information for evaluation of NTDC.

(a) Technical and commercial feasibility report;

(b) Detailed design of the facility that the applicant intends to install;

(c) A final committed implementation schedule showing proposed milestones for construction and commissioning of the applicant's facilities;

(d) Fees for registration and connection to the network;

(e) Details of the protection arrangements and relay settings;

(f) Copies of all safety rules and local safety instructions applicable at applicant's Sites; and

(g) Power quality monitoring mechanism

If the NTDC considers that the applicant's proposed connection may possibly adversely impact the networks of other Code Participants or

Users, the affected Code Participants and Users shall also be invited to evaluate the impacts and negotiate an agreement with the applicant.

The applicant shall pay registration and connection fees to the NTDC; and the remaining information and data required should be submitted to NTDC as soon as possible.

(Note: If the applicant is seeking connection to a distribution company, the distribution company shall carryout preliminary evaluation of the application and if the application is in line with the policies and technical criteria as outlined in the Grid Code and Distribution Code, it shall send its concurrence to NTDC to allow Connection with its System. The NTDC shall evaluate the application with reference to its obligations under the Transmission Licence and process the application of the applicant who is seeking connection to the distribution company's system).

If the applicant wants to have multiple Points of Connections to the NTDC Transmission System, it should include all the Point of Connections in the same application; however, the term and conditions for each Point of Connection may vary in accordance with the conditions prevailing at each Point of Connection.

NTDC shall evaluate this application and its contents within 30 business days (final evaluation time period), and then invite the applicant to have negotiations for a Connection Agreement.

CC 4.4 CONNECTION AGREEMENTS

All the information forming basis of terms and conditions of the Connection Agreement for "Connection and Use-of-System" must be supplied by the applicant to NTDC prior to completion date of the Agreement. Such information as listed below is referenced here for guidance but not limited to: -

(a) updated Planning Data as specified in the Planning Code with estimated values being confirmed or replaced with validated actual values and updated Forecast Data such as Load Demand pursuant to the Planning Code;

(b) details of the protection arrangements and settings referred to in the relevant Sections of CC 5.4 below;

(c) copies of all safety rules and local safety instructions applicable at the User's Sites which will be used at the NTDC/User interface. These instructions must be to the satisfaction of NTDC as set out in OC 9, CC 5.4 below;

(d) Information to enable NTDC to prepare Site Responsibility Schedules on the basis set out in the relevant sections of CC 5.4, and Appendix A of this sub-code;

(e) an Operation Diagram fcr all HV Apparatus on the User side of the Transmission Connection Point as specified in CC 5.4, and Appendix B of this sub-code;

(f) the proposed name of the User Site, which shall not be the same as the name of any NTDC Site, or any other User Site;

(g) written confirmation that the Safety Coordinators acting on behalf of the User are authorised and competent pursuant to the requirements of OC 9, and relevant sections of CC 5.4;

(h) a list of Managers who have been duly authorised to sign Site Responsibility Schedules on behalf of the User;

(i) information to enable NTDC to prepare Site Common Drawings;

(j) a list of the telephone numbers for the User's facsimile machines; and

(k) NTDC shall provide written confirmation to the User that the Safety Coordinators acting on behalf of NTDC are authorised and competent pursuant.

On receipt of an "Offer to Connect" to NTDC Transmission System, the applicant (Other than a Consumer): -

(a) Must apply for a respective NEPRA licence to operate as a Generator or a distribution company or Special Purpose Transmission Licence (SPTL);

(b) Must register with NTDC to operate as a Code Participant.

(c) Must agree to comply with all the provisions of the Grid Code, and Distribution Code (if applicable).

(d) Must abide by all related rules and regulations already issued or to be promulgated in the future by the GOP or the relevant authorities.

(e) Must agree to abide by all bindings, which are set out by the environmental agencies.

NTDC shall inform NEPRA that a Connection Agreement has been entered into between them, and forward to NEPRA relevant technical details of the proposed plant, apparatus, facilities and connection, including the proposed metering installation and the terms upon which a Code Participant is to supply any ancillary services under its Connection Agreement.

CC 4.5 **CONNECTION ARRANGEMENTS FOR GENERATORS**

NTDC is required under its licence to process a connection application or to make an offer to connect for the provision of transmission network services to the Generator.

The Generator shall follow the same procedure for seeking connection to the NTDC Transmission System as mentioned in CC 4. However, as a basis for negotiation for the connection agreement, the Generators:

(a) must provide to NTDC such information as is reasonably requested relating to the expected operation of its Generating Units; and

(b) NTDC must provide to the Generator such information as is reasonably requested to allow the Generator to fully assess the commercial significance of the connection arrangements sought by the Generator.

A Generator may seek its Open Access arrangements at any level of power transfer capability between zero and the maximum power injection into the NTDC Transmission System of the Generator' Registered Capacity.

NTDC shall make arrangements to provide connection to the Generator to its Transmission System. However, the costs of establishing the connection at the Point of Connection shall be borne by the Generator.

The augmentation or the required extensions of the affected transmission networks to provide appropriate transfer capabilities to other Code Participants with the new connection in place shall be carried out by NTDC; and the costs incurred for such works shall be reflected in the transmission tariff of NTDC.

The Generator shall post a performance bond in the name of NTDC, in an amount equal to the estimated NTDC cost to construct new facilities needed for the connection of the Generator. The bond shall be returned to the Generator upon successful commercial operation of the Generator's facilities. If the Generator fails to bring its project to commercial operation, then NTDC shall collect the performance bond.

Other procedures and requirements for intent application, Offer to connect to the network, preparation of connection application, evaluation of application and the Connection Agreement shall be according to the Connection Code of the Grid Code.

CC 5 **DISCONNECTION AND RECONNECTION**

The following procedures must be adopted for disconnection of any facility from the NTDC Transmission System.

CC 5.1 **Voluntary Disconnection**

For the voluntary disconnection of any equipment or the facility, the Code Participant must give advance notice, as established in the Connection Agreement, in writing, that it intends to disconnect its facility from NTDC Transmission System, subject to the procedures set out in its Connection Agreement.

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

Before taking any decision for disconnection of the equipment of the facility, of the Code Participant, NTDC shall ensure that such disconnection will have no impact on the quality or reliability of supply or Systems of other Code Participants.

Prior to any disconnection, the NTDC shall inform NEPRA about the disconnection proposal and its expected impact on the network.

All the costs incurred on disconnection of equipment or facility from the network will be borne by the Code Participant who is seeking the disconnection.

CC 5.2 **INVOLUNTARY DISCONNECTION**

The System Operator/NTDC may disconnect Equipment, Apparatus, or the Facility of a Code Participant by giving an advance notice in the case of only as per Connection Agreement if: -

(a) The Code Participant is not operating its facility in accordance with the Connection Agreement or in accordance with the law of the land or in accordance with the NEPRA licence, and other applicable documents.

(b) In case of operational emergencies, where transmission system of NTDC becomes incapable of providing the required services.

(c) In the event of emergencies, the Code Participant's facility must be disconnected in an orderly manner or as indicated in the Connection Agreement, such that the security and integrity of the System is not jeopardized.

In the event of involuntary disconnection, the affected Code Participant must not bring proceedings against NTDC to seek to recover any amount for loss or damage incurred due to the disconnection.

CC 5.3 **RECONNECTION OF EQUIPMENT OR FACILITY**

The NTDC shall reconnect the Code Participant's facility, equipment, and apparatus after confirming that:

(a) The Code Participant has rectified all such circumstances, which were the cause of disconnection; and NTDC has agreed and reasonably satisfied with the corrected status of the Code Participant's facility.

(b) NTDC shall charge such cost as indicated in the Connection Agreement for reconnection of the facility which was disconnected due to default.

(c) The facilities, which were disconnected due to emergencies, must be reconnected as soon as the causes of emergencies were rectified and NTDC Transmission System has come in steady-state operational conditions.

CC 5.4 **OPERATIONAL OBLIGATIONS OF CODE PARTICIPANTS**

All Code Participants must maintain and operate their facilities in accordance with, but not limited to the following provisions;

(a) Abide by the relevant laws, rules and regulations.

(b) Abide by the obligations under Grid Code and Distribution Code (if applicable).

(c) Adopt the prudent electric power industry practices and applicable standards enumerated in other rules, regulations and guidelines of NEPRA.

(d) Coordinate with NTDC in activities relating to operation, maintenance and development of the NTDC Transmission System.

(e) Abide to the conditions set out in the Connection Agreement so that the Quality of Supply (QoS), and security of the NTDC's Transmission System, and Systems of other Code Participants are not affected.

(f) Utmost care must be observed by the Code Participant in preparation and submission of technical data and other information required by the NTDC for planning and development, and day to day operation of the NTDC System.

(g) The Code Participant must maintain the Quality of Supply (QoS) and technical standards set out for the Point of Connections as

detailed in the NTDC Licence, Grid Code, Distribution Code, and other applicable documents of NEPRA.

(h) The Code Participant must register itself with NEPRA as a licensee to operate as a Generator, Distribution Company, SPTL or another Network Operator.

(i) The Code Participants should coordinate with NTDC and prepare a program with committed implementation schedule to install SCADA (on line data acquisition and monitoring facilities) on its system and requisite metering facilities.

(j) Inform NTDC of any real-time sudden changes on their own System as soon as possible.

Technical, Design and Operational Criteria

NTDC shall ensure that NTDC Transmission System complies with the following technical, design and operation criteria at the Connection Site with a User.

This section contains detailed technical transmission system requirements, which NTDC shall specify in consultation with other Code Participants and Users (NTDC to provide detailed specifications outlined below if not included thus for).

(a) NTDC Transmission System Performance Characteristics

(i) **Grid Frequency Variations**

The Frequency of the NTDC Transmission System shall be nominally 50Hz and shall be maintained within the limits of 49.8 to 50.2 unless exceptional circumstances prevail.

(ii) **Grid Voltage Variations**

Under (N-0) normal operating conditions, System Operating Voltages of the Total System shall be maintained within the bandwidth of +8% to -5% of Nominal System Voltage. Under (N-1) contingency operating conditions, the voltage variation shall be in the range of +10% and -10% of Nominal System Voltage.

However, 132 kV System Operating Voltages at the Points of Connection shall be governed by the limits provided in the Performance Standards (Transmission) and/or Performance Standards (Distribution) as applicable.

(iii) **Power Quality**

- Harmonic Content

  Total Harmonic Distortions (THD) level should be in accordance with IEEE Standard 519-1992

- Phase Unbalance

  Under Planned Outage conditions, the maximum negative phase sequence component of the phase voltage on the NTDC Transmission System should remain below 1% unless abnormal conditions prevail.

- Voltage fluctuations/Dips

- Negative and zero sequence loading

(b) Plant and Apparatus relating to User/NTDC Transmission Connection Site.

(i) **General Requirements**

- Design of Connections
- Earth Fault Factor
- Earthing Requirements
- Voltage Conditions

(ii) **Substation Plant and Apparatus**

- ✓ Plant and/or Apparatus prior to 1st January, 2005
- ✓ Plant and/or Apparatus post 1st January 2005 for a New Connection Point
- ✓ New Plant and/or Apparatus post 1st January 2005 for an existing Connection Point
- ✓ Used Plant and/or Apparatus being moved, Re-used or Modified

- Technical Specification of Substation Plant and Apparatus
- Fault levels at the Connection Site with/without the proposed Connection.

- User Compliance with NTDC's Specification.
- Design, Manufacturing and Testing.

(c) **Requirements Relating to Generator/NTDC Connection Points**

(i) Generating Unit and Power Plant Protection Arrangements.

(ii) Minimum Requirements.

(iii) Fault Clearance Times.

(iv) Equipment to be Provided.

(v) Protection of Inter-connections.

(vi) Circuit-breaker Fail Protection.

(vii) Loss of Excitation.

(viii) Pole-Slipping Protection.

(ix) Signals of Tariff Metering (CTs and PTs).

(x) Work on Protection Equipment.

(xi) Relay Settings.

(d) Requirements Relating to Network Operator/NTDC and Non-embedded Consumers/NTDC Connection Points.

(i) Protection Arrangements for Network Operators and Non-embedded Consumers.

- Fault Clearance Times.
- Fault Disconnection Facilities.
- Automatic Switching Equipment.
- Relay Settings.
- Work on Protection Equipment.
- Equipment to be provided.
- Protection of Inter-connections.

(e) General Generating Unit Requirements

(i) Technical, Design and Performance Requirements

- Reserve and Ancillary Service Obligations.
- Maintenance Outage Requirements.
- Stability and Suitability Requirements
- Insulation Level Requirements.
- Lightning Protection

(ii) Plant Performance Requirements

- All Generators Units must be capable of supplying rated power output (MW) at any point between the limits 0.80 power factor lagging and 0.90 power factor leading at the Generating Unit terminals. The short circuit ratio of Generating Units shall be not less than 0.5%;
- Each Generating Unit must be capable of Continuously maintain constant output for system frequency changes within the range 50.5 to 49.5 Hz; and
- The Active Power output under steady-state conditions of any Generating Unit directly connected to the NTDC Transmission System should not be affected by voltage changes in the normal operating range. The Reactive Power output under steady-state condition should be fully available within the voltage range of ±5% at all voltage levels.

(iii) Control Arrangements

- Each Generator must be capable of contributing to frequency and Voltage Control by continuous modulation of Active Power and Reactive Power supplied to the NTDC Transmission System;
- Each Generator must be fitted with a fast acting proportional turbine speed governor and Unit Load Controller or equipment control device to provide

frequency response under normal operation conditions. The governor must be designed and operated to the appropriate international standard; and

- A continuously-acting automatic excitation control system is required to provide constant terminal voltage control of the Generator without instability over the entire operating range of the Generator.

- **Frequency and Voltage Control Modulation**

  Minimum Frequency Response Requirements (Appendix C).

- **Steady-State Load Inaccuracies**

  The standard deviation of load error at steady state load over a 30 minute period must not exceed 2.5% of a Generating Unit.

- **Negative Phase Sequence Loadings**

- **Neutral Earthing**

  At Nominal System Voltage of 132kV and above the higher voltage windings of a transformer of a Generating Unit must be star-connected with the star point suitable for connection to earth.

- **Frequency Sensitive Relays**

  Generators shall be responsible for protecting all their Generating Units against damage if frequency excursions outside permissible range ever occur. Should such excursions occur, it is up to the Generator to decide whether to disconnect his Apparatus Plant or Facility for reasons of safety of Apparatus, Plant and/or personnel.

(f) General Network Operator and Transmission-connected Consumer Requirements

This part of the Grid Code describes the technical and design criteria and performance requirements for authorized electricity operators and Transmission connected Consumers.

(i) Neutral Earthing
(ii) Frequency Sensitive Relays
Technical Requirements for Low Frequency Relays for the Automatic Load Shedding (Appendix D)

(g) Communications System

(i) Communication Requirements

(ii) Control Telephony

(iii) Operational Metering

(iv) Instructor Facilities

(v) Electronic Data Communication Facilities

(vi) Facsimile Machines

(vii) Busbar Voltages

(h) System Monitoring

(i) Site Related Conditions

(i) Responsibilities of Construction, Commissioning, Control, Operation and maintenance of Facilities

(ii) Responsibility for Safety

- NTDC Safety Rules and Their Area of Application
- User's Safety Rules and Their Area of Application
- NTDC's Authorization to User/Network Operator to Carryout Works
- User's/Network Operator's Authorization to NTDC to Carry Out Works
- Connection Sites

(iii) **Site Responsibility Schedules**

- Format, Principles and Procedures to be used in the preparation Site Responsibility Schedules (SRS) (Appendix A)
- Proforma for Site Responsibility Schedule (SRS)] (Attachment to Appendix A)

(iii) Operation and Gas Zone Diagrams

- Appendix B (Part-I)
  Principles and Procedures Relating to Operation Diagrams.
- Appendix B (Part-II)
  Principles and Procedures Relating to Gas Zone Diagrams.
- Appendix B (Part-III)
  List of all Apparatus to be shown on Operation and Gas Zone Diagrams.
- Operation Diagrams
- Gas Zone Diagrams
- Preparation of Operation and Gas Zone Diagrams for User's Sites
- Preparation of Operation and Gas Zone Diagrams for NTDC's Sites
- Changes to Operation and Gas Zone Diagrams

(iv) **Site Common Drawings**

- Preparation of Site Common Drawings for a User Site
- Preparation of Site Common Drawings for NTDC Sites

(v) **Physical Access**

- Physical Access Requirements and Conditions.

(vi) **Maintenance Standards**

(vii) **Site Operational Procedures**

(j) **Ancillary Services**

(i) System Ancillary Services

(ii) Commercial Ancillary Services

Maintenance and Replacement of Interconnecting Facilities due to Aging/damage

The NTDC or the distribution company, as the case may be, who owns the assets at the Point of Connection shall carry out the maintenance of the equipment, including the equipment used for connection. All the costs incurred in this respect shall be borne by the owner of the assets.

The replacement of equipment due to aging shall be the responsibility of the NTDC or the distribution company, as the case may be, who owns the assets at the Point of Connection.

SCADA and SCADA Communications System

The SCADA and SCADA communication system shall be used by NTDC and Code Participants to monitor and control the NTDC Transmission System, including 500 kV and 220 kV grid stations, portions of 132 kV substations, and to dispatch Generators connected to the Transmission System of NTDC. The SCADA system shall also include data from Generators, and other Code Participant facilities as required by NTDC.

Open Access

NTDC shall operate the Transmission System in the spirit of "Open Access". By "Open Access" is meant that all Code Participants (extant and potential) shall be treated fairly and equitably without any discrimination or prejudice.

Open Access requires that NTDC shall develop a set of procedures for the receipt and management of requests for new connection to its Transmission System. NTDC shall prepare and maintain a list of the names of all persons requesting a connection to the system along with pertinent data including: date of request, location of connection, MW capacity of connection, name of line or substation to which the connection is requested and expected in-service date. NTDC shall provide NEPRA with a revised list whenever there is a change to the list of applicants.

NTDC shall prepare and submit to NEPRA, for information, a uniform set of rules describing the management of the list of requests for new connections. Rules shall provide for the situation in which an applicant

makes a change in any of the following: name of applicant, location of connection, MW capacity of connection, point of connection to grid, or expected in-service date. NTDC shall publish the list on its Internet Web Page and provide copies on request from interested parties.

NTDC shall prepare load flow and short-circuit studies for each proposed new connection and the study results shall distinguish in a clear and impartial way between impact of a new connection on the steady state power flow, and short circuit impacts of a proposed new connection during summer and winter peak load conditions for the year of proposed in-service date. Such studies shall not be made for a given proposed new connection for years after the year of the proposed new connection. NTDC shall advise each new connection of the transmission and substation facilities to be added to allow the output from the proposed new connection to flow onto the NTDC Transmission System.

NTDC shall not require new connection to pay for upgrades and improvements of the Transmission System that are beyond the immediate Open Access Point of Connection. In the case of an Entity being aggrieved by any determination of the Code Administrator (NTDC), the decision shall be referred to Review Panel for arbitration.

Frequency and Voltage Control

Each Generator, through automatic action, must be capable of auto-monitoring and contributing to Frequency and Voltage Control and regulation of the NTDC's Transmission System by continuous modulation of Active Power and Reactive Power output.

Reactive Power Supply and Voltage Regulation

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

Load Following and Frequency Regulation (balance supply and demand).

Generators that have good response capability and necessary controls may offer frequency regulation as an ancillary service, and may be assigned the function of providing the load following and frequency regulation services or duties as the case may be.. The output of the generating units used to provide load-following service shall be adjusted continuously and automatically to compensate for changes in system load.

CC 6 DATA REQUIREMENTS

CC 6.1 Preferred Connection Arrangement

The six schemes have been described in Table 3-1 for Interconnection of the Generators including GENCOs, IPPs and other Generators (private or public). The existing Generators are using these schemes, however, the new Generators may design new configurations, which shall be acceptable by NTDC after evaluation of the prevailing system conditions. These schemes of connection diagrams are provided in Appendix E of this sub-code.

Table-3-1

Connection Voltage	Approximate Generation Size	Connection Configuration Schemes			
		1	2 & 2A	3 & 3A	4
11kV and Bellow	1-4 MW	•			
66kV	4-40 MW		•		
132kV	40-150 MW			•	
220kV	150-400 MW				•
500kV	400 MW and above				•

The suggested connection arrangements for each plan and three typical protection schemes are shown in diagram 3-1 through diagram 3-6 in Appendix E of this sub-code.

CC 7 SERVICE AND NETWORK DESIGN CONDITIONS

CC 7.1 Service Conditions

Parameters (Based on prevailing Standards)

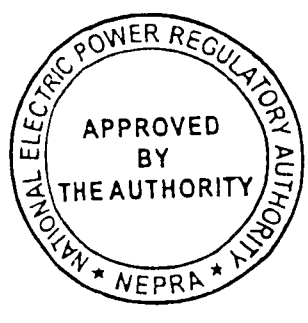
Altitude	0- 1500 M
Maximum ambient temperature	50 ^{0}C
Minimum ambient temperature*	-4 to –7^{0}C
Every day temperature*	30-42^{0}C (summer) 0 – 32^{0}C (winter)
Relative humidity (Percentage)	0-100
Average rainfall	500-900 mm
Isokeraunic level – Average	32 – 65
Isokeraunic level – Maximum	120 thunder storm days/year
Maximum wind velocity	160 km/hour
Atmospheric pollution	Marine-desert & industrial
Maximum ESDD mg/cm^2	1.0 south of Jamshoro 0.67 south of Guddu 0.12 North of Guddu

* *Minimum ambient temperatures are with reference to Quetta and daily temperature ranges are from Peshawar to Karachi.*

CC 7.2 **Network Conditions**

Parameters (Based on prevailing Standards)	500kV	220kV	132kV
Frequency	50 Hz	50 Hz	50Hz
Configuration	3 phase, tri and quad bundle/phase	3 Phase single and twin bundle/phase	3 Phase single and twin bundle/phase
Neutral arrangement	Solidly earthed	Solidly earthed	Solidly earthed
Nominal voltage	500kV r.m.s	220kV r.m.s	132kV r.m.s
Highest voltage for equipment	550kV r.m.s	245kV r.m.s	145KV r.m.s
Three phase symmetrical short circuit current	40 kA r.m.s	40 kA r.m.s	31.5/40 kA r.m.s
Three phase symmetrical peak withstand current	100kA/125 kA r.m.s	100 KA/ 125 kA r.m.s	80/100 KA r.m.s
Insulation Coordination Lightening impulse with stand 1.2/50 us			
a- To earth and between phases	1550 kV peak	1050 kV peak	650 kV peak
b- Between open isolator contacts	1550 kV peak (+315)kV peak	1200 kV peak	750 kV peak
One minute power frequency withstand			
a-To earth and between phases	620 kV r.m.s	460 kV r.m.s	275 kV r.m.s
b- Between open isolator contacts	800 kV r.m.s	530 kV r.m.s	315 kV r.m.s

Connection diagrams (3-1 to 3-6) as referred to in Table 3.1 are provided in Appendix E of this sub-code.



APPENDIX A
OF
CONNECTION CODE

FORMAT, PRINCIPLES AND PROCEDURES TO BE USED IN THE PREPARATION SITE RESPONSIBILITY SCHEDULES (SRS)

CC.A.1 **Principles**
Principles which form the basis of developing SRS

CC.A.1.1 **Types of Schedules**

a. Construction
b. Commissioning
c. Control
d. Operation
e. Maintenance
f. Testing

CC.A.1.2 **New Connection Sites**

CC.A.1.3 **Sub-division of Connection Sites; if any**

CC.A.1.4 **Description of each Item of Plant and Apparatus at the Connection Site.**

CC.A.1.5 **Additional Detail of Plant and Apparatus, if any.**

CC.A.1.6 **Lines and Cables Emanating from Connection Sites.**

CC.A.1.7 **Issuance of draft SRS**

CC.A.1.8 **Accuracy Confirmation by concerned Parties**

CC.A.1.9 **Site Responsibility Schedule (Signed by NTDC)**

CC.A.1.10 **Distribution of SRS**

CC.A.1.11 **Availability of Site Responsibility Schedules (SRS)**

CC.A.1.12 **Alterations/Revisions to Existing Site Responsibility Schedules; if any**

CC.A.1.13 **Revised Site Responsibility Schedules**

CC.A.1.14 **Finalization of Site Responsibility Schedules**

CC.A.1.15 **Urgent Changes**

CC.A.1.16 **Names and Designation of Authorized Person and Safety Coordinators**

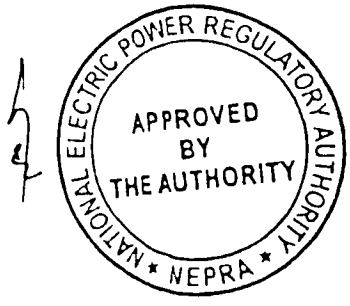
CC.A.1.17 **De-commissioning of Connection Sites**

APPENDIX A
OF
CONNECTION CODE
(ATTACHMENT)

PROFORMA FOR SITE RESPONSIBILITY SCHEDULE (SRS)

This Performa should at least contain the following:

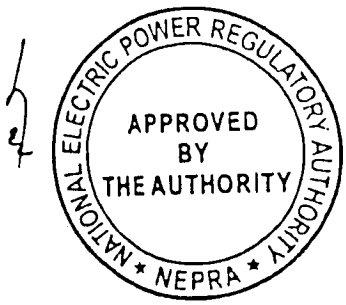
1. Number of Schedule, Issue, Number and Date.
2. Name of Complex and Connection Site.
3. Identification of Apparatus.
4. Name of the Owner of the Apparatus.
5. Name of the Person Incharge of the Work Site (Authorized Person)
6. Item of Plant Apparatus.
7. Name of the Safety Co-ordinator.
8. Details of the Operations carried out on each Apparatus.
9. Safety Rules and Precautions.
10. Operational Procedures.
11. Party Responsible for Undertaking Inspections, Fault Investigation and Maintenance.
12. Remarks



APPENDIX B
OF
CONNECTION CODE
(PART-I)

PRINCIPLES AND PROCEDURES RELATING TO OPERATION DIAGRAMS

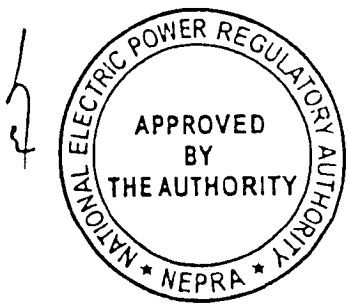
(The Operation Diagram shall include all HV Apparatus and the Connections to all external circuits including Numbering, Nomenclature, Labeling as set out in OC 10).



APPENDIX B
OF
CONNECTION CODE
(PART-II)

PRINCIPLES AND PROCEDURES RELATING TO GAS ZONE DIAGRAMS

(Areas of the Connection Sites where gas-insulated metal enclosed switchgear and/or gas-insulated HV apparatus is installed shall be depicted by a chain detted line which intersects the Gas Zone boundaries. A Gas Zone Diagram is to be prepared for each Connection Site where a gas-insulated switchgear/apparatus has been used. These Diagrams shall conform to the Operation Diagrams in terms of Graphical symbols and Nomenclature)



APPENDIX B
OF
CONNECTION CODE
(PART-III)

List of all apparatus to be shown on the Operation and Gas Zone Diagrams that is installed at the Connection Sites including its present status as it pertains to the System Operation.

APPENDIX C
OF
CONNECTION CODE

Minimum Frequency Response Requirements

CC.C.1 **Scope**

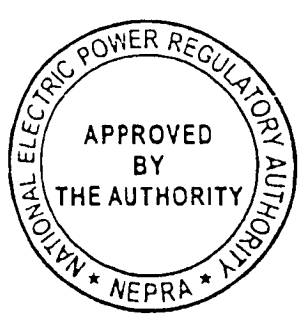
CC.C.2 **Plant Operating Range**

CC.C.3 (a) Minimum Frequency Response Capability Profile in the graphical form;

(b) Interpretation of Initial and Secondary Response Values by the Connecting Party in the graphical form

CC.C.4 Testing of Minimum Frequency Response Capability

CC.C.5 Repeatability of Response



APPENDIX D
OF
CONNECTION CODE

TECHNICAL REQUIREMENTS FOR LOW FREQUENCY RELAYS FOR THE AUTOMATIC LOAD SHEDDING

CC.D.1 Low Frequency Relays

(Technical Specifications and Setting as per Connection Agreement)

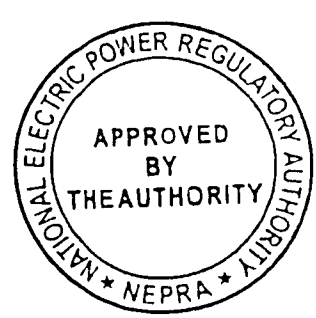
CC.D.2 Low Frequency Relay Voltage Supplies

(Secured voltage supply arrangement for the low frequency relay)

CC.D.3 Scheme Requirements

a. Minimum dependability functional requirements at each Connection Site.

b. Outage requirements with respect to load shedding specified by NTDC.



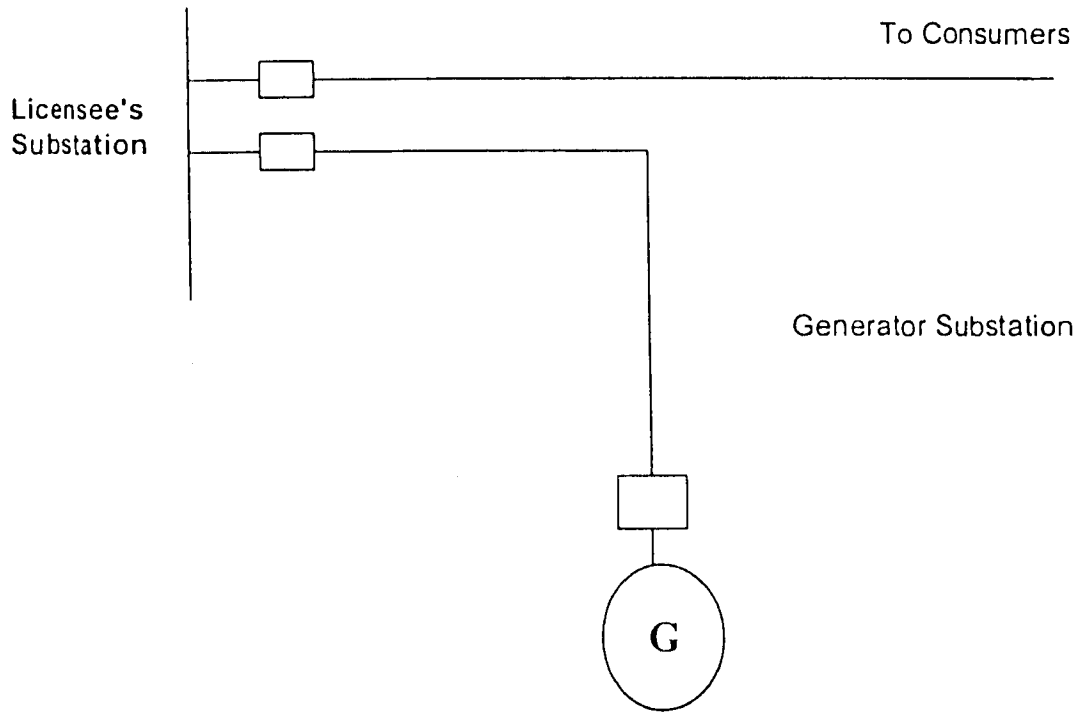
Annexure E

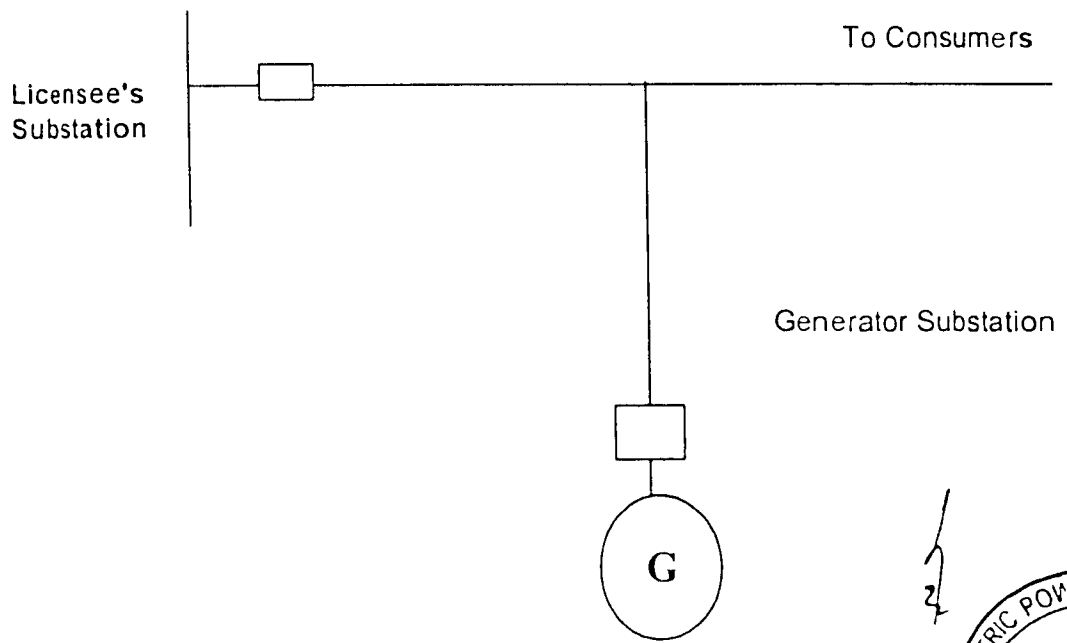
Scheme 1

INTERCONNECTION CONFIGURATIONS FOR GENERATORS

Connections at 11kV

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.





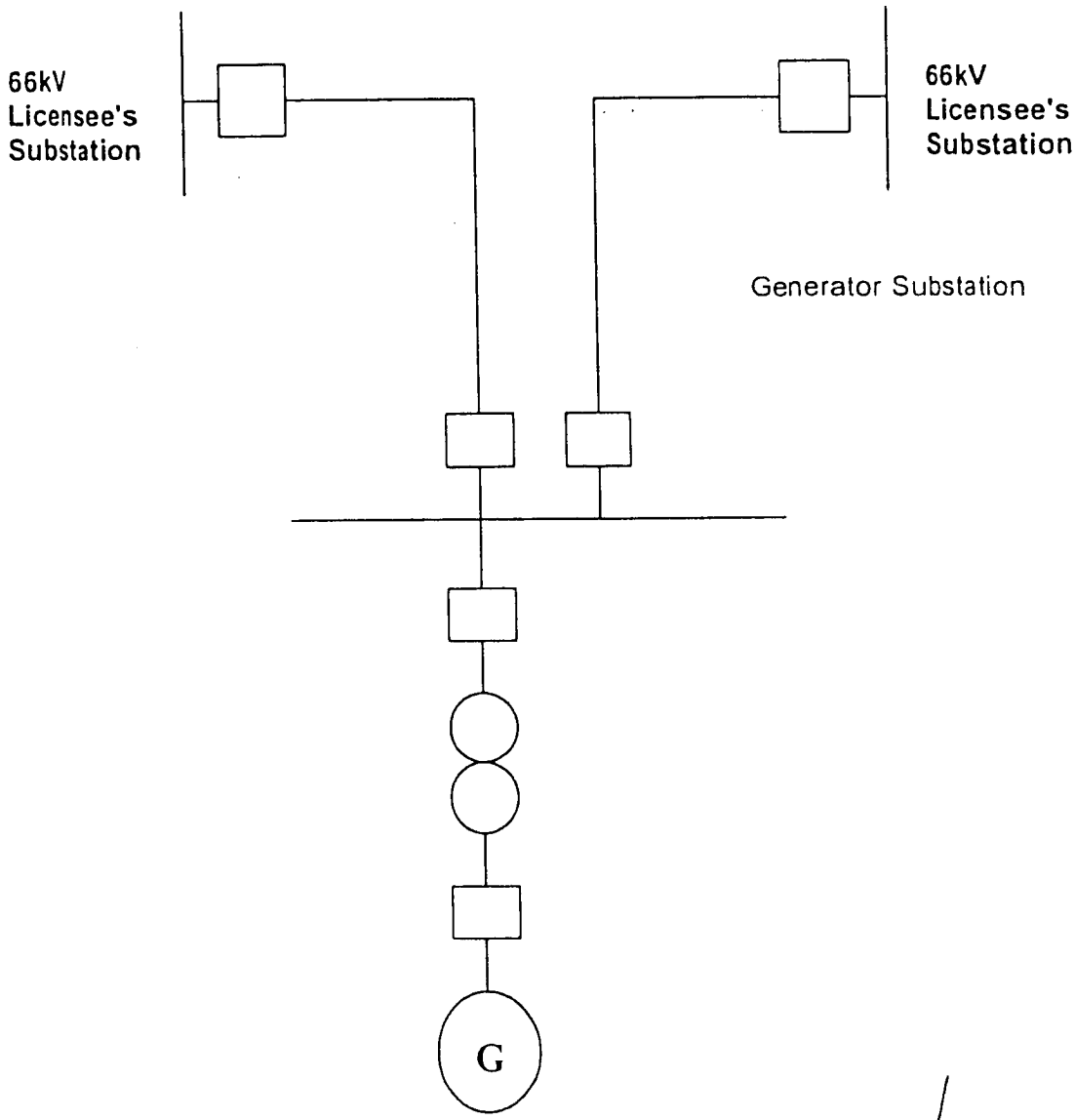
Annexure E

Scheme 2

INTERCONNECTION CONFIGURATIONS FOR GENERATORS

Connections at 66kV

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 NTDC/System Operator may accept after carrying out necessary system studies.

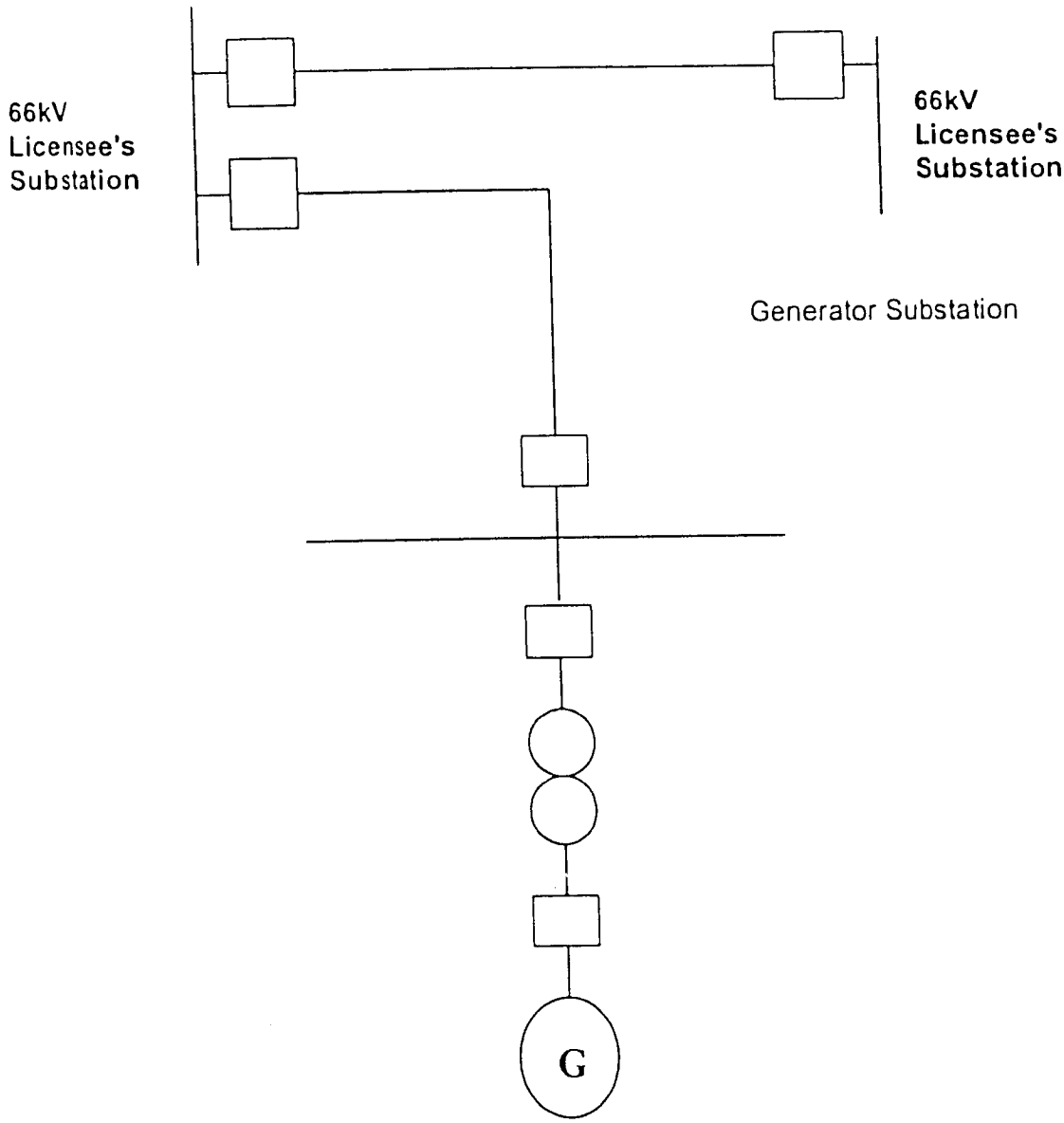


Annexure E

Scheme 2A

INTERCONNECTION CONFIGURATIONS FOR GENERATORS

Connections at 66kV



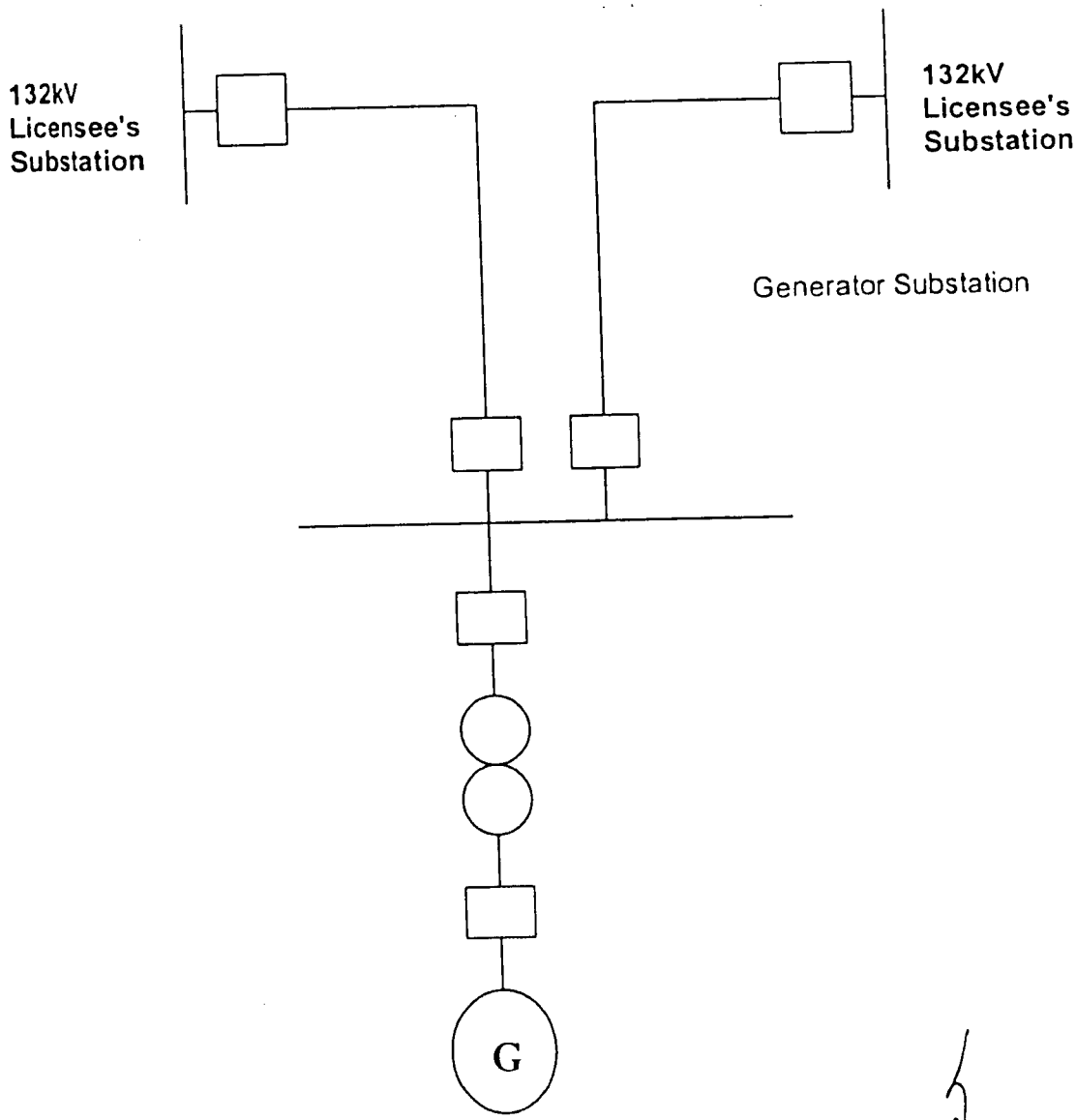
Annexure E

Scheme 3

INTERCONNECTION CONFIGURATIONS FOR GENERATORS

Connections at 132kV

For interconnection of Generators to 132kV system 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 NTDC/System Operator may accept according to prevailing and expected future conditions of the Transmission System.



Annexure E

Scheme 4

Interconnection Configurations for Generators

Connections at 220kV and 500kV

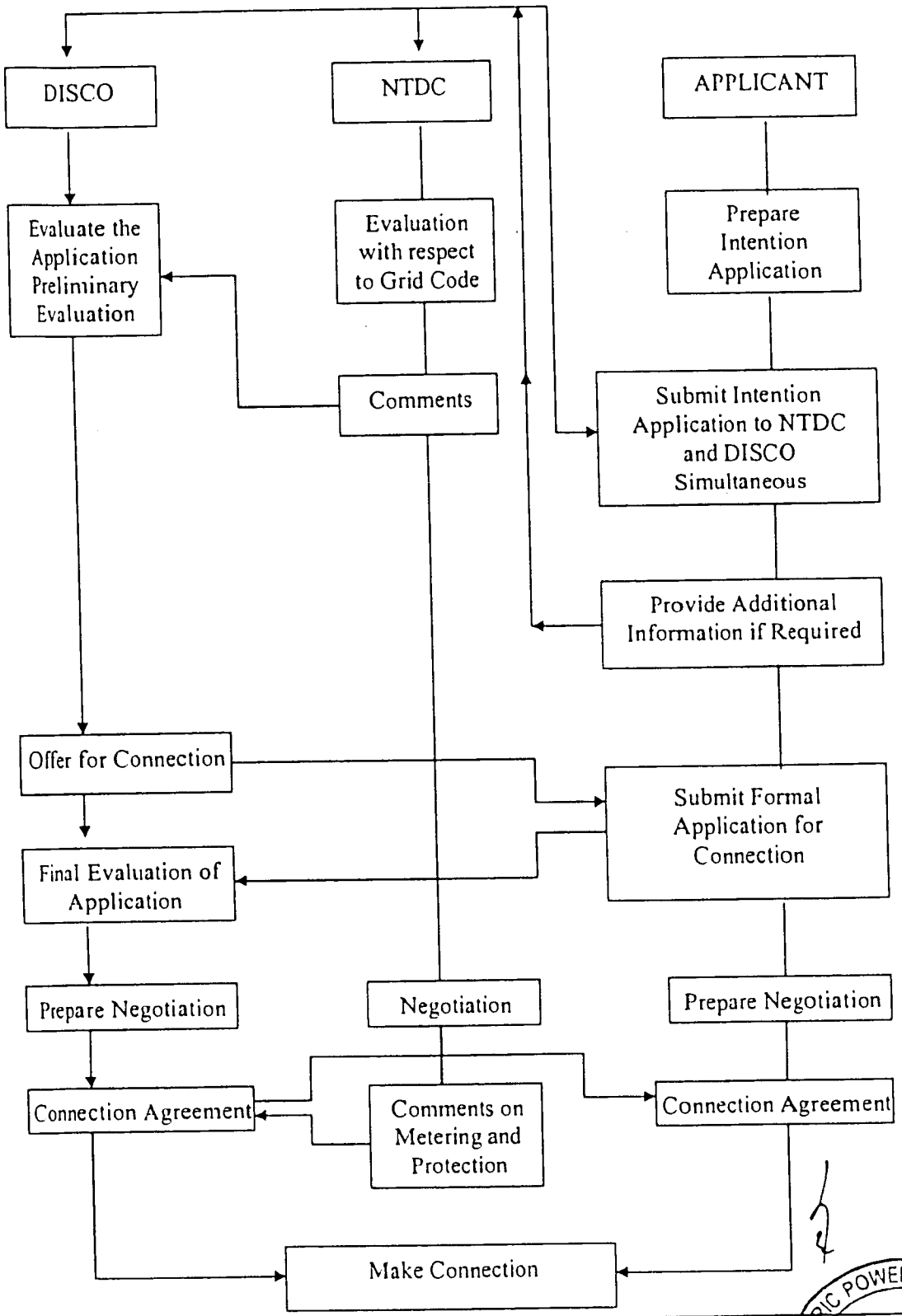
(To be provided by NTDC)

Annexure F

Figure-1

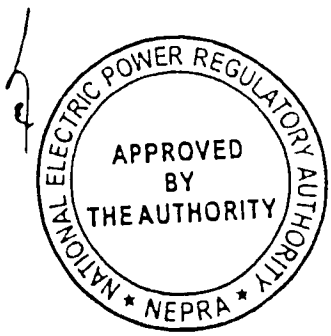
CONNECTION PROCEDURE

for New Connection or Modification of Existing Connection



PROTECTION AND METERING CODE

CONTENTS



PROTECTION AND METERING CODE

PMC 1 **INSPECTION AND TESTING**

Each User/Code Participant must furnish, for NTDC review and approval, proposed settings of the relays of their facilities. If requested, NTDC shall provide its Transmission System data needed to determine the relay settings.

Before commencing integrated operation with the NTDC Transmission System, the installation must be witnessed and inspected by NTDC. The Code Participant is responsible for providing necessary equipment and qualified personnel, who will complete all required tests. NTDC shall not perform any of the testing unless contracted to do so.

The Code Participant must perform submit certified test reports to NTDC, and have NTDC witness the following tests:

a) CT and PT ratio tests

b) CT and PT secondary circuit tests to verify phasing, polarity etc.

c) Completion of relay manufacturers recommended acceptance tests.

d) Tests of phasing between NTDC and Code Participants System.(primary Voltage)

e) Directional test for distance (impedance) relay (s), if required.

f) Final synchronization tests, before paralleling the two systems, to verify Code Participants/Generator (s) are in phase with the NTDC Transmission System.

g) Earthing – Earthing test to be performed at request of NTDC

h) Insulation – Megger and hi-pot testing

i) Switching Operation – Functional Operational Testing

j) Other tests prescribed by NTDC to verify design conformance, functioning and safety of equipment.

k) CT/PT Continuity test

l) C & DF test for CT/PT

m) CT Saturation Curve Test

n) CT VA Burden test

Satisfactory results shall demonstrate the design performance, functionality, and safety of individual components as well as the entire substation.

The User/Code Participant must notify NTDC at least ten business days before performing the required tests. Updated drawings (as built) must be provided to NTDC for verification at least seven business days before performing testing.

Once the NTDC determines the installations to be suitable to operate in parallel with NTDC Transmission System, both the Code Participant and NTDC representatives must sign and date the "Approval for Operation of the Facility" in, parallel with NTDC Transmission System. After this is done, the Code Participants facility is authorized to operate its System in parallel with the NTDC Transmission system.

PMC 2 METERING AND PROTECTION

PMC 2.1 Metering Coordination

a. Purpose

This section specifies the minimum technical, design and operational criteria for revenue metering, for the purpose of electricity sales and flow, which must be complied with by all Generators and other Users connected to or seeking connection with the electric Transmission System of DISCOs and/or National Transmission and Dispatch Company (NTDC).

For the purpose of settlement, electric energy (active and reactive) supplied and delivered at each defined metering point must be measured and recorded through metering equipment installed, operated and maintained under this Metering Code with the accuracy standards defined in this sub-code.

b. Location of Metering Points

Metering facilities would be installed at the substation for Point of Connection between the Users and the Transmission System of NTDC. Metering between the generator and the Transmission System of NTDC would be installed at the high voltage side of the Point of Connection. Metering between the Delivery Point to the User and the transmission network would be installed at the 132 kV, low side of the connection. Metering cabinet shall be installed inside the substation building. Revenue class instrument transformers as specified in IEC or IEEE Standards shall be installed at the substation as required.

Notwithstanding the above, the location of the Metering Point on each transformer shall be such that the cost of transformation losses shall always be with the Entity that owns the transformer.

c. **Application**

Metering shall provide accurate metering of electrical quantities delivered to or received from the NTDC Transmission System. Metering devices including all instrument transformers must have revenue class accuracy in accordance with the applicable NTDC Standards or IEC Standards as listed in PMC 2.1.f, for reference with options for measuring apparent energy, active and reactive energy, load demand, power factor, etc. that are required for billing, planning and engineering purposes. Metered quantities shall be remotely transmitted and recorded in the metering database at the computer systems of the System Operator/NTDC.

Metering shall be provided in a separate metering cabinet to be located in a control building. For new metering installations separate dedicated revenue class current (CT) and potential (PT) transformers shall be provided for revenue metering, and shall not be shared with protection system or check meter. For existing installation where instrument transformers are shared for metering and protection, a metering audit shall be performed to ascertain that no unacceptable error due to overload or instrument transformer saturation is introduced in the metering. If error introduced to revenue metering is unacceptable, new instrument transformers for metering shall be installed. CTs and PTs shall have a locking termination compartment that can be sealed. All wiring between the CTs and PTs shall be stranded copper wire, with PVC/polyethylene jacket. The metering cabinets shall be installed in rigid conduits. The metering cabinet shall be heavy gauge steel, primed and finished with gray finish, with locking door. A glass window shall be provided on the door to permit visual reading of the meter.

d. **Principles**

Metering facility shall be provided at the Point of Connections between Code Participants and NTDC to record energy and maximum power (Active and Reactive both) supplied to or delivered from the Transmission System of NTDC for the purposes of billing, engineering studies, and planning. Metering must provide accurate measurements of energy and power delivered at the Points of Connection between NTDC, Generators and other users. All metered electrical quantities, including time and date information shall be transmitted to the System Operator for processing, billing and settlement of accounts. Metering data shall be made available to Code Participants.

e. **Metering Requirements**

Metering will be installed by NTDC at a secured location in the substation where connection between the Generator or other Users and NTDC Transmission System is made. Metering and instruments transformers shall be installed in such a manner that they cannot be tampered with.

Each User/Code Participant shall provide and install the revenue meter at the connection location. Meter shall be the type and model approved by the NTDC. Meters and associated CTs and PTs shall comply with relevant IEC Standards listed in PMC 2.1.f., and/or applicable NTDC Standards.

The CTs and PTs shall be supported be required accuracy certificate from the manufacturer. The energy meter test shall be conducted or site jointly by NTDC and the respective Code participant.

NTDC shall be responsible for testing and maintenance of the meters, and shall have test and calibration facility, with necessary tools and instruments, for testing and calibration of meters and will be responsible for periodic testing and maintenance of the metering and ancillary equipment. All test equipment shall comply with IEC 60736 or applicable IEC Standards to be prescribed by NTDC. The User shall replace meter or other metering component that is found to be defective.

f. **Standards**

Protection/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 signalling.
- 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

g) **Performance Requirements**

Revenue metering and ancillary equipment must read energy and power (Active and Reactive) delivered to or received from the NTDC Transmission System, with an appropriate degree of accuracy specified in applicable IEC Standards, but not less than
+/- 0.2%. Revenue class metering shall have the following characteristics:

(i) Three elements four-wire configuration, electronic, digital, with accuracy class of 0.2 in accordance with IEC Standards for Grid Meters.

(ii) Meters shall be capable of measuring and recording active energy at 30 minutes intervals for a period of 70 days with intervals programmable from 5 minutes to 30 minutes.

(iii) The meter must have the capability of recording active and reactive power and energy and maximum Load Demand for the entire billing period. The meter-billing period may be programmable and capable of being programmed to automatically store the accumulated value and reset the counter for the next billing period.

(iv) Multiplier corresponding to the combination of CT and PT ratios may be programmable in the meter. Accuracy class of CT and PT shall be in accordance with NTDC technical specifications.

(v) Meters may be capable of time-of-use and seasonal applications. Meters shall have internal time clock for time and date stamping of data. Time clock must have high accuracy and synchronize to GPS time signals.

(vi) Meters may have capability for remote meter reading by telemetering or by SCADA. Communication ports should be provided with optical and serial data communication with industry standard protocol support.

(vii) Meter should have self-diagnostic capability and include an alarm to indicate failure and/or tampering.

h) **Installation**

Installation of revenue meter and ancillary equipment at the substation for the Point of connection shall be the Generator and other Code Participant/Users' responsibility. The Generators and other User connecting to the NTDC Transmission System shall submit to the NTDC 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 telemetering, 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. Access to the metering facility shall be accorded to NTDC personnel as per PMC 2.1.k.

i) **Telemetering (Data Collection System)**

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

(i) Apparent Energy

(ii) Real Energy

(iii) Energy (KWh or MWh) delivered to Load

(iv) Energy (KWh or MWh) received from Supply

(v) Reactive Energy (KVArh or MVArh)

(vi) Peak Demand MW or KW

(vii) Peak MVAr or kVAR Demand

(viii) Power Factor

(ix) Active and Reactive Energy Import and Export (MWh and MVARh)

Metering database is to be provided at the NTDC Headquarters or National Power Control Centre location. Database shall 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.

j) **Settlement of Account**

Discrepancy in meter reading arising from error introduced by the meter or saturation or defect in instrument transformers should be resolved by the Grid Code Review Panel. This may require an audit of the metering system to verify the accuracy of

the meter and instrument transformers. If problem with the meter and instrument transformer accuracy is detected, the reading will be adjusted as per agreed procedure between the Users/Code Participants and NTDC.

The User/Code Participant, at his option, may elect to install a check meter to verify the reading in the revenue meter at the Point of Connection. Instrument transformers for revenue meter must not be shared with check metering. Any check meters should have separate instrument transformers

All disputes regarding meter readings and settlement of accounts shall be presided over by NTDC in accordance with the provisions of the Commercial Code and Bulk Power Supply Agreements (to be developed later).

k) **Access**

Each User/Code Participant shall authorize each Code Participant, its employee, agents and sub-contractors 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 obligations under this sub-code.

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

Each User/Code participant shall ensure 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.

l) **Tamper and Revenue Protection**

Representatives of the NTDC and any other concerned Entity shall supervise meter installation. After completing the installation, the representatives of concerned Entity, NTDC as observers, shall lock and seal the meter and metering compartment.

m) **Testing and Calibration**

Meter audits shall be conducted periodically, on a schedule to be determined by the System Operator/NTDC and Code Participants/Users but not less than every two years, to verify meter accuracy and resolve disputes regarding meter reading. Meter audit may be performed by NTDC. Meter found to be

inaccurate would be removed for testing and calibration at the NTDC laboratory. NTDC laboratory shall have all the necessary equipment and devices to test and calibrate the different types and models of meters used.

Test and calibration of meters shall be in accordance with applicable IEC Standards listed in PMC 2.1.f, above. All test equipment for testing energy meters shall conform to IEC 60736, Testing Equipment for Electrical Energy Meters.

n) Metering and Reconciliation Agreements [to be provided as part of Commercial Code]

o) Right to access and use of distribution company's/ BPC's switchyard by NTDC.

NTDC shall have the right to enter a distribution company and BPC switchyards for the purpose of installing, checking, testing and maintaining metering and related equipment and wires. Distribution Companies and BPCs shall accommodate requests by the NTDC for access on demand, and shall not prevent NTDC from making unscheduled inspections on short notice.

PMC 2.2 **Protection Coordination**

a. **General**

The design of Inter-connection between any Generator; other Users and the NTDC Transmission System should be consistent with the Operation, Planning Standards and Protection Design Standards of NTDC, and the Standards laid down in this Grid Code. Apparatus for the protection of Generators, substation equipment and transmission lines from faults and overloads shall be provided at the Points of Connection. Both Primary and Secondary (back-up) protection schemes are to be provided to enhance system reliability. Design and settings of protection system shall be coordinated between the Users/Code Participants and NTDC. Settings of protective devices shall be reviewed periodically by NTDC to maintain consistency with operation, planning and protection design standards.

b. **Standards and Practices**

Protection devices shall conform to the applicable IEC Standards and prudent utility practices adopted by NTDC. Design of protection system at the Points of Connection shall be submitted by Users/Code Participants for review and approval of NTDC.

c. **Generator Protection**

Connection between a Generator and NTDC Transmission System must be controlled by a circuit breaker capable of interrupting the maximum short circuit current at the Point of Connection. The maximum short circuit current shall be specified by NTDC at the time of design based on most recent analyses.

Protection of Generators and their connections to the NTDC Transmission System must meet the minimum requirements delineated below (relay settings are to be reviewed by the System Operator/NTDC from time to time):

(i) For faults on the Generator's equipment directly connected to the NTDC Transmission System and for faults on the NTDC Transmission System directly connected to the Generator's equipment, fault clearance period from fault inception to circuit breaker arc extinction shall be set out in either Transmission Service or Connection Agreement, as the case may be. The time limit shall be according to the respective IEC Standards.

(ii) 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.

On the Generator connected to the NTDC Transmission System where only one primary or main protection is provided to clear fault on the high voltage Generator connections within the required fault clearance time, the secondary or back-up protection in the Generator shall operate within the limits provided in the respective IEC Standards. On the Generator connected to the NTDC Transmission System where two primary or main protections are provided, the secondary or back-up protection shall operate to give a total fault clearance, which is within the time limits provided in the respective IEC Standards.

Generator secondary or back up protection shall be required to withstand, without tripping, the loading incurred during clearance of a fault by a breaker fail protection on the NTDC Transmission System. Back-up protections in the Generator and NTDC Transmission System shall be coordinated to provide discrimination.

(i) Circuit breakers provided at the Points of Connection between the Generator and the NTDC Transmission System shall be provided with breaker fail protection. In the event the breaker failed to operate, the breaker fail protection shall initiate tripping of all the electrically adjacent circuit breakers within the time limits provided in the respective IEC Standards.

(ii) The target performance for 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.

(iii) The Generator shall have protection equipment, but not limited to the following:

- Protection of primary conductors from the current transformer at the line side of the circuit breaker to the Point of Connection.

- Circuit breaker fail protection equipment shall be provided at the Generator. A back-up trip signal shall be provided in the event of a main circuit breaker failure to trip the electrically adjacent breakers to clear the fault.

- Protection shall be provided to initiate a Generator trip when loss of excitation is detected.

- Pole slipping protection shall be provided with the generating units.

(iv) Protection system shall be designed to provide adequate protection of the Generator, substation apparatus and the Transmission System of NTDC.

d. <u>Substation Protection</u>

Connections between the NTDC Transmission and other Users/Code participants (DISCOs, BPC, etc.) substations must meet the minimum requirements delineated below:

(i) For faults on the User's substation equipment directly connected to the NTDC Transmission System and for faults on the NTDC Transmission System directly connected to the User's substation equipment, fault clearance period from fault inception to circuit breaker arc extinction shall be set out in the respective Transmission

Service or Connection Agreement as the case may be. The period specified shall be within the time limits specified in the respective IEC Standards.

Longer fault clearing times may be specified by NTDC/System Operator if permitted by protection and design criteria of NTDC.

(ii) In the event the primary or main protection system failed 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.
Code Participants/Users substations connected to the NTDC Transmission System where only one primary or main protection is provided to clear fault of the Points Connection within the required fault clearance time, the secondary or back-up shall operate to give a total fault clearance time as specified in the respective IEC Standards.

Substation secondary or back up protection will be required to withstand, without tripping, the loading incurred during clearance of a fault by a breaker fail protection on the NTDC Transmission System. Back-up protections in the substation and NTDC Transmission System shall be coordinated to provide discrimination.

(iii) Circuit breakers provided at the Points of Connection between the Code Participants/User's substation and the NTDC Transmission System shall be provided with breaker fail protection. In the event the breaker-failed to operate, the breaker-fail protection will initiate tripping of all the electrically adjacent circuit breakers within the time limits specified in the respective IEC Standards.

(iv) The following protection shall be provided at the substation:

- Bus bar protection
- Transformer protection
- Transmission line protection
- Lightning protection

(v) The target performance for 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 on the System.

e. **Fault Recording Equipment**

Equipment for recording fault condition and sequence of events shall be provided by the Code Participant/User at the Points of Connection. The recording equipment shall record a snapshot of the voltages and current during the fault, and sequence of events for evaluation and analysis of the fault. The fault recording equipment shall have facilities for the information via SCADA to the NTDC.

f. **SCADA**

The Users shall provide a Remote Terminal Unit (RTU) at the Points of Connection to monitor and control apparatus at the substation. At the Generator, a RTU shall be provided for monitoring and control (dispatch) of the Generators. The Users shall provide the communication link to the nearest communication node in the NTDC communication system for RTU communication with the NTDC SCADA System. The RTU shall have sufficient number of input and output points; and shall be fully compatible with the NTDC SCADA system. In addition, RTU provided by the Generator shall have facility of dispatching and loading the Generator from the NPCC Control Centre. The communication link shall be fully compatible with the NTDC communication system.

g. **Time Clock Synchronization**

Time clock in protection devices, recording equipment and SCADA shall have facilities for synchronizing time with geo-stationary positioning satellite (GPS). The User at the Points of Connection shall provide the required receiving and signal distribution equipment.

h. **Testing, Calibration and Maintenance**

NTDC shall carry out a thorough review of the entire protection system in their System and at the Points of Connection periodically. Adjustments or changes in relay settings shall be performed due to changes in the characteristics of the NTDC Transmission System. In addition, periodic testing, calibration and maintenance of the protection system for the NTDC Transmission System and Points of Connection shall be performed by NTDC. NTDC shall provide testing facility, test vehicle and test instruments for field and laboratory for the purpose of testing, calibration and maintenance of protection equipment. Cost of providing this service to Code Participants/ User shall be included in the tariff.

i **Substation direct current check.**

All Code Participants/Users shall co-operate with NTDC and the System Operator in the scheduling and performance of testing and periodic checks of the readiness and adequacy of direct current systems and facilities in their substations.

j) **Testing Frequency and Calibration**

Code Participants shall provide on an annual basis a schedule for testing for substation facilities in its substations. NTDC and the System Operator shall have the right to require additional testing, and to request recalibration of testing equipment.

k) **Testing Equipment Ownership**

Code Participants shall own and maintain, or contract with qualified testing companies, for the testing equipment required to perform tests.

l) **NTDC Right to Inspect**

NTDC shall have the right to inspect 132 kV substations and transmission lines that are connected to the Transmission System of NTDC, and which are owned by DISCOs, BPCs, SPTLs or any other Code Participant.

PMC 2.3 CONTROL AND SWITCHING COORDINATION

a. **General**

For the purpose of connecting and disconnecting a Generator and User's substation from the NTDC Transmission System, it is essential that the necessary equipment be provided. This equipment shall include, but not limited to the following:

(i) In conjunction with the protection system, circuit breakers shall be provided at the Point of Connection between the Code Participants/User and the NTDC Transmission System. 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.

(ii) Control panels for circuit breakers, disconnecting switches and protection system shall be provided at the Points of Connection. SCADA connections for monitoring

and control of circuit breakers, disconnecting switches, metering and protection devices.

(iii) 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.

(iv) Disconnecting switches shall be provided for isolating transformer 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.

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

(vi) Disconnecting and grounding switches shall be motor-operated to 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.

b. **Switching Procedures**

All switching activities performed at the Points of Connection shall be performed under the direction of the NTDC/System Operator. All other switching activities in the Code Participant/Users system shall be coordinated with the NTDC. Proper communication and tagging procedure shall be observed to prevent accidents and damage to equipment involved in the switching operation.

c. **Testing and Maintenance of Control Facilities**

Control and switching shall be scheduled periodically for testing and maintenance. Adjustments in protection system and control shall be made at this time if necessary. Equipment found to be defective would be repaired or replaced, accordingly. Testing and maintenance shall be coordinated with The System Operator/NTDC. Tests, calibration, repair and replacement of equipment shall be recorded and distributed to all concerned parties.

PMC 3 PROTECTION OF POWER SYSTEM EQUIPMENT

PMC 3.1 Introduction

Power system security shall depend greatly on the design of the protection system, as well as, proper coordination with the protective relay systems and settings in the User/Code Participant's Systems. As a minimum, a primary protection scheme and a back-up protection scheme shall be provided for each User/Code Participant's System. Code Participants/User shall provide protection systems for the following:

(a) 220 kV and 500 kV grid sub-station bus bars

(b) 220 kV and 500 kV transmission lines

(c) Transformers

(d) Generators

(e) Circuit breakers

(f) 132 kV distribution company substations, and BPC facilities where applicable

(g) 132 kV transmission lines

(h) Grid station auxiliary systems

PMC 3.2 Types of Protection

The following protective relaying schemes shall be provided for the following sub-systems:

(a) 220 kV and 500 kV sub-station bus bars

  (i) Bus differential relaying

  (ii) Lightning protection

  (iii) Additional protection for bus bars if needed

(b) (I) 500 kV Transmission Lines

  (i) Distance protection Set-I

  (ii) Distance protection Set-II

  (iii) Transfer trip

(iv) Line over current and earth fault protection

(v) Line auto re-closing scheme

(c) (II) 220 kV Transmission Lines

(i) Distance protection Set -I

(ii) Distance protection Set-II

(iii) Line overcurrent, and earth fault protection

(iv) Line auto re-closing scheme

(v) Transfer trip

(d) 500/220 kV AND 220/132 kV Transformers

(i) Transformer differential relays

(ii) Ground relays

(iii) Sudden pressure relays-Bucholtz relay

(iv) Temperature relays

(v) Under/over voltage relays

(vi) Over current relays

(vii) Over fluxing relay

(viii) Over load relay

(ix) Tertiary overcurrent relay

(x) REF relays

(e) Generators

(i) Generator differential relays

(ii) Over current relays

(iii) Over/under voltage relays

(iv) Loss of excitation relays

(v) Ground relays

(vi) Over/under frequency relays

(f) Circuit Breakers

(i) Breaker-fail relays

(ii) Transfer trip relays

(g) 132 kV DISCO substation

(i) Bus differential relays

(ii) Transformer differential relays

(iii) Overcurrent relays

(iv) Over and under voltage relays

(v) Breaker failure relays

(vi) Distance relays

(vii) Ground fault relays

(viii) Transfer trip relays

(ix) Over/under frequency relays

(x) Auto re-closing

NTDC shall install cross-tripping schemes in the eventuality of loss of a particular Generator or Power Plant or plant and/or transmission facility utilizing over/under frequency or voltage protection to protect System from Total or Partial Collapse.

PMC 3.3 **Instrument Transformers**

Current Transformers (CTs) and Potential Transformers (PTs) shall be furnished for the protection systems. CTs and PTs shall have the accuracy, ratio and burden ratings required to operate the protective relays. Instrument transformer for protective relaying shall not be shared with revenue metering equipment. Likewise, instrument transformers for revenue metering shall not be shared by protective relaying equipment.

PMC 3.4 **Shunt Reactor Protection**

The shunt reactors shall be protected from internal as well as external faults. Circuit breakers may be provided for shunt reactors to allow for disconnection of the shunt reactor if an internal fault occurs. If circuit breakers are not provided for each reactor then protective relaying on shunt reactors shall be used to trip associated line circuit breakers. Isolation switch shall be provided to allow isolation of shunt reactor and circuit breakers for maintenance. The following relays shall be provided for shunt reactor protection as a minimum:

(a) Differential relays

(b) Impedance relays

(c) Sudden Pressure Relays – Bucholtz relay

(d) Lightning protection

Protective relay settings shall be coordinated with the line and substation relays to prevent inadvertent and unwanted operations of protective relays.

PMC 3.5 **Relay Coordination**

Protective relays in the various sub-systems of the national power grid system must be coordinated to prevent unwanted tripping. Proper coordination of protection systems of the various sub-systems will enhance the security and safe operation of the system.

To facilitate proper protective relay coordination, relay coordination software shall be used by NTDC. Relay coordination should be checked and updated each time a User/Code Participant's system characteristics are changed, but in any case at least every five years.

Any changes in the User/Code Participant's system that affects the operation of the power system must be communicated to the NTDC immediately. The NTDC shall evaluate the impact of the changes to the protection of the power system, and initiate the necessary adjustments in the operation and/or changes in protective relay settings.

PMC 3.6 **Single Pole Tripping**

The line relaying system shall be arranged to allow for single pole tripping of selected 220 kV and 500 kV transmission lines. One-shot re-closing of the tripped line shall be allowed according to studies designed to establish the best re-closing time. If the tripped phase fails to re-close, all three phases will be tripped accordingly.

PMC 3.7 **Relay Testing and Maintenance**

Periodic testing of all protective relays shall be performed by NTDC/System Operator to ensure that all protective relays are in good operating condition, and are set properly. Relays found defective or with substandard design during the test must be repaired or replaced, accordingly. Circuit breakers and control circuits shall be tested periodically, and if parts are found to be defective or deficient, they should be repaired or replaced.

Protective relaying in the User/Code Participant's System shall be tested and calibrated annually to ensure that they are in good operating condition; and that the relay settings are correct. User/Code Participants may perform testing and maintenance of their protective relay under supervision of System Operator/NTDC, or request NTDC to perform testing and setting of their relays for a fee.

All testing and maintenance performed on the protection and control equipment, including those of the User/Code Participants, shall be recorded and a copy submitted to the NTDC for review and archiving. All test and maintenance records shall be kept for a period of 5 years.

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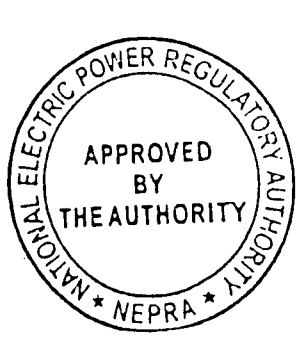

SCHEDULING AND DISPATCH CODE NO.1 (SDC 1)

GENERATION SCHEDULING

CONTENTS

SCHEDULING AND DISPATCH CODE NO.1

GENERATION SCHEDULING

SDC 1.1 **INTRODUCTION**

As a part of functions of the National Transmission and Dispatch Company (NTDC), Scheduling and Dispatch of generation is performed by the System Operator. The Generation Scheduling sub-code (SDC 1) defines the roles and responsibilities of the System Operator/NTDC and Code Participants in the scheduling of available generation facilities, and operation and management of a secure bulk power transmission system of NTDC.

The purpose of this sub-code is to set out the processes, guidelines, and procedures for: -

(a) Generation Scheduling

(b) Ancillary Services Scheduling and Dispatch

(c) Generator Outage Co-ordination

SDC 1.1.1 **Scheduling and Dispatch Code No. 1 ("SDC 1") sets out the Procedure for:**

(a) The daily Notification by a Generator to the System Operator of the Availability of any of its CDGUs in an Availability Notice;

(b) The daily Notification to the System Operator of whether there are any Parameters which differ from the Contracted Generation Scheduling and Dispatch Parameters (GSDPs) in respect of the following schedule day by each Generator in a GSDP Notice;

(c) Each Generator with CDGUs (Centrally Dispatched Generating Units), the daily Notification to the System Operator in respect of the next following Schedule Day in an Availability Notice of the MW Availability of each Generator with CDGUs;

(d) In the case of all Generators under Central Dispatch with PPA and/or PSODA as applicable, the submission to the System Operator of any revisions to fuel rates (or energy purchase prices, as the case may be) by such Generators as per the provisions of their PPA and/or PSODA as applicable.

(e) The issuance by the System Operator of a "Day Ahead Notification" on the day before the Schedule Day as a "Statement" of which of the Available Generators may be required for the next Schedule Day.

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(d) In the case of all Generators under Central Dispatch with PPA and/or PSODA as applicable, the submission to the System Operator of any revisions to fuel rates (or energy purchase prices, as the case may be) by such Generators as per the provisions of their PPA and/or PSODA as applicable.

(e) The issuance by the System Operator of a "Day Ahead Notification" on the day before the Schedule Day as a "Statement" of which of the Available Generators may be required for the next Schedule Day.

Provided that the System Operator, in the process of Scheduling and Dispatch of generation facilities shall have the following consideration:
All the information contained in Appendices A-G of SDC 1 needs to be provided by all the CDGUs, which are declaring their Availability for the next Schedule Day.

SDC 1.1.2 The System Operator shall take into account the impact/effects of power transfers across any External Interconnection when preparing its Generation Schedule (including taking into account the cost of any such transfers when compiling the "Generation Schedule"); and any power transfers across the NTDC's Transmission System.

SDC 1.1.3

(a) This sub-code (SDC 1) requires that each Generator under Central Dispatch to submit an Availability Notice, the form of which is set out in, Appendix B, which needs to be submitted in writing or through telephone; and the required information is to be submitted in full in such a notice.

(b) The notice, if given through telephone, must then be confirmed by facsimile and in writing as soon as possible thereafter (and in any event be sent to the System Operator within 2 hours). Where a facsimile and written notice are so sent by way of confirmation, each notice shall state clearly that it is in confirmation of a notice already given by telephone and must state the exact time at which the notice was given by telephone.

SDC 1.1.4 In this SDC 1, the term "Notice Submission Time" shall mean, 10.00 a.m.

SDC 1.1.5 For the purposes of this SDC 1, any reference to the fuel used for a CDGU shall, in the case of a PPA CDGU (regardless of the entity it is contracting with) be construed as a reference to the Designated Fuel.

SDC 1.2 **OBJECTIVE**

To enable the System Operator to prepare a "Generation Schedule" (utilising, amongst other things, a Merit Order) to be used in the Scheduling and Dispatch process, and thereby to ensuring (as far as possible): -

(a) the integrity of the NTDC System;

(b) the security and quality of supply;

(c) compliance with emissions requirements if any; and

(d) that there is sufficient generation capacity to meet total demand at all times together with an appropriate Reserve Margin (Sum of Operating and Contingency Reserve).

The purpose of this sub-code is also to enable the System Operator to prepare and issue the "Day-ahead Notification".

SDC 1.3 **SCOPE**

SDC 1 applies to NTDC and to all the Generators under Central Dispatch with regard to their Generating Plants.

SDC 1.4 **PROCEDURE**

SDC 1.4.1 **Availability Notice**

SDC 1.4.1.1.a

(a) Each Generator including those at a Power Station with multiple Generating Units shall, by no later than the notice submission time each Schedule Day, notify the System Operator by means of an Availability Notice, in the form set out in Appendix B to this SDC 1 or in such other form as the System Operator/NTDC may specify with the approval of NEPRA, notify to each Generator, from time to time, the Availability of each of its CDGUs.

(b) The Availability Notice shall state the Availability of the relevant CDGU for each period in the following Schedule Day (subject to revision under SDC 1.4.2.5(a)).

SDC 1.4.1.1.b In the case where a PPA CDGU (with/without PSODA) is capable of firing on different fuels, then the Generator must submit an Availability Notice in respect of each Designated Fuel for the CDGU, each containing the information set out in SDC 1.4.1.1.a above for each Designated Fuel and each marked clearly to indicate for which Designated Fuel the Availability Notice applies to.

SDC 1.4.1.1.c

(a) Notwithstanding that a CDGU has been declared unavailable, the Generator shall submit all the information that it would have submitted under this SDC 1 had the CDGU been declared Available.

(b) The System Operator shall use its reasonable endeavours to seek uniform treatment in terms of availability of Gas turbines for start-up purposes with due regard to their PPA and/or PSODA conditions as applicable.

SDC 1.4.1.1.d

(a) In relation to gas turbine PPA CDGUs (the Availability of which varies according to ambient temperature), an Availability Notice submitted by a Generator to NTDC for the purposes of declaring the level of Availability of such CDGU must state the Availability at an ambient temperature of 15°C.

(b) The Availability shall be deemed to be declared for all ambient temperatures by reference to the level of Contracted Capacity for

a PPA CDGU as specified in the relevant Schedule to their Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) adjusted by the temperature correction factor set out in the relevant schedule of the relevant Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) by applying that absolute MW value.

(c) In relation to gas turbine PPA CDGUs, the term "Availability" shall be construed accordingly.

SDC 14.1.1.e In relation to any steam turbine PPA CDGU (with/without PSODA) at a power plant which is capable of firing both on gas (which may include a mixture of gas and oil) and on oil, the System Operator may, in respect of any settlement period (and/or successive settlement periods) give notice (an "Overburn Notice") to the relevant Generator with as much notice as possible and in any event (except in the circumstances specified in (c) below) not less than 24 hours before the start of such settlement period (or the first such period) with the following effect and subject as follows:

(a) the Contracted Capacity (Gas) shall thereby be increased to Overburn Contracted Capacity in respect of such settlement period (or periods) following which the Generator shall re-declare the Availability of the CDGU in an Availability Notice (and, for the avoidance of doubt, such increase shall only apply for the settlement periods specified in the Overburn Notice);

(b) the aggregate number of settlement periods in any period of 24 hours and in any period of 12 months for which Overburn Notices may be given shall be no greater than the limits set out in the respective Schedule of the relevant Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) as applicable;

(c) NTDC shall waive the rebate of Availability Payments for late declaration of Availability under relevant schedule to the relevant Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) as applicable if the Overburn Notice is issued by NTDC less than 24 hours in advance of the start of the relevant settlement period.

SDC 1.4.1.1.f

(i) The Availability Notice issued by the Generator at a Power Plant where CDGUs can be operated singly or in pairs, in accordance with SDC 1.4.1.1(a) shall, in addition to the information required by SDC 1.4.1.1(a), state the CDGUs, that have been declared to be Available for the next following Schedule Day, shall be operated in pairs; and which CDGUs shall be singly operated. For this purpose;

The Generator may change the pairing of its CDGU Generators in consultation with the System Operator.

SDC 1.4.1.2 **Availability of Generating Plant**

(a) Each Generator under Central Dispatch Power Station with multiple Generating Units shall, subject to the terms and conditions of the relevant Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) throughout the term of the Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) relating to a particular CDGU, maintain, repair, operate and fuel its CDGU as required by Prudent Operating Practices and any legal requirements with a view to providing the power delivery, system support services, Contracted Capacity, and the Contracted GSDPs.

(b) All the Generators under Central Dispatch Power Station with multiple Generating Units shall use all reasonable endeavours to ensure that it does not at any time declare by issuing or allowing to remain outstanding an Availability Notice, or a GSDP Notice which declares the Availability or GSDPs of the CDGU at levels or values different from those that the CDGU could achieve at the relevant time under its Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) with NTDC as applicable except under unavoidable circumstances with the prior consent of the System Operator.

(c) Provided that nothing contained in this Grid Code shall require the Generator to declare levels or values better than the Contracted Capacity and the Contracted GSDPs in respect of a PPA CDGU.

SDC 1.4.1.3 If at any time when the Availability of a CDGU is zero, an Availability Notice shall be given increasing the Availability of the CDGU with effect from a specified time, such Notice shall (in the case of a steam turbine CDGU) be construed as meaning that the CDGU is capable of being synchronised with the NTDC's System at that specified time or, (in the case of a gas turbine PPA CDGU), capable of being started at that specified time. A dispatch instruction issued by the System Operator to synchronise the CDGU to the NTDC's System or, as the case may be, start the CDGU, at or after the specified time shall be a valid dispatch instruction (regardless of the minimum time to synchronise specified in the GSDPs).

SDC 1.4.1.4 If at any time when a CDGU is synchronised with the NTDC's System, the Generator issues an Availability Notice increasing the level of Availability of the CDGU from a specified time, such notice shall be construed as meaning that the CDGU is capable of being dispatched to increase generation to levels greater than the previously prevailing level of Availability up to the level specified in the new Availability Notice but commensurate with the maximum loading rate declared for the CDGU as a GSDP from the specified time.

SDC 1.4.1.5 If at any time when a CDGU is synchronised with the NTDC's System, the Generator issues an Availability Notice decreasing the level of Availability of the CDGU from a specified time, such Notice shall be construed as meaning that the CDGU is capable of maintaining output at the level of the prevailing Availability until the time specified in the Notice and thereafter, shall be capable of maintaining output to the level which would have been achieved if a dispatch instruction had been given to de-load, with effect from the specified time, at the maximum de-loading rate declared for the CDGU in the GSDP Notice at such time down to the level of Availability specified in the new Availability Notice.

SDC 1.4.2 **GENERATION DISPATCH METHODOLOGY**

SDC 1.4.2.1 **GSDPs Revisions**

Any revisions to the Contracted GSDPs during Real Time Operations must be well documented and agreed to with the System Operator including the nature and quantification of the revision, duration of such revision, reason for the revision, and anticipated time when the Generator shall be back to its Contracted GSDP values.

(a) (i) By no later than the notice submission time each Schedule Day, each Generator shall in respect of each of its CDGU that has been declared Available in an Availability Notice submit to the System Operator in a revised GSDP Notice, in the form set out in Appendix C to this SDC 1 or in such other form as the System Operator may notify to each Generator from time to time.

(ii) In the case of a PPA CDGU (with/without PSODA), any revisions to the GSDPs compared with the Contracted GSDPs to apply for the next following schedule day in the form set out in Appendix C to this SDC 1 or in such other form as NTDC may specify from time to time.

(b) In the case of any revision to the GSDPs, as to which the Generator should, acting in accordance with prudent operating practices, have some flexibility either in the revision itself or in the time-frame in which the revision is to take place, the System Operator may, acting reasonably, suggest an amended revision to the Generator (including a statement to provide that there shall be no further revision) and/or an amended time at which the revision is to take effect. Insofar as the System Operator is able to do so without breaching any obligations regarding confidentiality contained either in the NTDC's Licence or in any Agreement, the System Operator shall notify the Generator of the reasons for such amended revision request in such degree of detail as the System Operator considers reasonable under the circumstances. If the Generator agrees to such suggestion of the System Operator (such Agreement not to be unreasonably withheld by either Entity), the Generator shall use reasonable

endeavours to accommodate such suggestion, and submit a revised GSDP Notice accordingly. In any event, the System Operator may require such further information on the revision as is reasonable, and the Generator must give the System Operator such information as soon as possible. None of the revisions to the GSDPs shall be in violation of the terms of the specific PPA Agreements with NTDC. Financial impacts of such deviations or revisions in the Contracted GSDPs shall be assessed by the NTDC/System Operator, and communicated with the Generator.

The methodology of calculating the financial impacts of GSDPs revisions requested by the Generator shall be sufficiently detailed in the approved Commercial Code.

(c) In the case where a CDGU is capable of firing on different fuels, then the Generator must submit a GSDP Notice in respect of each Designated Fuel for the CDGU (or fuel in the case of an Externally-connected CDGU), each containing the information set out in (a) above for each Designated Fuel (or each fuel) and each marked clearly to indicate to which Designated Fuel (or fuel) it applies to.

(d) A Generator must notify NTDC in writing in the form set out in Appendix C of this SDC 1 as soon as it becomes aware, acting in accordance with prudent operating practices, if (whether due to a defect in the CDGU or in its associated Power Plant equipment) any of its CDGUs is unable to meet the Spinning Reserve capability set out [in the case of a PPA CDGU (with/without PSODA)] in the Sustained Load Diagram attached to relevant Schedule of the Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) as applicable, and submitted pursuant to the Planning Code or Connection Code or in the relevant applicable documents.

Such notification must be made by submitting a GSDP Revision Notice (Appendix C) in relation to item 2(c) of Appendix A to this SDC 1. In accordance with the Generator's obligations under SDC 1.4.1.2(b), such reserve characteristics may only be amended (with the System Operator's consent) in the event of a defect in or failure of a CDGU or any associated Power Plant equipment. Such amendment shall only take place so long as it takes place in accordance with Prudent Operating Practices, legal requirements of the Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) as applicable for the relevant CDGU or associated Power Plant equipment to be repaired; and such repair must re-instate the Spinning Reserve capability to its level stated in the GSDPs or to such other level as the System Operator may propose acting in accordance with prudent operating practices, and agree, taking into account the provisions of SDC 1.4.1.2(a), and the Generator must then submit a GSDP Revision Notice re-declaring its re-

instated Spinning Reserve capability accordingly. The Generator must specify to the System Operator of the nature of any such defect or its failure; and of the Generator's best estimate, acting as a reasonable and prudent Generator of the time it shall take to complete the repair and restore the reserve characteristics to their former Contracted levels.

SDC 1.4.2.2 **Other Generation Relevant Data**

(a) By no later than the notice submission time each Schedule Day, each Generator shall in respect of each CDGU which has been declared Available in an Availability Notice under SDC 1.4.1.1 in respect of the following Schedule Day submit to the System Operator in writing (in the form set out in Appendix B to this SDC1 or in such other form as the System Operator may notify to each Generator from time to time) details in relation to the following Schedule Day of any "newly arisen special factors" which in the reasonable opinion of the Generator may have a material effect on the likely output of its Generating Unit. The notice must be consistent with the Generator's obligations under the provisions of SDC 1.4.1.2(b).

(b) In the case where a CDGU is capable of firing on different fuels, the Generator must submit details in respect of each Designated Fuel for the CDGU, each containing the information set out in (a) above for each Designated Fuel, and each marked clearly to indicate to which Designated Fuel (or fuel) it applies to.

SDC 1.4.2.3 **Fuel Rate**

(a) The generation or energy purchase prices including any revisions to the energy purchase prices for a PPA CDGU in respect of the week beginning on the Schedule Day falling on the next following Monday shall be deemed to be submitted by that Generator by the notice submission time each Tuesday.

(b) In so far as not revised or if the fuel rate in the energy bid price notice is higher than that deemed to have been submitted under (a) above, the most recently submitted generation or energy prices shall apply for the relevant week.

Supplemental Energy Bid

(a) Each Generator may in respect of each Generator each day prior to the notice submission time submit to the System Operator a supplemental energy bid, if any, in accordance with the approved commercial arrangements as per the provisions of the approved Commercial Code.

Excess Output

(a) Each Generator may in respect of each PPA CDGU (with/without PSODA) on each day prior to the notice submission time submit to the NTDC a set of generation or energy prices consistent with its PPA in respect of the following Schedule Day in relation to output over and above the Contracted Capacity for the relevant Declared Fuel or Designated Fuel.

Unit Nominations

(b) Each Generator shall a day prior to the notice submission time submit to the System Operator a Unit Nomination in accordance with approved commercial arrangements as specified in the approved Commercial Code.

(c) Before the notice submission time for each schedule day, each Generator must give the System Operator the information referred to in paragraph (c) below. The information must be in the form set out in Appendix G to this SDC 1 or such other form as the System Operator may specify from time to time. All Unit Nominations are assumed to be expressed as "Generator Sent Out Energy", and it is the responsibility of the Generators concerned to take that into account when submitting Unit Nominations.

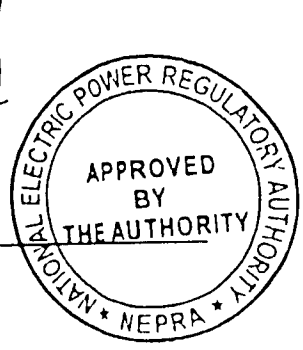
(d) Each Generator must notify the System Operator of the number of kWh of active electric energy each of its Generating Units wants to deliver to the NTDC's System as power supply by the Generator for each settlement period during the Schedule Day. Unit Nominations must include:

(i) If requested by the System Operator, specify the number of kWh of energy being supplied to each User;

(ii) Be in whole numbers of kWh.

(e) When converted into MW at the generator terminals, the Unit Nomination for a particular Generator for a given settlement period must not exceed the Availability of the Generating Unit for that settlement period.

(f) Unit Nomination of a Generating Unit for a given settlement period must not be less than minimum generation of that particular Generator.



SDC 1.4.2.4 **Generating Unit Works Units**

Once per week, on a day and time specified by the System Operator from time to time but not less than two (2) hours before the occurrence of maintenance outage, each Generator must, in respect of each of its Power Plants, unless the data is supplied in some other agreed and approved form, submit to the System Operator, in writing, details of the Generating Unit Works Units for that Power Plant consumed by that Power Plant since the last submission under this SDC 1.4.2.4, together with such other information as the System Operator may require in order to calculate the Generating Unit Works Units consumed by each CDGU at that Power Plant.

SDC 1.4.2.5 **Further Revisions**

(a) A Generator Power Station with multiple Generating Units may make revisions to the Availability Notice submitted to the System Operator under SDC 1.4.1.1 at any time after submission of the Availability Notice in accordance with its obligations under SDC 1.4.1.2(b) by submission of a revised Availability Notice which shall be in the form set out in Appendix D - F to this SDC 1 or in such other form as the System Operator may reasonably notify to each Generator from time to time. In the event that the Generator submits a maintenance outage notice under OC4 or NTDC submits a post-event notice under OC12 in relation to any part of the period covered by the Availability Notice at any time after submission of the Availability Notice, the Generator shall be deemed to have submitted a revised Availability Notice consistent with such Outage Notice or post event notice, as the case may be. However, in the case where the Outage Notice is not issued immediately and does not specify the reduced Availability, the Generator must, as soon as possible, submit a revised Availability Notice reflecting its reduced Availability. The System Operator shall, insofar as it is reasonably possible, take account of such revisions in the preparation of its "Generation Schedule".

(b) If any of the data submitted to the System Operator under SDC 1.4.2.1 and SDC 1.4.2.2 changes, a Generator must (in the case of data submitted under SDC 1.4.2.1 by means of a GSDP Notice) make revisions to such data and must notify the System Operator of any revisions to any previously revised data by submitting another Revised GSDP Notice (in the form set out in Appendix C to this SDC 1 or in such other form as the System Operator may reasonably notify to each Generator from time to time) and must notify the System Operator of any Other Generation Relevant Data of which it becomes aware at any time after any original submission in writing. The System Operator shall, insofar as it is reasonably possible, take account of such revisions or notifications. The provisions of SDC 1.4.2.1(b) shall

apply to revisions under this paragraph to data submitted under SDC 1.4.2.1 and SDC 1.4.2.2.

SDC 1.4.2.6 (a) (i) Insofar as any data submitted or deemed to have been submitted on any particular day in any Availability Notice, GSDP Notice, or Notice of Other Generation Relevant Data or any revision thereto is inconsistent with any other data in any other such notice, then the most recently submitted data which, if substituted for the inconsistent data, would make the data in such notices consistent, shall apply for the next following Schedule Day.

(ii) Insofar as an Availability Notice is not submitted, the Generator shall be deemed to have submitted an Availability Notice by the notice submission time stating that the Availability of the relevant CDGU for the whole of the following Schedule Day shall be the level of Availability declared in respect of the final settlement period of the current Schedule Day.

(iii) Insofar as not revised, the most recent GSDP Notice to have been submitted shall apply for the next following Schedule Day.

(iv) Insofar as not revised, the most recent GSDP Notice relating to Other Generation Relevant Data to have been submitted shall apply for the next following schedule day.

(b) As a general requirement, the Generator must ensure that the data in any Availability Notice, GSDP Notice, or Notice of any Other Generation Relevant Data or any revision thereto is consistent with its obligations under SDC 1.4.1.2(b) and the Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA) with NTDC.

SDC 1.4.2.7 **Additional Supply Data**

The following procedures shall be followed to allow the System Operator to develop a daily "Schedule" for dispatching:

(a) Sixty days prior to 1 April of each year, all bilateral contracts shall be submitted to NEPRA, NTDC, CRPEA and the System Operator for review and approval.

(b) On or before 1 April of each year, all Generators, including Hydel and Nuclear shall submit a declaration of Availability to the System Operator covering a period of next one year.

(c) Demand-side Users (distribution companies and BPCs) shall submit a daily energy purchase requirement on an hourly basis. The NTDC shall calculate, and issue NTDC transmission line

losses for billing after-the-fact as per the provisions of the approved Commercial Code.

SDC 1.4.3 **Compilation of the Generation Schedule**

SDC 1.4.3.1 A Generation Schedule shall be compiled daily by the System Operator as an "Internal Statement" of which CDGUs and/or power transfer across any External Interconnection may be required for the next following Schedule Day.

SDC 1.4.3.2 **Merit Order**

Subject as provided below, a Merit Order shall be developed/compiled for each schedule day from the Incremental Price and the No-Load Price (which together, in relation to a particular Designated Fuel or Declared Fuel, as the case may be, shall be known as the "Merit Order Price Set"), which is applicable on the basis of ascending prices so that the CDGU at the head of the Merit Order shall be that CDGU which has the lowest Incremental Price per MWh or KwH; and that at the foot of the Merit Order shall be that CDGU which has the highest Incremental Price per MWh or KwH while taking account of average CDGU output and Generating Unit Works Units based on the information supplied by each Generator in SDC 1.4.1 through SDC1.4.2.6.
Once compiled, the Merit Order shall be used, subject as provided in this SDC 1, to determine which CDGU is to be scheduled and dispatched.

If there is more than one Merit Order Price Set offered, then the CDGU shall appear in the Merit Order for each Merit Order Price Set submitted.

SDC 1.4.3.3 In compiling the "Final Generation Schedule", the System Operator shall take account of, and give due regard and weightage to the following factors:

(a) NTDC's Transmission system constraints from time to time, as determined by the System Operator;

(b) The level of generation output covered by Unit Nominations;

(c) In respect of CDGUs, the values of their Contracted GSDPs registered under this SDC 1 and other information submitted under SDC 1.4.2.1 and SDC 1.4.2.2.

(d) The Start-up Price of each CDGU;

(e) The requirements, as determined by the System Operator for voltage control and MVAr reactive reserves:

(i) CDGU stability, as determined by NTDC;

(ii) In respect of CDGUs, with lower emission level;

(iii) Other matters to enable NTDC to meet its Licence standards and obligations;

(f) The need to provide the required Operating Margin by using the various categories of Reserve as specified in OC4 and OC5), as determined by the System Operator;

(g) The requirements, as determined by the System Operator for maintaining Frequency Control;

(h) Monitoring, testing and/or investigations to be carried out, or being carried out, under OC12; testing to be carried out, or being carried out, at the request of a User under OC11.2 and/or commissioning/acceptance testing prior to connection or re-connection or commissioning under the Connection Code of Grid Code;

(i) System tests being carried out or to be carried out under OC11;

(j) Any "Take or Pay" contract for the purchase of fuel to which a Generator is a party, and the terms of which have been agreed to by the NTDC and which impacts the NTDC's System, and/or the terms of any other contract to which NTDC is a party of, and which may, in its opinion be relevant;

(k) Operation of Generating Plant over periods of low demand to provide, in the System Operator's view-point, a sufficient Minimum Demand Regulation (MDR);

(l) The need for a Generator to comply with requirements in respect of emissions in relation to a Generator's Power Plant which contains PPA CDGUs;

(m) The inability of any CDGU to meet its full Spinning Reserve capability; and

(n) The availability and cost of power transfers across any External Interconnection.

SDC 1.4.3.4 Taking into account of and applying the factors referred to in SDC 1.4.3.3 above, the "Final Generation Schedule" shall be compiled by the System Operator to Schedule such CDGUs which have been declared Available in an Availability Notice, and are the subject of a Unit Nomination, and power transfers across any External Interconnection:

(a) The System Operator shall ensure that all CDGUs are Scheduled in accordance with their Unit Nominations;

(b) In accordance with the Merit Order, starting with the least-cost CDGU at the head of the Merit Order; and taking into account the cost of power transfers across any External Interconnection;

(c) As shall in aggregate (after taking into account power delivered other than from CDGUs) be sufficient to match at all times (to the extent possible having due regard to the Availability of CDGUs and to the availability of power transfers across any External interconnection) the forecasted NTDC's total system demand (derived as specified in OC 2.4) together with such Operating Margin as specified in OC 5.; and

(d) As shall in aggregate be sufficient to match minimum system demand levels together with sufficient Minimum Demand Regulation.

Due to taking into account of and application of the factors stated in SDC 1.4.3.3 shall mean that, in general, the strict Merit Order as stated in SDC 1.4.3.2 may not necessarily be the final outcome in the shape of "Final Generation Schedule".

SDC 1.4.3.5 After the completion of the scheduling process, but before the issuance of Day-ahead Notification, the System Operator may consider it necessary to make adjustments to the output of the scheduling process. Such adjustments may be required to be necessary due to any of the following factors:

(a) Changes in Availability and/or GSDPs of CDGUs notified to the System Operator after the commencement of the scheduling process;

(b) Changes to NTDC load demand forecast(s);

(c) Changes to NTDC's system constraints emerging from the iterative process of scheduling and network security assessment;

(d) Changes to CDGU requirements following Notification to NTDC of the changes in the capacity of a Generator to provide a special action as described in SDC 2;

(e) Changes to CDGU requirements within constrained groups, following re-appraisal of NTDC load demand forecasts within that constrained group;

(f) Changes to any conditions, which in the reasonable opinion of the System Operator, which would impose increased risk to the NTDC's System, and would therefore require the System Operator to increase Operating Margin;

(g) Unpredicted NTDC's Transmission System (Transmission and Grid) Outages, and Outages on 132 kV transmission lines connecting power stations, which places more than the equivalent of one large CDGU at risk to a secured fault;

(i) Unpredicted Outage of a Generating Plant equipment which imposes increased risk to the plant output;

(ii) Volatile weather conditions giving rise to low confidence in the System Operator's load demand forecasts;

(iii) Severe weather conditions imposing high risk to the total NTDC's system demand; and

(h) Any known or anticipated limitations and/or deficiencies of the System Operator's process of scheduling of generating and transmission facilities.

(i) Unexpected Outages on major 132/66 kV transmission facilities of distribution companies.

(j) Unexpected Outages of large Embedded Generators connected to the distribution company's Systems after the commencement of scheduling process.

SDC 1.4.3.6 When:

(a) Adverse weather is anticipated;

(b) There is a high risk to the whole or part of the NTDC's System;
(c) Load demand management and control has been instructed by the System Operator;

(d) A Total or Partial Shutdown exists;

These factors can result in a CDGU being chosen "other than in accordance with the Merit Order" to a greater degree than would be the case when merely taking into account and giving due regard & weightage to the factors listed in SDC 1.4.3.3 in order to seek to maintain the integrity, security, and adequacy of the NTDC's System.

SDC 1.4.3.7 (a) The synchronising and de-synchronising times shown in the Day Ahead Notification are Indicative only; and it should be borne in mind by all the Generators that the actual dispatch instructions may reflect more or different CDGU requirements than in the Day Ahead Notification, although they should (subject to SDC 2) reflect Unit Nominations. The System Operator may issue dispatch instructions in respect of a CDGU which may not have been declared "Wholly Unavailable" in an Availability Notice. The Generators with CDGUs must ensure that their Generating Units are available, able and ready to be synchronised at the times scheduled but only if so dispatched by the NTDC by issue of a dispatch instruction. The Generators shall, as part of a revision to the GSDPs, indicate to the System Operator the earliest time at which a dispatch instruction is required to meet the scheduled synchronising time.

SDC 1.4.3.8 **Content of Day Ahead Notification**

The information contained in the Day Ahead Notification shall indicate, on an individual CDGU basis, the period, MW loading and Declared Fuel for which it is scheduled during the following Schedule Day. In the case of a CDGU which is capable of firing on two different Designated Fuels, it shall also indicate the Designated Fuel for which it is scheduled during the following Schedule Day. If no declared fuel and/or, where relevant, designated fuel is contained in the Day Ahead Notification, then the most recently specified declared fuel and/or, where relevant, designated fuel shall be treated as having been indicated.

SDC 1.4.3.9 **Issue of Day Ahead Notification**

(a) The Day Ahead Notification shall be issued in writing to the Generators by 1700 hours each day, provided that all the necessary information from the Generators has been made available by no later than the notice submission time. However, if on any occasion, the System Operator is unable to meet this time, NTDC reserves the right to extend this time scale for the issuance of Day Ahead Notification to the extent necessary.

SDC 1.4.3.10 The Day Ahead Notification received by each Generator shall contain information relating to its CDGUs only.

SDC 1.4.3.11 **Minimum Demand Regulation (MDR)**

It is a requirement for running the NTDC's System that all synchronised CDGUs must, at all times, be capable of reducing output necessary to allow a sufficient regulating Operating Margin for adequate Frequency Control. The System Operator shall monitor the output data of the "Final Generation Schedule" against forecasted total system load demand to see whether the level of MDR for any particular period is insufficient, and may take any shortfall into account in the scheduling and dispatch process.

SDC 1.4.3.12 **Data Requirements**

Appendix A sets out the GSDPs for which values are to be supplied by a Generator in respect of each of its CDGUs by no later than the notice submission time on the day prior to the Schedule Day.

SDC 1.4.3.13 **Verification of Contract Fulfilment**

The NTDC shall be responsible for the enforcement of the PSODA with the Generators. The NTDC shall also be responsible for the verification of contract fulfillment for the purpose of account settlement. The System Operator shall prepare a report of all dispatch transactions with the exact time and amount of power delivered to the network; and amount of power delivered to the Code Participants and other Users. A

separate report shall be prepared by the System Operator for the ancillary services provided to the NTDC Transmission System.

For the purpose of Verification, the NTDC shall provide accurate active and reactive power measuring instruments at the Points of Connection between NTDC and Code Participants. For billing purposes and account settlement, the NTDC shall provide revenue metering at the Points of Connection, as specified in the Protection and Metering Code. The information shall be collected by the NTDC SCADA System and communicated to the NTDC/ System Operator/ as appropriate.

The System Operator has the sole authority to Schedule and Dispatch generation, manage and discipline a secure and safe operation of the NTDC's Transmission System. The Code Participants who are contracted to supply generation power supplies must comply with the dispatch instructions of the System Operator, in totality, regardless of their circumstances or prevailing conditions. Any Failure of Code Participant to comply with dispatch instructions of the System Operator shall be subject to penalties, in accordance with the provisions of the Grid Code under Code Management sub-code.

NTDC shall oversee compliance and impose penalties, if necessary. NEPRA shall consider failure to comply with the System Operator's dispatch instruction as an infraction to the Power Purchase Agreement (PPA) and/or Power Station Operation & Dispatch Agreement (PSODA), and shall use the available information to evaluate continued eligibility of respective NEPRA licence of the Code Participant/User of NTDC's Transmission System.

NTDC/System Operator shall notify the Code Participant, Review Panel, and NEPRA of each infraction not agreed to by the offending Code Participant/User in writing, immediately. If there is a justified cause for the infraction, the Code Participant must reply in writing to SO Review Panel, and NEPRA within seven (7) days after receiving the infraction notice. Review Panel/NEPRA shall review justification submitted by the offending Code Participant within seven (7) days from the receipt of the letter of justification. Review Panel/NEPRA shall accept or reject the justification and issue their final adjudication including imposition of penalties, if any.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY
NEPRA

APPENDIX A

(SCHEDULING AND DISPATCH CODE 1)

Generation Scheduling and Dispatch Parameters (GSDPs)

A. For each CDGU:-

1. (a) in the case of steam turbine CDGUs, synchronising times for the various levels of warmth;

   (b) in the case of gas turbine CDGUs, the time from initiation of a start to achieving dispatched load.

2. Basic data:

   (a) Minimum Generation in MW;

   (b) Governor Droop (%);

   (c) Sustained Response Capability.

3. Two shifting limitation (limitation on the number of Start-ups per schedule day);

4. Minimum on time;

5. Block load following synchronisation in MW;

6. Maximum loading rates for the various levels of warmth and for up to two output ranges.

7. Maximum de-loading rates for up to two output ranges;

8. The MW and MVAr capability limits within which the CDGU is able to operate as shown in the relevant Generator Performance Chart;

9. Maximum number of changes to the dispatched fuel per 24 hour period;

10. Maximum quantity of oil in "ready-use tank(s)" and associated pipe work;

11. Maximum number of changes to the designated fuel per 24 hour period;

12. Minimum notice to change the designated fuel;

13. Maximum number of on load cycles per 24 hour period, together with the maximum load increases involved; and

14. Settings of the Unit Load Controller for each CDGU for which a Unit Load Controller is required under CC7.5.5.

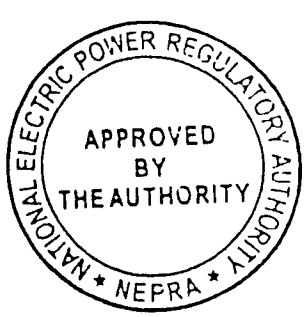
15. in the case of gas turbine CDGUs only, the declared peak capacity.

In the case of a Gas Turbine Unit, only the data applicable to Gas Turbine Units should be supplied.

B. For the Power Plant of which the CDGU forms part:-

1. Time between synchronising different CDGUs in a power plant taking account of actual off-load periods for the various levels of warmth; and

2. Time between de-synchronising different CDGUs in a Power Plant.



APPENDIX B

(SCHEDULING AND DISPATCH CODE 1)

FACSIMILE

TO : NTDC Control Centre, xxxxxxxxxx,xxxxxxxxxxxx
FAX :
FROM :

[ ] POWER PLANT - DAILY SCHEDULING NOTICES

1. AVAILABILITY NOTICE
The availability of each CDGU at [ ] Power plant for the schedule day to which this notice refers is shown on page 2 attached.

2. ENERGY BID PRICE NOTICE (Rs/MWHr - enter bid price where appropriate)
[Power Limited] offers NTDC the following energy prices (which are lower than the contracted prices) for the Schedule Day to which this notice refers.

[Fuel] [Fuel]

[Fuel] [Fuel]

[Fuel]

3. GSDP NOTICE

The Generation Scheduling and Dispatch Parameters for each CDGU at [ ] Power Plant for the Schedule Day to which this notice refers are as given in Schedule 1 of the relevant Power Purchase Agreement (PPA) or Power Station Operation & Dispatch Agreement (PSODA)

YES / NO (Delete as appropriate)

(If NO, each GSDP which varies from Schedule 1 must be shown on page 3 attached.
If YES, page 3 shall be omitted)

4. OTHER GENERATION RELEVANT DATA

5 DECLARATION

These notices are issued by [Power Limited] in respect of the Centrally Dispatched Generating Units (CDGUs) at [ ] Power Plant in accordance with the requirements of SDC 1.

We declare that the figures and other information given in the notices fully reflect the actual capability of the CDGUs.

The notices are applicable to Schedule Day:

Signature:_____ Name:_____
(in block capitals)

Position: Commercial Engineer/Control Engineer (delete as applicable)

Date/Time of Issue:

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY

AVAILABILITY NOTICE

Settlement Period	[UNITS ON OIL]		[UNITS ON GAS]		GAS TURBINES REDUCTION	
	1	2	1	2	1	2
Contracted Capacity						
0000 - 0030						
0030 - 0100						
0100 - 0130						
0130 - 0200						
0200 - 0230						
0230 - 0300						
0300 - 0330						
0330 - 0400						
0400 - 0430						
0430 - 0500						
0500 - 0530						
0530 - 0600						
0600 - 0630						
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1330 - 1400						
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1430 - 1500						
1500 - 1530						
1530 - 1600						
1600 - 1630						
1630 - 1700						
1700 - 1730						
1730 - 1800						
1800 - 1830						
1830 - 1900						
1900 - 1930						
1930 - 2000						
2000 - 2030						
2030 - 2100						
2100 - 2130						
2130 - 2200						
2200 - 2230						
2230 - 2300						
2300 - 2330						
2330 - 2400						

GSDP NOTICE

______________________________ [Power Limited] declares that the undermentioned CDGUs are presently unable to perform to the characteristics stated in [Schedule 1 of the relevant Power Purchase Agreement (PPA) or Power Station Operation & Dispatch Agreement (PSODA)] and that the affected characteristics are mentioned below with revised values that should be used for the purposes of Scheduling and Dispatch.

UNIT	GENERATION SCHEDULING AND DISPATCH PARAMETER AFFECTED	CONTRACTED VALUE	REVISED VALUE	TIME FROM	TO

Examples

1.	Governor Droop	4.0%	4.5%	0000	2400
2	Loading Rate after Hot Start 30+ MW	6.0	2.5	1800	2200

This notice is applicable to schedule day: ______________________________

Signature: ______________________________

Notes

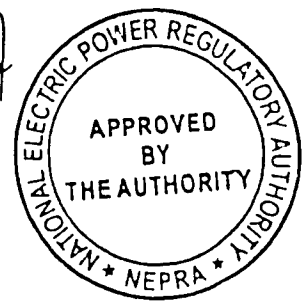
1. All Availabilities shall be expressed in MW. Alongside the MW figure shall be placed the unit operating status (in brackets) as defined by the Final Generation Outage Programme: 1 = Normal Availability, 2 = Inflexible Outage, 3 = Flexible Planned Outage, 4 = Advanced Flexible Planned Outage, 5 = Deferred Flexible Planned Outage, 6 = Short Term Planned Maintenance Outage, 7 = Return to Service, 8 = Notified Unplanned Outage, 9 = Forced Outage.

2. For each CDGU, an Availability figure must be entered for the first settlement period. Where the CDGU is completely unavailable, a zero shall be entered. Thereafter, an Availability figure shall only be entered where the Availability for the CDGU is changed from the previously expressed value.

3. This Availability Notice shall include all planned Outages agreed with NTDC and all Unplanned/Forced Outages already notified to NTDC. It shall not include Unplanned/Forced Outages not yet notified to NTDC unless the appropriate Outage Notice is attached.

This notice is applicable to schedule day:

Signature: _____



APPENDIX C

(SCHEDULING AND DISPATCH CODE 1)

FACSIMILE

TO/FROM NTDC Control Centre, xxxxxxxx, xxxxxxxxxxxxxxxxxxxxx
FAX. [ ]
FROM/TO [Power Limited]

GSDP REVISION NOTICE

1. [ ] POWER PLANT REQUEST
[Power Limited] advises System Operator that the GSDPs mentioned below for the following CDGUs are not in accordance with Schedule 1 of the relevant Power Purchase Agreement (PPA) or Power Station Operation & Dispatch Agreement (PSODA) and, as a result, the CDGUs shall be unable to meet their Spinning Reserve capability:

UNIT ID	CONTRACTED GSDP AFFECTED	REVISED VALUE	START VALUE	DATE	ESTIMATED DURATION TIME	HRS

Reason for Change

Signature _____ Name: _____
(in block capitals)

Position: Commercial Engineer/Control Engineer (delete as applicable)

Date/Time of Issue: _____

2. SYSTEM OPERATOR RESPONSE TO REQUEST (Delete as applicable)

1. Request accepted and confirmed as above
2. Amendment proposed as shown below:
REVISED VALUE: _____ REVISED ESTIMATED DURATION HRS: _____
REVISED START DATE: _____ REVISED START TIME: _____
Signature: _____ Name: _____
(in block capitals)

Position: Commercial Engineer/Control Engineer (delete as applicable)
Date/Time of Issue: _____

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY
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APPENDIX D
(SCHEDULING AND DISPATCH CODE 1)

NOTIFICATION OF REVISED AVAILABILITY

Settlement Period	UNITS ON OIL 1	UNITS ON OIL 2	UNITS ON GAS 1	UNITS ON GAS 2	GAS TURBINES 1	GAS TURBINES 2
Contracted Capacity						
0000 - 0030						
0030 - 0100						
0100 - 0130						
0130 - 0200						
0200 - 0230						
0230 - 0300						
0300 - 0330						
0330 - 0400						
0400 - 0430						
0430 - 0500						
0500 - 0530						
0530 - 0600						
0600 - 0630						
0630 - 0700						
0700 - 0730						
0730 - 0800						
0800 - 0830						
0830 - 0900						
0900 - 0930						
0930 - 1000						
1000 - 1030						
1030 - 1100						
1100 - 1130						
1130 - 1200						
1200 - 1230						
1230 - 1300						
1300 - 1330						
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1800 - 1830						
1830 - 1900						
1900 - 1930						
1930 - 2000						
2000 - 2030						
2030 - 2100						
2100 - 2130						
2130 - 2200						
2200 - 2230						
2230 - 2300						
2300 - 2330						
2330 - 2400						

Notes

1. All Availabilities shall be expressed in MW. Alongside the MW figure shall be placed the unit operating status (in brackets) as defined by the Final Generation Outage Programme: 1 = Normal Availability, 2 = Inflexible Planned Outage, 3 = Flexible Planned Outage, 4 = Advanced Flexible Planned Outage, 5 = Deferred Flexible Planned Outage, 6 = Short Term Planned Maintenance Outage, 7 = Return to Service.
2. For each CDGU, an Availability figure shall be entered in respect of the relevant settlement period(s) where the Availability of the CDGU is changed from a value notified previously in an Availability Notice. Where the change in Availability occurs otherwise than at the commencement of an Availability period, an appropriate annotation must be made, stating the exact time of the change. If the CDGU is unavailable, a zero shall be entered.

This notice is applicable to schedule day:

Signature: _____

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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APPENDIX E

(SCHEDULING AND DISPATCH CODE 1)

FACSIMILE

TO : NTDC Control Centre, xxxxxxxx, xxxxxxxxxxxxxxxxxxxxxxxxxx

FAX : [ ]

FROM : [ ]

[ ] POWER PLANT - DAILY SCHEDULING NOTICES

1. AVAILABILITY NOTICE

The Availability of each CDGU for the schedule day to which this notice refers is shown on page 2 attached.

2. ENERGY BID PRICE NOTICE **[£x.xxxx/GJ - enter bid price where appropriate)**

[ ] offers NTDC the following energy prices (which are lower than the contracted prices) for the week commencing the Monday following this notice.

(Fuel)

3. GSDP NOTICE

The Generation Scheduling and Dispatch Parameters for each CDGU at [ ] Power plant for the schedule day to which this notice refers are as given under Contracted Operating Characteristics in the respective Schedule of the relevant Power Purchase Agreement (PPA) or Power Station Operation & Dispatch Agreement (PSODA).

YES / NO (Delete as appropriate)

(If NO, each GSDP which varies from Schedule 1 contracted operating characteristics must be on page 3 attached. If YES page 3 shall be omitted)

4. OTHER GENERATION RELEVANT DATA

_____

_____

_____

_____

_____

5. DECLARATION

These notices are issued by [ ] in respect of the Centrally Dispatched Generating Units (CDGUs) and Ranges at [ ] Power Plant in accordance with the requirements of SDC 1.

We declare that the figures and other information given in the notices fully reflect the actual capability of the CDGUs and Ranges.

The notices are applicable to schedule day: _____

Signature: _____ Name: _____ (in block capitals)

Position: Commercial Engineer/Control Engineer (delete as applicable)

Date/Time of Issue: _____

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APPENDIX F

(SCHEDULING AND DISPATCH CODE 1)

FACSIMILE

TO : NTDC Control Centre, xxxxxxxxxx, xxxxxxxxxxxxxxxxxxxxxxxxxx

FAX : [ ]

FROM : [ ]

NOTIFICATION OF REVISED AVAILABILITY

1. [ ] POWER PLANT NOTIFICATION

[ ] hereby notifies NTDC that the Availability of the undermentioned CDGU(s) is/are not in accordance with that declared in the current Availability/Range Availability Notice and is/are being redeclared as shown below:

UNIT/ RANGE ID	DECLARED MW/MW(e)	REVISED MW/MW(e)	VALID FROM	VALID TO

Note: where Availability is being increased, the time to be stated for the increase to take effect shall be stated in accordance with the Grid Code.

Reason for Change

This notice confirms the telephone notice issued at _____ (insert time of telephone notice, if applicable). If this notice contradicts the information given in the telephone notice it shall be disregarded and NTDC shall so inform the Generator.

Signature: _____ Name: _____ (in block capitals)

Position: Commercial Engineer/Control Engineer (delete as applicable)
Date/Time of Issue: _____

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APPENDIX G

(SCHEDULING AND DISPATCH CODE 1)

SCHEDULING DATA: PARTICIPATING GENERATORS

PART 1

UNIT NOMINATIONS

Name of Participating Generator

Name of Generating Unit

Date on which Scheduling Day Commences

Local Unit Nomination (SDC 1.4.2.3C (c))

Settlement Period		Unit Nomination (Totals) (kWh)
Start	End	
06.00	06.30	
06.30	07.00	
07.00	07.30	
07.30	08.00	
08.00	08.30	
08.30	09.00	
09.00	09.30	
09.30	10.00	
10.00	10.30	
10.30	11.00	
11.00	11.30	
11.30	12.00	
12.00	12.30	
12.30	13.00	
13.00	13.30	
13.30	14.00	
14.00	14.30	
14.30	15.00	
05.00	05.30	
05.30	06.00	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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APPENDIX G

(SCHEDULING AND DISPATCH CODE 1)

PART 2

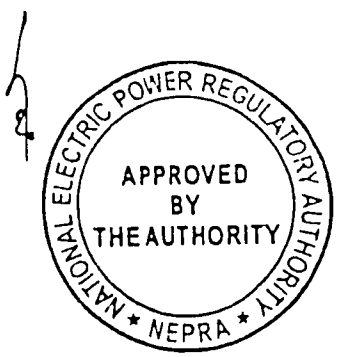
SUPPLEMENTAL ENERGY BIDS

1. Name of participating Generator
2. Name of Generating Unit
3. Date on which Scheduling Day commences
4. Supplemental Energy Bid for Scheduling Day

   Start Up Price (Rs.)

   Fixed Price (Rs./hour)

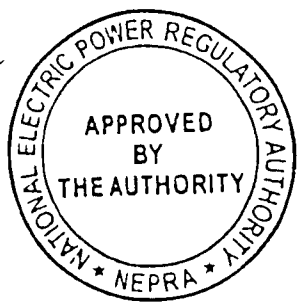
   Incremental Price (Rs./MWh or Rs./KwH)



SCHEDULING AND DISPATCH CODE NO. 2 (SDC 2)

CONTROL SCHEDULING AND DISPATCH

CONTENTS



CONTROL SCHEDULING AND DISPATCH CODE NO. 2

CONTROL SCHEDULING AND DISPATCH

SDC 2.1 INTRODUCTION

In the daily functioning of the National Transmission and Dispatch Company's business, scheduling, dispatch and control of generation facilities shall be performed by the System Operator. The Control Scheduling and Dispatch Code (SDC 2) defines the roles and responsibilities of the System Operator and Code Participants in the dispatch and control scheduling of Available generation facilities, and operation and management of a secure bulk Transmission System of NTDC.

SDC 2.1.1 Scheduling and Dispatch Code No. 2 ("SDC 2") sets out the procedures for the System Operator to issue dispatch instructions to Generators in respect of their CDGUs (in relation to their Unit Nominations) as per "Final Generation Schedule" concluded in SDC 1. This sub-code is supplemental to SDC 1 and SDC 3.

SDC 2.2 OBJECTIVE

The Objectives of the Control Scheduling and Dispatch Code (SDC 2) are to establish the process, guidelines and procedures for:

(a) Principles and criteria for dispatch

(b) Minimizing overall cost of supply

(c) Steps to be taken to prepare a dispatch algorithm

(d) Accounting for bilateral contracts

(e) Establishment of a Merit Order Ranking

The procedures for the issuance of dispatch instructions to Generators by the System Operator is intended to enable (as far as possible) the System Operator to match continuously, utilising the Merit Order and "Final Generation Schedule" derived pursuant to SDC 1, and the factors to be taken into account listed in SDC 1 (SDC 1.4.3.3), CDGU output to NTDC total system demand, taking into account any power transfers over any External Interconnections and non-CGDU output together with an appropriate Operating Margin whilst maintaining the integrity and security of the NTDC's System coupled with the requirements of adequacy and quality of power supply as provided in this Grid Code.

SDC 2.3 SCOPE

SDC 2 applies to the System Operator, and to the Code Participants with regard to their Generating Plants.

SDC 2.4 PROCEDURE

SDC 2.4.1 Information Used

SDC 2.4.1.1 The information which the System Operator shall use in assessing as to which CDGU to dispatch, shall be the 1) Availability Notice; 2) Unit Nominations; 3) Merit Order as derived under SDC 1; 4) Other factors to be taken into account as listed in SDC 1 (SDC 1.4.3.3); 5) Generation Scheduling and Dispatch Parameters (GSDPs); 6) Operating Reserve Characteristics, and; 7) Other Generation Relevant Data in respect of that CDGU, supplied to it under SDC 1 (and any revisions under SDC 1 and this SDC 2 to the date).

SDC 2.4.1.2 Subject as provided below, the factors used in the dispatch phase in assessing which CDGUs to dispatch in conjunction with the Merit Order as derived under SDC 1, and the other matters identified in SDC 1.4.3, SDC 1.4.3.3 and SDC 1.4.3.5 and SDC 1.4.3.6 shall be those used by the System Operator to compile the Generation Schedule under SDC 1.

SDC 2.4.1.3 Additional factors which the System Operator shall, however, also take into account are those Generators who have not complied with dispatch instructions or; "special actions requests" which the System Operator has (in its absolute discretion) granted for the early synchronisation of a CDGU to the NTDC System; requests which System Operator has made and to which the Generator has agreed to for an early or late synchronisation of a CDGU to the NTDC's System; and variation between forecasted and actual NTDC system demand, as these can have an impact on the overall dispatch. The System Operator shall also take into account the need to dispatch CDGUs for monitoring, testing or investigation purposes under OC11, or for testing at the request of a User, under OC11.2.

SDC 2.4.1.4 In the event of two or more CDGUs having the same "Merit Order Price Set" and the System Operator not being able to differentiate on the basis of the factors identified in SDC 1.4.3.2, SDC 1.4.3.3 and SDC 1.4.3.4, the System Operator shall select for dispatch first the Generator which in System Operator's best reasonable judgement is most appropriate under the circumstances and prevailing conditions of the Scheduling Day.

SDC 2.4.2 DISPATCH INSTRUCTIONS

SDC 2.4.2.1 Introduction

Dispatch instructions relating to the Schedule Day shall normally be issued at any time during the period beginning immediately after the issuance of the Day Ahead Notification preferably with effect from 00.01 hrs (midnight). In respect of that Schedule Day. The System Operator may, however, at its discretion, issue dispatch instructions in relation to a CDGU prior to the issuance of the Day Ahead Notification which includes that CDGU.

SDC 2.4.2.2 (a) The System Operator shall issue dispatch instructions direct to the Generator for the dispatch of each of its CDGU. Subject to the provisions of this SDC 2, the System Operator shall issue dispatch instructions with respect to information submitted by each Generator. The System Operator may issue dispatch instructions for any CDGU which has been declared Available in an Availability Notice even if that CDGU was not included in the Day Ahead Notification subject to its availability later on.

SDC 2.4.2.3 **Scope of Dispatch Instructions for CDGUs**

In addition to instructions relating to the dispatch of Active Power, dispatch instructions (unless otherwise specified by the System Operator at the time of giving the dispatch instructions) shall be deemed to have included an automatic instruction of Spinning Reserve, and voltage/reactive support.

SDC 2.4.2.4 In addition to instructions relating to the dispatch of Active Power, dispatch instructions in relation to CDGUs may include:

(a) Target (at instructed MW level) voltage levels at the Points of Connection or the individual reactive power output from CDGUs at the Generator terminals which shall be maintained by the CDGU. The issue of dispatch instructions for Active Power at the Generator terminals shall be made with due regard to any resulting change in reactive power capability, and may include instruction for reduction in Active Power generation to increase reactive power capability. In the event of a sudden change in the System Operator's system voltage, a Generator must not take any action in respect of any of its CDGUs to override automatic MVAr response unless instructed otherwise by the System Operator or unless immediate action is necessary to comply with voltage/stability limits. A Generator may take such action, as is in its reasonable opinion necessary, to avoid an imminent risk of injury to persons or material damage to property (including the CDGU);

(b) (i) The declared fuel to be used by the Generator in operating the CDGU must be declared by the Generator ahead of scheduling. In the case of a CDGU capable of firing on different fuels, the dispatch instruction may also specify the designated fuel to be used by the Generator. If no declared fuel and/or, where relevant, Designated Fuel is contained in the dispatch instruction, then the most recently instructed Dispatched Fuel and/or, where relevant, designated fuel shall apply. The part of a dispatch instruction which specifies a change in the dispatched fuel and/or, where relevant, designated fuel to be burned by the Generator shall be known as a "Dispatched Fuel Notice". The System Operator may, however, use a separate dispatched fuel notice and which may be issued separately from any dispatch instruction, containing the above information.

(ii) In the case of an existing CDGU only, the Generator may (subject to the following provisions of this paragraph, in complying with a dispatch instruction burn a fuel other than the Declared Fuel and/or, where relevant, the Designated Fuel specified in the dispatch instruction.

(c) A reference to any implications for future dispatch requirements and the security of the NTDC's Transmission System, including arrangements for change in output to meet post-fault security requirements;

(d) An instruction to switch into or out of service a "System to CDGU" Intertripping scheme;

(e) Notice and changes in notice to synchronise or de-synchronise CDGUs in a specific time scale;

(f) Instructions relating to abnormal conditions, such as adverse weather conditions, or high or low NTDC System voltage;

(g) An instruction for a change in Generator step-up transformer tap positions;

(h) An instruction for a CDGU to operate in synchronous compensation mode;

(i) An instruction in relation to the carrying out of testing, monitoring or investigations as required under OC11, or testing at the request of a User under OC11.2.

(j) In the case of a Gas Turbine PPA CDGU, an instruction requiring it to generate at a level in excess of its Availability but not exceeding its temperature adjusted peak capability which may only be given if, at the time of issue of the instruction, the CDGU is dispatched to an output equal to its Availability, and provided that the limit on the number of hours for which such instructions may be given during the year (as agreed with the relevant Generator) is not thereby exceeded. Such an instruction shall be identified as a "peak instruction". When the System Operator gives a dispatch instruction which is in excess of the Availability of the gas turbine, the CDGU which is not designated a "peak instruction", the Generator must inform the System Operator immediately that the dispatch instruction is so in excess in order that the System Operator can so designate the dispatch instruction as a "peak instruction" or withdraw the instruction completely. The Generator shall not then be obliged to comply with the dispatch instruction unless and until the System Operator notifies it that the instruction is designated as a "peak instruction".

SDC 2.4.2.5 **Reactive Support for Voltage Control**

Reactive support for necessary voltage control shall be provided by each Generator with due regards to manufacturer's specifications of design characteristics of the individual Generator.

SDC 2.4.2.6 **Form of Instruction**

(a) Instructions may be given by telephone, by facsimile transmission, by instructor or by radio/telephone. These may be given electronically where a relevant communication system has been established between the System Operator and the Generator. In the case of a low-frequency relay initiated response from a Gas Turbine CDGU, the instruction shall be deemed to be given at the moment that the low frequency relay operates.

(b) In addition, the System Operator may notify a Generator that in certain circumstances it requires the Generator to operate in accordance with a Standing Instruction, which shall be deemed to be given when the circumstances arise. These Standing Instructions may include instructions on how to operate if the System Operator loses the ability to direct the operation and management of the NTDC's Transmission System temporarily, in the circumstances envisaged under OC 8 where the System Operator or the Control Centre (NPCC) is incapacitated for any reason pending the transfer of system operations to a temporary Control Centre. The System Operator shall not, by means of a Standing Instruction, require any of the CDGUs to be dispatched in a manner in which the System Operator would not have access or be able to exercise option to require such units to be dispatched by means of a dispatch instruction issued in accordance with this SDC 2.

(c) The reduction by a Generator of the output of one of its CDGUs under SDC 3.6.1 shall be deemed to have followed a dispatch instruction issued by the System Operator.

(d) The de-synchronisation of a CDGU following the operation of an intertrip scheme selected by the System Operator shall be deemed to have happened as a result of a dispatch instruction issued by the System Operator.

SDC 2.4.2.7 (a) Dispatch instructions given by telephone, by facsimile transmission or electronically shall generally indicate the target MW (at Target System Frequency) to be provided at the Generator terminals (or where provided in the relevant Connection Agreement, on the energy sent out basis).

(b) Dispatch instructions given by the SO shall indicate the target MW (at Target System Frequency) to be provided at the

Generator terminals of the CDGU to which the operator relates (or where provided in the relevant Connection Agreement, on energy sent out basis), in the case of a Power Plant which has an Operator for each CDGU.

(c) Dispatch instructions deemed to be given upon the Operation of a low frequency relay shall be deemed to indicate the target MW (at System Target Frequency), which may either be at full load or at some lower output (as previously specified by the System Operator), to be provided at the Generator terminals which reflects; and is in accordance with the GSDPs of Gas Turbine CDGUs GSDPs given as under or revised in accordance with SDC 1 or SDC 2.

(d) Dispatch instructions deemed to be given upon the activation of a Standing Instruction shall be deemed to indicate the target MW (at Target System Frequency), which may either be at full load or at some lower output (to be provided at the Generator terminals (or where provided in the relevant Connection Agreement, on the energy sent out basis) as set out in the Standing Instruction notified by the System Operator from time to time; to be achieved in accordance with the respective GSDPs given under (or as revised in accordance with) SDC 1 or this SDC 2, or such rate within those parameters as is specified in the Standing Instruction.

SDC 2.4.2.8 The form, manner, and the terms to be used by System Operator in issuing dispatch instructions together with their meanings are set out in the attached appendices..

SDC 2.4.2.9 Subject only to SDC 2.4.2.8, and as provided below in the SDC 1 and SDC 2, dispatch instructions shall not be inconsistent with the Availability, Unit Nominations, Contracted GSDPs, and Other Generation Relevant Data notified to the System Operator under SDC 1 (and any revisions under SDC 1 or this SDC 2 to that data). A dispatch instruction may be subsequently cancelled or varied (including an instruction for a cancelled start) at any time. The dispatch instructions may, however, be inconsistent with the Availability and/or Unit Nominations and/or GSDPs and/or Other Generation Relevant Data so notified to the System Operator for the purposes of carrying out a test at the request of the relevant Generator under OC12.3 or a system test at the request of the relevant Generator under OC11.2, to the extent that such dispatch instructions are consistent with the procedures agreed (or otherwise determined) for conducting the test or system test (as the case may be). For the avoidance of doubt, any dispatch instructions issued by the System Operator for the purposes of carrying out a test at the request of the relevant Generator under OC12.3 or a system test at the request of the relevant Generator under OC11.2 shall not be deemed to be dispatch instructions given pursuant to SDC 2.4.2.10.

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SDC 2.4.2.10 To preserve the NTDC's Transmission System integrity under emergency circumstances where licence standards and obligations cannot be met, the System Operator may, however, issue dispatch instructions to change CDGU output even when this is an outside parameter so registered or so amended. This may, for example, be an instruction to trip a CDGU or to part-load a CDGU. The instruction shall be stated by the System Operator to be one in relation to emergency circumstances under SDC 2.4.2.10.

SDC 2.4.2.11 **Communication with Generators**

(a) A Generator must, at the beginning of each shift at its Power Station, contact the System Operator by telephone; and the Operator at the Power Station and the System Operator must exchange names in order to identify each other. If during the shift at the Power Station, the Operator changes, the Person whose Operator has changed must notify the other accordingly.

(b) Dispatch instructions whether given by telephone, by facsimile transmission or by Operator must be formally acknowledged immediately by the Generator at the Power Station by telephone, by return facsimile transmission or by acceptance of the dispatched signal, given in the manner agreed between the Generator and the System Operator or a reason must be given as soon as possible for non-acceptance, which may (subject to SDC 2.4.2.10) only be to avoid, in the Generator's reasonable opinion, an imminent risk of injury to persons or material damage to property (including the CDGU) or because they are not in accordance with the applicable Availability Notice, or GSDPs or do not reflect "Other Generation Relevant Data" submitted by the Generator pursuant to SDC 1.

(c) In the event that in carrying out the dispatch instructions, an unforeseen problem arises, leading to a possibility of, in the Generator's reasonable opinion, to an imminent risk of injury to persons or material damage to property (including the CDGU), the System Operator must be notified as soon as possible by telephone.

SDC 2.4.2.12 **Action Required from Generators**

Each Generator shall comply in accordance with SDC 2.4.2.13 and their Power Purchase Agreement (PPA) or Power Station Operation & Dispatch Agreement (PSODA) as applicable with all dispatch instructions properly given by the System Operator unless the Generator has given a notice to System Operator under the provisions of SDC 2.4.2.10 regarding non-agreement of dispatch instructions. A Generator shall not, however, be in default in complying with the dispatch instructions, if, subsequent to the issuance of the dispatch instruction, the Generator and the System Operator agree on an early or late

synchronisation, and the Generator synchronises the relevant CDGU in accordance with that agreement.

SDC 2.4.2.13 **Implementation of Instructions by Generators**

The Generators shall immediately respond to dispatch instructions properly given by the System Operator without any delay in accordance with the instructions, including those dispatch instructions issued pursuant to SDC 2.4.2.10. Instructions indicating a target MW and Voltage/MVARS at that MW level and an Output at the System Target Frequency shall be complied with by Generators notwithstanding any tolerance bands set out in their PPAs/PSODA.

SDC 2.4.2.14 Subject to the exception set out below in this SDC 2.4.2.14, the Generators shall only synchronise or de-synchronise CDGUs to the dispatch instructions of the System Operator or unless it occurs automatically as a result of intertrip schemes or low-frequency relay operations. De-synchronisation may otherwise only take place without the System Operator's prior agreement if it is done to avoid, in the Generator's reasonable opinion, an imminent risk of injury to persons or material damage to property (including the CDGU) exists. If that happens, the System Operator must be informed that it has done so within ten (10) minutes of the de-synchronization of the Unit.

SDC 2.4.2.15 The System Operator may suspend the issuance of the dispatch instructions to a particular Generating Unit in a plant in accordance with the Merit Order (having taken account of and applied the factors referred to in SDC 1.4.3.3 to the extent that the conditions in SDC 1.4.3.5 arise. When necessary, the System Operator shall issue dispatch instructions for a Black Start.

SDC 2.4.2.16 **Generating Plant Changes**

(a) Each Generator Power Station with multiple Generating Units shall, without delay, notify the System Operator by telephone or by facsimile transmission of any change or loss (temporary or otherwise) to the operational capability of the Power Plant including any changes to the Generation Scheduling and Dispatch Parameters (GSDPs) of each CDGU (in the case of Generation Scheduling and Dispatch Parameters, by the submission of a GSDP Revision Notice) indicating (where possible), the magnitude and the duration of the change. In the case of CDGUs already synchronised to the NTDC's Transmission System, the Generator at its Power Plant must also state whether or not the loss was instantaneous.

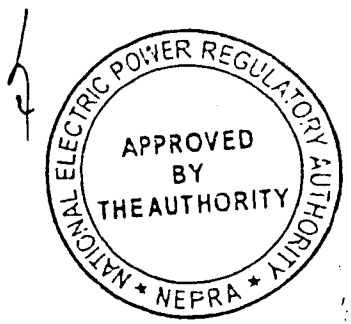
SDC 2.4.2.17 Each Generator at its Power Plant shall operate its synchronised CDGUs with AVRs and VAR limiters in service at all times (where required pursuant to generator control arrangements contained in PPA/PSODA or Connection Code) unless released from this obligation in respect of a particular CDGU by the System Operator.

SDC 2.4.2.18 **Minimum Demand Regulation ("MDR")**

Synchronised centrally-dispatched Generating Units must at all times be capable of reducing Output sufficient to allow a sufficient Operating Margin for adequate frequency control. The System Operator shall monitor the output data of the Generation Schedule against forecasted NTDC's total system demand to see whether the level of MDR for any period is insufficient; and may take any shortfall into account in altering the dispatch.

SDC 2.4.3 **Special Actions**

The System Operator, may as part of the issuance of dispatch instructions, issue instructions for special actions (either pre- or post-fault) to a Generator in respect of any of its CDGUs in the event that System Operator, in its reasonable opinion, believes that such instructions are necessary in order to ensure that the licence standards and obligations are met. Special actions shall generally involve a Load change or a change in required Notice to synchronise within a specific timescale on individual or groups of CDGUs. They may also include selection of "System to CDGU" intertrip schemes for stability or thermal reasons. Instructions for special actions shall always be within Generation Scheduling and Dispatch Parameters (GSDPs).



SDC 2 - APPENDIX A

Dispatch Instructions for CDGUs

SDC 2.A.1 **Form of Dispatch Instruction**

SDC 2.A.1.1 All loading/de-loading rates shall be assumed to be in accordance with Generation Scheduling and Dispatch Parameters (GSDPs). Each dispatch instruction shall, wherever possible, be kept simple, drawing as necessary from the following forms and SDC 2.4.2.

SDC 2.A.1.2 (a) The dispatch instruction given by telephone, electronically or facsimile transmission shall normally follow the form:

(i) The specific CDGU to which the instruction applies;

(ii) The Output to which it is instructed;

(iii) If the start time is different from the time the instruction is issued, the start time shall be included;

(iv) Where specific loading/de-loading rates are concerned, a specific target time;

(v) The issue time of the instruction;

(vi) The Designated Fuel and/or declared fuel (or fuel), as the case may be;

(vii) In the case of a gas turbine CDGU, if the instruction is designated as a "Peak Instruction", this shall be stated.

(b) The dispatch instruction given by Instructor shall normally follow the form:

(i) The specific CDGU to which the instruction applies, if the Instructor is on a unit basis or the group of CDGUs to which the instruction applies;

(ii) The Output to which it is instructed.

Any dispatch instruction relating to the Designated Fuel and/or Declared Fuel, (or fuel) as the case may be, shall be given by telephone, electronically or by facsimile transmission.

SDC 2.A.2 **Dispatching a Synchronised CDGU to Increase or Decrease Output**

SDC 2.A.2.1 If the time of the dispatch instruction is 1400 hours, the unit is unit 1 and the Output to be achieved is 205 MW, the relevant part of the instruction would be, for example:

"Time 1400 hours. Unit 1 to 205 MW"

SDC 2.A.2.2 If the start time is 1415 hours, it would be, for example:
"Time 1400 hours. Unit 1 to 205 MW, start at 1415 hours"

SDC 2.A.2.3 Loading and de-loading rates are assumed to be in accordance with Generation Scheduling and Dispatch Parameters (GSDPs) unless otherwise stated. If different loading or de-loading rates are required, the time to be achieved shall be stated, for example:
"Time 1400 hours. Unit 1 to 205 MW by 1420 hours"

SDC 2.A.3 **Dispatching a CDGU to Synchronise/de-Synchronise**

SDC 2.A.3.1 **CDGU Synchronising**

SDC 2.A.3.1.1 In this instance, for CDGUs, the dispatch instruction issue time shall always have due regard for the synchronising time declared to System Operator by the Generator as a GSDP.

The instruction shall follow the form, for example:
"Time 1300 hours. Unit 1, Synchronise at 1600 hours"

In relation to an instruction to synchronise, the start time referred to in SDC 2.A.1.2(a) shall be deemed to be the time at which synchronisation is to take place.

SDC 2.A.3.1.2 Unless a loading programme is also given at the same time it shall be assumed that the CDGU(s) are to be brought to minimum generation level and on the Generator reporting that the Generating Unit has been synchronised, a further dispatch instruction shall be issued.

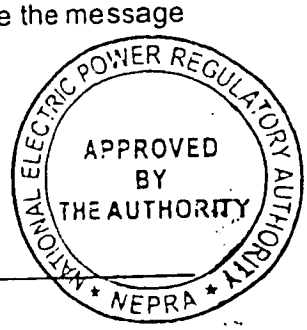
SDC 2.A.3.1.3 When a dispatch instruction for a CDGU to synchronise is cancelled (i.e. a cancelled start) before the unit is synchronised, the instruction shall follow the form, for example:
"Time 1400 hours. Unit 1, cancel synchronising instruction"

SDC 2.A.3.2 **CDGUs De-Synchronising**

SDC 2.A.3.2.1 The dispatch instruction shall normally follow the form, for example:
"Time 1300 hours. Unit 1, Shutdown"

If the instruction start time is for 1400 hours the form shall be, for example:
"Time 1300 hours. Unit 1, Shutdown, start at 1400 hours"

Both the above assume de-loading rate at declared Generation Scheduling and Dispatch Parameters (GSDPs). Otherwise the message shall conclude with, for example:
"... and se-synchronise at 1500 hours"



SDC 2.A.4 **Frequency Control**

SDC 2.A.4.1 All the above dispatch instructions shall be deemed to be at "Target System Frequency" (50 Hz), i.e. where a CDGU is in the Frequency Sensitive Mode, instructions refer to target Output at Target System Frequency. Target System Frequency changes shall always be given to the Generator by telephone and shall normally only be 49.95, 50.00, 50.05Hz (at an interval of 0.05 Hz).

SDC 2.A.4.2 CDGUs required to be frequency insensitive shall be specifically instructed as such. The dispatch instruction shall be of the form for example:

"Time 2100 hours. Unit 1, to Frequency Insensitive mode"

SDC 2.A.4.3 Frequency control instructions may be issued in conjunction with, or separate from, a dispatch instruction relating to Output.

SDC 2.A.5 **Emergency Load Drop**

The dispatch instruction shall be in a pre-arranged format and normally follow the form, for example:

"Time 2000 hours. Emergency load drop of "X"MW in "Y" minutes"

SDC 2.A.6 **Voltage Control Instruction**

In order that adequate NTDC Transmission System voltage limits as specified in OC 4 are maintained under Normal and (N-1) conditions, a range of voltage control instructions shall be utilised from time to time, for example:

(a) Operate to Nominal System Voltage as specified in OC 4.9;

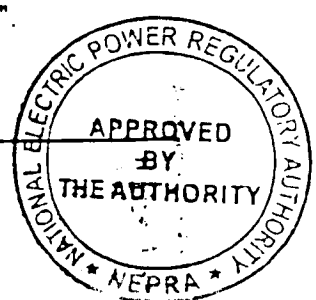
(b) Maximum generation of reactive power (at current instructed MW output);

(c) Increase reactive output by 10MVAr (at current instructed MW output).

SDC 2.A.7 **Instruction to change dispatched fuel**

When the System Operator wishes to instruct a Generator to change the fuel being burned in the Operation of one of its CDGUs from one Dispatched Fuel (or fuel) to another (for example from 1% sulphur oil to 3% sulphur oil), the dispatch instruction shall follow the form, for example:

"Time 1500 hours. Unit 2 change to 3% Fuel at 1700 hours".



SDC 2.A.8 **Instruction to change Designated Fuel for a Dual Firing CDGU**

When the System Operator wishes to instruct a Generator to change the fuel being burned in the operation of one of its CDGUs which is capable of firing on two different fuels (for example, coal or oil), from one Designated Fuel (or fuel) to another (for example, from coal to oil), the instruction shall follow the form, for example:

"Time 1500 hours. Unit 1 generate using oil at 1800 hours".

SDC 2.A.9 **Peak Instruction to Gas Turbine CDGUs**

When the System Operator wishes to instruct a Generator to operate its Gas Turbine PPA CDGU at a level in excess of its Availability in accordance with SDC 2.4.2.4(j), the instruction shall follow the form, for example:

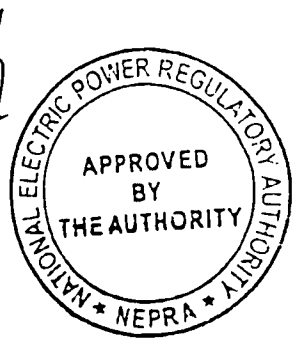
"Peak Instruction. Time 1800 hours. Unit GT2 to 58MW."

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY
NEPRA

SCHEDULING AND DISPATCH CODE NO.3 (SDC 3)

FREQUENCY CONTROL

CONTENTS



SCHEDULING AND DISPATCH CODE NO. 3

FREQUENCY CONTROL

SDC 3.1 INTRODUCTION

All Generators (with/without Bilateral Contracts) shall have an obligation to meet their due share of ancillary services including voltage and frequency control, operating reserve both (spinning and non-spinning reserve), reactive support, load imbalance services, black-start, system restoration, and load following requirements.

SDC 3.1.1 SDC 3 sets out the procedure by which the System Operator shall use to direct frequency control. The NTDC System Frequency shall be controlled by:-

(a) Automatic response from CDGUs operating in "Frequency Sensitive Mode", including "Unit Load Controller Operation";

(b) The dispatch of CDGUs; and

(c) Load demand control.

SDC 3.1.2 The requirements for frequency control are determined by the consequences and effectiveness of generation scheduling and dispatch; and by the effects of power transfers across any External Interconnection; and therefore, SDC 3 is supplemental to SDC 1 and SDC 2.

SDC 3.2 OBJECTIVE

The procedure for the System Operator to direct frequency control is intended to enable (as far as possible) the System Operator to meet the requirements of frequency control as contained in this Grid Code and NEPRA Transmission Performance Standards.

SDC 3.3 SCOPE

SDC 3 applies to the System Operator, NTDC, Distributors, Generators with regard to their Generating Units, Transmission-connected Consumers, and Externally-connected Parties and Consumers.

SDC 3.4 **PROCEDURE**

SDC 3.4.1 **Automatic Response from Generating Plant**

SDC 3.4.1.1 (a) All CDGUs must be capable of operating at all times in Frequency Sensitive Mode (including, where applicable, with the Unit Load Controller in Operation) which means an automatic incremental or decremental generation response (Primary Response) to contain the initial system frequency change together with a sustained generation and load response (Secondary Response) which can contribute to correcting and containing the system frequency within the requirements for frequency control contained in this Grid Code and NEPRA Transmission Performance Standards Rules.

(b) All synchronised CDGUs must, unless relieved of the requirement by the System Operator, operate at all times in the Frequency Sensitive Mode (including, where applicable, with the Unit Load Controller in Operation) except where, in the Generator's reasonable opinion, it is necessary to cease operation in Frequency Sensitive Mode in order to avoid an imminent risk of injury to persons or material damage to property (including the CDGU) with the consent of the System Operator. The detailed instructions for droop settings and participation factor would be given by the System Operator separately to the CDGUs for contribution towards frequency corrections.

SDC 3.4.1.2 A System Frequency induced change in the Active Power Output of CDGUs which assists the recovery to Target System Frequency must not be manually overridden by a Generator except where it is necessary, in the Generator's reasonable opinion, to avoid an imminent risk of injury to persons or material damage to property (including the CDGU) with the consent of the System Operator.

SDC 3.4.2 **SYSTEM OPERATOR'S DISPATCH INSTRUCTIONS**

SDC 3.4.2.1 When the System Operator determines it is necessary, by having monitored the NTDC System Frequency, it shall, as a part of the procedure set out in SDC 2, issue dispatch instructions including the instructions for Spinning Reserve, in order to regulate the NTDC System Frequency to meet the requirements for frequency control as contained in the Grid Code, and NEPRA Transmission Performance Standards Rules. The CDGUs to be selected by the System Operator for Unit Load Controller Operation shall be instructed by the System Operator to operate at the NTDC Target System Frequency, which shall be 50.00 Hz.

SDC 3.4.2.2 Any dispatch instruction to CDGUs shall refer only to the required CDGU output at the Target System Frequency.

SDC 3.4.3 Low frequency relay initiated response from Gas Turbine PPA CDGUs.

SDC 3.4.3.1 The System Operator may allocate a part of the requirements for Operating Reserve to Gas Turbine PPA CDGUs with the capability of low frequency relay initiated response for start-up to a pre-determined output level which have not been scheduled for dispatch in accordance with SDC 1, although the System Operator may, in the event, decide to issue a dispatch instruction in respect of any of such CDGU in accordance with SDC 2. Alternatively, Gas Turbine PPA CDGUs of this type may be scheduled for dispatch by the System Operator in accordance with SDC 1.

SDC 3.4.3.2 The System Operator shall periodically specify, within the range established pursuant to the Connection Agreement, low frequency relay settings to be applied to the CDGUs pursuant to SDC 3.4.3.1 and shall instruct the low frequency relay initiated response to be placed in and out of service.

SDC 3.4.3.3 All Generators and Users/Code Participants shall comply with System Operator's instructions issued under SDC 3.4.3.2 for low frequency relay settings. The Generators shall not alter such low frequency relay settings or take low frequency initiated response out-of-service without the System Operator authorization, except where necessary, in the Generator's reasonable opinion, to avoid an imminent risk of injury to persons or material damage to property (including the CDGU) with the authorization of the System Operator.

SDC 3.5 **ACTION REQUIRED BY GENERATORS IN RESPONSE TO LOW FREQUENCY**

SDC 3.5.1 (a) If the NTDC System Frequency falls to or below 49.8 Hz, each Generator at its Power Plant shall be required to check that each of its CDGUs is achieving the required levels of response including that required from the Unit Load Controller, where applicable, in order to contribute to containing and correcting the low System Frequency.

SDC 3.5.2 In order that the System Operator can deal with emergency conditions effectively, it needs as much up-to-date information as possible and accordingly, the System Operator shall be informed of the action taken as soon as possible after the fall in the System Frequency directly by telephone from the Power Plant.

SDC 3.6 **ACTION REQUIRED BY GENERATORS IN RESPONSE TO HIGH FREQUENCY**

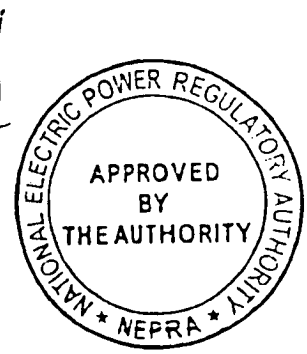
SDC 3.6.1 If the NTDC System Frequency rises to or above 50.2 Hz, each Generator at its Power Plant shall be required to ensure that each of its CDGUs has responded in order to contribute to correcting and containing the high System Frequency by automatically or manually

reducing output by a minimum amount of 2% and by a maximum amount of 5% of Power Plant output per 0.1 Hz deviation of the NTDC's System Frequency from declared or Target System Frequency.

SDC 3.6.2 This reduction shall have to be made without reference to the System Operator; and must be maintained until the NTDC System Frequency has returned to Target System Frequency or receipt of revised dispatch instructions from the System Operator under SDC 2. In order that the System Operator can deal with the emergency conditions effectively, it needs as much up-to-date information as possible and accordingly, the System Operator must be informed of the action taken as soon as possible after the rise in System Frequency directly by telephone from the generating plant.

SDC 3.7 **ELECTRIC TIME**

SDC 3.7.1 The System Operator shall endeavour (in so far as it is able to) control electric clock time to within plus or minus 10 seconds of Standard Time by specifying changes to target the NTDC's System Frequency, and by dispatch taking into account Merit Order and forecast Power Plant/Load Demand margins. Errors greater than plus or minus 10 seconds may be temporarily accepted at the System Operator's reasonable discretion. The System Operator shall give 15 minutes notice to each generator of variation in Target System Frequency.



The Terms Not Contained here have been Defined in Various Applicable Documents of NEPRA and listed as Annexure–A (attached).

GLOSSARY AND DEFINITIONS

ITEM	Sub-Code	DEFINITION
24 Hour Recall	SDC	An Agreement [Power Purchase Agreement (PPA)/ Power Station Operation & Dispatch Agreement (PSODA)] between NTDC and a Generator whereby a CDGU subject to a Notified Unplanned Outage may be recalled by NTDC upon giving a 24 hours Notice to the Generator.
Active Energy	PMC 2.1	The electrical energy produced, flowing or supplied by an electrical circuit during a time interval, being the integral with respect to time of the instantaneous power, measured in units of watt- hours or standard multiples thereof, i.e.: 1000 Wh = 1 kWh 1000 kWh = 1 MWh 1000 MWh = 1 GWh 1000 GWh = 1 TWh
Active Load Limiter	SDC 3	Device that does not allow a Generator to increase its active power higher than established.
Active Power	SDC 3.4.1.2	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
ASRAR	OC	Annual System Reliability & Assessment Report
Apparatus	CC 5.4 Code Management	All electrical equipment, conductor installed on the electrical power system.
Apparent Power	OC 4 Appendix 7	The product of voltage and of alternating current measured in units of Volt-amperes and standard multiples thereof, i.e.: 1000 VA- = 1kVA 1000 kVA = 1 MVA
Automatic Generation Control (AGC)	OC 4 SDC 1 & 2	The mechanism, and equipment installed on a Generator 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) Rules.
Automatic Load Shedding	CC 5.4 OC 4	A load shedding scheme, utilized by NTDC, to prevent frequency collapse or other problems, and to restore the balance between generation output and load demand on the NTDC system,
Automatic Voltage Regulator (AVR)	SDC 2	A continuously acting automatic excitation control system to control the voltage of a Generator measured at the Generator terminals.
Auxiliaries	OC 12	Any item of Plant and/or Apparatus not directly a part of the boiler plant or Generator's, but required for the boiler plant's or Generator's functional operation

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ITEM	Sub-Code	DEFINITION
Auxiliary Diesel Engine Generator	SDC	A diesel engine driven electric generator used to provide emergency electric power for auxiliary power supply. Plants with sufficiently large auxiliary diesel-generator could have Black Start capability.
Availability Notice	SDC	The Notice for each CDGU, must state the Availability in a whole number of MW and, for each CDGU, state the Availability in MW to one decimal place.
Available Power	SDC 1.4.1	Effective power from the Generator available in the bulk power transmission system for load dispatch.
Back-up Protection	PMC	Protection equipment or system which is intended to operate when a system fault is not cleared in due time because of failure or inability of the primary or main protection scheme to operate or in case of failure to operate a circuit-breaker other than the associated circuit-breaker. Also known as secondary protection.
Balancing Code (BC)	OC & SDC	That part of the Grid Code which details the Balancing Mechanism.
Balancing Mechanism	OC & SDC	A balancing arrangement for the purpose of bilateral contracts for dispatching Generators, access to additional generation for system needs, and establish a price for each operating time period at which differences between contractual and real time operations are settled.
Bilateral Contracts	SDC 1.4.2.7	A direct contract, (without NTDC having to purchase power on behalf of the Buyer), between the Power Producer (Seller) and Purchaser (Buyer) for the purchase of electric power and energy.
Black Start	OC 1.2 SDC 2	The procedure necessary for a recovery from a Total Shutdown or Partial Shutdown.
Black Start Capability	OC	For a designated Black Start Station, the ability for at least one of the generating units of a Generator to Start-Up from Shutdown; and to energize a part of the System and/or be synchronized to the System on the instructions of NTDC, without any external electrical power supply.
Black Start Station	OC	Black start stations are Generators with Black Start capability. An emergency auxiliary (station service) supply, such as auxiliary diesel-electric generator capable of supplying auxiliary power to the station is provided.
Black Start Test	OC 11	A test carried out by a Generator to the instructions of NTDC to demonstrate that the designated Black Start Station has a Black Start Capability.
BM Participant	OC & SDC	A Person who is responsible for and controls one or more Generators. For the avoidance of doubt, it does not imply that they must be active in the Balancing Mechanism.
Bulk Power Supply Agreement	PMC	The commercial agreement (PPA) between a Generator and a purchaser of electric power for the delivery and/or use of the electric power.
Bulk Power Transmission Agreement	PMC	The commercial agreement between the NTDC and a Code Participant for the provision of transmission services.

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ITEM	Sub-Code	DEFINITION
		Schedule as stated in SDC 1.4.3.4) for simultaneous transmission purposes of electric power.
Congestion Condition	OC 1	A constraint resulting from overloading of transmission line and/or transformer which could jeopardize the system security and integrity.
Connection Agreement	CC 4 CC 4	An Agreement between NTDC and or User setting out the terms and conditions relating to a Connection to and/or use of its bulk power transmission system.
Connection Charges	SDC	NTDC's charges to Users for Connection to the NTDC System.
Connection Point	SDC 1	A point at which a User's or Code Participant's Plant and /or Apparatus connects to the bulk power transmission system of NTDC.
Connection Site	CC 5.4 CC Appendix A CC Appendix B	A site containing a Connection Point.
Consumer Generating Plant	DRC	A power generating plant installed at the consumer's premises by the Consumer.
Consumption	PMC	Is the use of electrical energy by a licensee or Bulk Power Consumer, in a period of time that has been previously established
Contingency Reserve	SDC	The margin of generation over forecast load demand, which is required in the period from 24 hours ahead, to be available within 30 minutes of the contingency event; down to real time to cover against uncertainties in generation availability and mismatch between load and generation, and against both weather forecast and demand forecast errors.
Contracted Capacity	SDC 1	In relation to a CDGU with a PPA, the Normal Full Load (NFL) Capacity of the CDGU which is set out in the Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA) for that CDGU, as that Normal Full Load (NFL) Capacity which may be amended from time to time in accordance with the Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA).
Contracted Capacity (Peak)	SDC	In relation to a gas turbine PPA CDGU, the figure (expressed in MW) specified as such in the relevant Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA).
Contracted Generation Scheduling and Dispatch Parameters (GSDPs)	SDC 1	In relation to a CDGU with a PPA, the values of GSDPs which are identical to those parameters set out in a Schedule to the Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA) for that CDGU, which are those referred to as "Contracted Operating Characteristics", as those values, which can be amended from time to time in accordance with the Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA). In the case of an EC CDGU (Externally Connected), the values of GSDPs which are identical to the parameters set out in the relevant Inter-connection Agreement and

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ITEM	Sub-Code	DEFINITION
Frequency Control	SDC	The control of the frequency on the NTDC System by the System Operator.
Frequency Deviation	SDC	A measure of frequency error, from the declared/Target System Frequency, accumulated over a period of time.
Frequency Regulation	SDC	The, mechanism through which the system's frequency is maintained within the allowable limits as specified in the Grid Code (OC 4.8) and NEPRA Performance Standards (Transmission)-Rules.
Frequency Sensitive Mode	OC 4.8	The operation of a Generator whereby its generation level is varied automatically to compensate for variations in the frequency of the NTDC System in the Frequency Sensitive Mode (49.8-50.2 Hz).
Frequency Transient	SDC	For the purposes of Operating Code and Metering & Protection Code, a period when the NTDC System Frequency is below 49.5 Hz (Tolerance Frequency Band).
Fuel Rate	SDC 1	Has the meaning ascribed to that term in the relevant Generator's Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA) as applicable.
Full Load	SDC	Highest value of load specified for rated conditions of operation.
Fully Available	CC 5.4	In relation to a CDGU or a Range, means Available to the CDGU's Contracted Capacity (or full output in the case of an EC CDGU).
Generating Plant	SDC 1	A Power Plant subject to Central Dispatch.
Generating Unit	SDC 1 CC	One of the Units of a Generator in a Generating Plant/Station producing electric power and energy.
Generating Unit Work Unit	SDC 1	Auxiliary consumption of an individual Generating Unit of a Generator.
Generation Offer Prices	SDC	A set of prices submitted by a Generator in respect of each of its dispatch units specifying. 1. A Start-up Price (expressed in Rupees) 2. A No-Load Price (expressed in Rupees per Hour) 3. A Maximum Generation Price (a positive value expressed in Rupees per MWh).
Generation Prices	SDC	A set of prices for each CDGU with PPA calculated by relevant division of NTDC from the relevant Power Purchase Agreement (PPA) and the Fuel Rate calculated in accordance with the Power Purchase Agreement (PPA).
Generator	CC SDC 1, 3	An Entity who is involved in generation business under a Generation License granted by NEPRA.
Generator Performance Chart	SDC 1 Appendix A	A diagram which shows the MW and MVAr capability limits within which a Generator is expected to operate under steady-state conditions in the format set out in the Grid Code.
Generator Transformer	SDC	The main transformer for a CDGU through which power passes from the Generating Unit to the NTDC System.
Governor	CC 5.4	A mechanical device used to automatically regulate the speed of a turbine of electric generator.

The Terms Not Contained here have been Defined in Various Applicable Documents of NEPRA and listed as Annexure–A (attached).

ITEM	Sub-Code	DEFINITION
Governor Droop	SDC 1 Appendix A & B	In relation to the operation of the governor of a Generating Unit, the percentage droop in system frequency which would cause the Generating Unit under free governor action to change its output from zero to full load.
Grid Entry Point	SDC	A point at which a Generator connects to the NTDC System.
Grid Exit Point	SDC	A point at which electricity may be delivered from the NTDC System to a Bulk Power Consumer, Distribution Company or to a Tie-line or to Externally-connected Parties/Consumers.
GSDP Notice	SDC 1 Appendix B	A Notification given by a Generator to NTDC stating the GSDPs of a CDGU to apply for the next following Schedule Day which, if given by not later than the Notice Submission Time, shall be in the form set out in Appendix B to SDC1 or in such other form as NTDC/System Operator may reasonably notify to each Generator from time to time, and which, if given after the Notice Submission Time, shall be in the form set out in Appendix C to SDC1 (which is headed "GSDP Revision Notice") or in such other form as NTDC may reasonably notify each Generator from time to time.
Half Hour	OC 4	Means any 30-Minute period ending on the Hour or Half Hour
Hot Standby	SDC	A condition of readiness to be able to synchronize and attain an instructed output in a specified time period that must be maintained by Generator.
IGCEP	OC	Indicative Generation Capacity Expansion Plan
Incidents	OC 8	An event of external or internal origin, affecting equipment or the supply system, and which disturbs the normal operation of the System.
Incremental Price	SDC 1 Appendix G	The marginal price (i.e. incremental price for each MWh produced) between zero and Normal Full Load (NFL) Capacity of a Generator.
Independent Generating Plant	SDC	A Generator not owned by any public sector entity which may or may not be subject to Central Dispatch.
Independent Power Producer (IPP)	PC 3	A private power generating company not owned/ controlled by any public sector organization but subject to Central Dispatch.
Initial Response Instructor	SDC	The device by which NTDC can issue a signal by way of dispatch relating to the loading of CDGUs from the National Power Control Centre (NPCC) to the Generators.
Instrument Transformer	SDC	A transformer intended to transmit an information signal to measuring instruments, meters and protective or control devices. The term "instrument transformer" encompasses both current transformer and voltage transformers.
Inter tripping Scheme	PMC	The tripping of circuit-breaker(s) by signals initiated from protection at a remote location independent of the state of the local protection.

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ITEM	Sub-Code	DEFINITION
Isolation Device	PMC	A device for achieving electrical Isolation.
Load	SDC 1 CC 4.2, 5.4	The Active, Reactive or Apparent Power as the context requires to be generated, transmitted or distributed.
Load Curve	SDC	The curve that represents the behavior of the MW load during a particular study period.
Load Curves of Daily Peaks	SDC	The graphical representation of daily peak MWs of an electric power entity over a given study period.
Load Factor	SDC	Is the relation between the average Load Demand of an established period with regard to the maximum Load Demand for the same period.
Loss of load probability (LOLP)	PC 4	Loss of Load Probability, the percentage of time that the system capacity is inadequate to meet load demand.
Low Frequency Disconnection	SDC	The process, a part of load reduction or management, of load disconnection (manually or automatic) under low frequency system conditions.
Low Frequency Initiated Response	SDC	A capability of a Generator to respond to low system Frequency Transient to initiate its Primary and Secondary responses to help correct and maintain permissible system frequency limits as contained in the Grid Code (OC 4.8 of Operating Code) and approved by the Authority.
Major Event	SDC	An Event which either: (a) was notified by a User To NTDC which NTDC considers that has had a or may have had a significant effect on the NTDC Transmission System, and NTDC requires the User to report that Event in writing and notifies the User accordingly; or (b) was notified by NTDC to a User, and which that User considers that has had or may have had a significant effect on that User's system, and that User requires NTDC to report that Event in writing and notifies NTDC accordingly.
Maximum Continuous Rating (MCR)	CC, PC, SDC	The normal Full Load MW Capacity of a Generator, which can be sustained on a continuous basis under specified conditions.
Maximum Demand	PC Appendix A	Maximum electrical power (MW and MVAR) used and registered in a specified time period.
Merit Order Price Set	SDC 1	A price set consisting of an Incremental Price and No-load Price in relation to a particular designated declared fuel.
Merit Order Ranking	SDC	The order at which all the Generators participating in the Central Dispatch are ranked by the System Operator based on their Merit Order Price Set for the purpose of Scheduling and Dispatch. The ranking order is from lowest to the highest cost, the lowest cost being the first ones to be dispatched.
Metering Data	SDC	Information on measured electrical quantities recorded in the meter register, such as energy, demand and power factor, including time and date.
Metering Equipment	SDC	Ensemble of instruments for the purpose of measuring electrical quantities which includes Meter, CTs and PTs

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ITEM	Sub-Code	DEFINITION
Minimum Generation	SDC 1 Appendix A	The minimum MW output, which a Generator can generate continuously, registered with NTDC under SDC1 as a Generating Station Dispatch Parameter (GSDP).
Minimum Demand Regulation or MDR	SDC 1	Means minimum level of Active Power of a Generator, which is sufficient to provide an adequate regulating margin for necessary Frequency Control.
Monitoring Notice	SDC	A Notice issued by NTDC to a Generator informing the Generator that NTDC is monitoring one of its CDGUs.
Multiple Connection Point	CC	More than Single Connection Point, interconnected to each other through the User's System.
Network Operator	CC 5.4	An Entity, which operates and manages an electrical power (transmission or distribution) network.
NFL Capacity	SDC	The Normal Full Load (NFL) Capacity of a CDGU (expressed in MW and stated, where relevant, in relation to a Designated Fuel) to generate electricity (using, where relevant, the Designated Fuel), determined at the Generator terminals.
No-Load Price	SDC 1	That component of the generation prices of a CDGU (expressed in Rupees/hour of operation of the CDGU) which relates to the operation of the CDGU at "No Load: but which is applicable to all levels of output of that CDGU.
Nominal or Nameplate Power	SDC	The rated power output specified by the manufacturer of a given electrical equipment.
Nominal System Voltage (Rated Voltage)	OC 4	As defined in NEPRA Rules on Performance Standards (Distribution) or other NEPRA applicable documents.
Notice to Synchronize	SDC	The amount of time (expressed in minutes) that is declared by a Generator in relation to a dispatch unit to enable it to be synchronized following the receipt of an Instruction to synchronize with the NTDC system.
Notification	SDC	The daily submission Notice of Availability by Generators to the System Operator for dispatch purposes.
NTDC Calendar Year	Grid Code	1st January-31st December of a given year.
NTDC Site	CC 4.5 & 5.4	Means a site of inter-connection owned by NTDC or by a User but occupied and managed by NTDC.
NTDC System Demand	PC Appendix A	i. The amount of electricity to be supplied from the Grid Supply Points (Entry or Exit) plus to be supplied by Embedded Generating Plant plus NTDC Transmission System Losses less the output of directly-connected Independent Generating Plants. ii. Demand on the Total System less the output of Independent Generating Plants.
Open Access	CC 5.4	Provision of connection and non-discriminatory "Use" of the transmission, sub-transmission and distribution network of a licensee.
Operating Margin	SDC 1 & OC 5	Sum of Contingency Reserve and Operating Reserve as defined in OC 5.2.
Operating Reserve	SDC	The additional output from Generators which must be realizable in real-time operations to respond in order to

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ITEM	Sub-Code	DEFINITION
		contribute to correcting and containing any system frequency fall to an acceptable level after the loss of generation or loss of import from an External Interconnection or mismatch between generation and Load Demand.
Optimum Dispatch (Final Dispatch)	SDC	The dispatch with due regard to both economic and technical conditions represents the optimum dispatch.
Out of Band VAR	SDC	Reactive power supplied by a Generator operating outside of its rated power factor.
Outage	SDC 1 Appendix B	a. In relation to a CDGU/Generator, a total or partial reduction in Availability in connection with the repair or maintenance of the CDGU or any associated power plant equipment, or resulting from a breakdown or failure of the CDGU or any associated power plant equipment. b. In relation to NTDC, the removal for repair or maintenance, or as a result of failure or breakdown, of any part of the NTDC System. c. Means the state of a component when it is not available to perform its intended function due to some event directly associated with that component. An outage may or may not cause an interruption of service to customers, depending on system configuration.
Outage Notice	SDC	A Notice submitted by a Generator under OC4 notifying NTDC of an Outage.
Output	CC 5.4 SDC 1 Appendix A	The actual output at the main generator terminals of a CDGU (in MW) derived from data measured pursuant to this Grid Code.
Overburn Contracted Capacity	SDC	In relation to a CDGU, which is capable of firing one or two different Designated Fuels, the figure expressed in MW, measured at the Generator terminals identified in a Schedule to the relevant Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA) as "Overburn Contracted Capacity".
Part Load	SDC	A Generator which is loaded but is not running at its declared Availability.
Partial Collapse	SDC	Breakdown of the electrical system due to a failure or contingency that affects a particular area or region of the country and is limited to that area or region only.
Partial Shutdown	SDC 1	The situation existing when all generation has ceased in a particular part of the Total System; and there is no electricity supply from External Interconnections or other parts of the Total System to that particular part of the Total System and, therefore, that particular part of the Total System is shutdown; with the result that it is not possible for that particular part of the Total System to begin to function again without NTDC directions relating to a Black Start.
Peak Capability	SDC	In relation to a gas turbine CDGU, the capability of the

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ITEM	Sub-Code	DEFINITION
		CDGU (expressed in MW) to generate electricity in excess of its Contracted Capacity determined in accordance with the relevant Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA).
Plant	CC 4.4 & 5.4 SDC 1 Appendix A	Fixed and movable equipment used in the generation, transmission and distribution of electricity.
Plant Factor	DRC	The relation of the total actual generation to the generation that may have been produced if the unit had operated in a continuous manner to its Normal Full Load (NFL) Capacity.
Point of Connection	CC 5.4	An electrical Connection Point between the NTDC bulk power transmission system and a User's/Code Participant System as defined in OC 4.2 of the Grid Code.
Power Line Carrier (PLC)	OC 6	Communications system of radio frequency generally under 600 kHz, which transmits information using high voltage transmission lines.
Power Plant	SDC 1 Appendix A & B CC 1	An installation comprising one or more Generating Units owned and controlled by the same Generator.
Power Purchase Agreement (PPA)	SDC 1	Power Purchase Agreement is between the Seller ("Generator" in this case) and the Buyer [licensed distribution companies, Bulk Power Consumers whether directly or indirectly connected to the NTDC's bulk transmission system and other Persons as stated in DRC 1.2 (d)], other externally-connected Parties and Consumers, for the purpose of purchase of electric power and energy. The Power Purchase Agreement mayl contain operational, control, dispatch, outage and maintenance procedures and requirements of the power station, technical limits, GSDPs, Generation Performance Charts, and other Generator data requirements stated in various sub-codes of this Grid Code or it may refer to the Grid Code for such requirements.
Power Station Operation & Dispatch Agreement (PSODA)	SDC 1	Not withstanding anything contained in the PPA between a Generator and Purchaser of electric power and energy, each Generator having a bilateral contract shall have in place, at all times, a Power Station Operation & Dispatch Agreement (PSODA) with NTDC for the purposes as follows: The PSODA shall contain operational, control, dispatch, outage and maintenance procedures and requirements of the power station, technical limits, GSDPs, Generation Performance Charts, and other Generator data requirements stated in various sub-codes of this Grid Code.

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ITEM	Sub-Code	DEFINITION
Power Station	SDC 1	Power Station means Power Plant in this Grid Code.
Power System Stabilizer (PSS)	CC	Equipment controlling the exciter output via the voltage regulator in such a way that power oscillations of the synchronous machines are dampened. Input variables may be speed, frequency or power (or a combination of these).
Preventive Maintenance	OC 4, SDC 1	Is the periodic maintenance performed on the equipment to avoid the occurrence of possible unplannned failure or outages.
Primary Response	SDC	The automatic response to NTDC system frequency changes released increasingly with time over the period 0 - 3 seconds and 3-10 seconds from the time of frequency change, and fully available within these time scales and achieving its maximum value within 10 seconds following a frequency fall and subject to the agreed Unit Load Controller adjustment where applicable and must be sustainable for upto 30 seconds.
Protection and Control	PMC	The provisions for detecting faults or other abnormal or emergency conditions in a power system. For enabling fault clearance, for terminating abnormal or emergency conditions, and for initiating signals or indications.
Reactive Power	CC 5.4 SDC 1	The product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive and standard multiples thereof i.e. 1000Var = 1kVAr 1000kVAr = 1MVAr 1000MVAr = 1GVAr
Reactive Reserve	SDC	The MVAR reserve on the on-line Generators (difference between MVAR capability at the output MW level at a given time and actual MVAR produced).
Real Time Operation	OC 4	Operation performed by NTDC through the SCADA monitoring system.
Registered Capacity	PC Appendix A	The Normal Full Load (NFL) Capacity of a Generator in MW measured at the Generator terminals.
Regulating Margin	SDC	The margin of generating capacity over Demand which is required in order to maintain frequency control.
Remote Terminal Unit (RTU)	OC 6	A part of the SCADA system. It is a set of electronic devices that collects and transmits data to, and receives and executes the commands from the master unit.
Reserve Characteristics	SDC	The MW level of reserve required at any given MW output of a CDGU as set out in the Sustained Load Diagram which is a part of the Grid Code or Power Purchase Agreement (PPA)/Power Station Operation and Dispatch Agreement (PSODA).
Revenue Metering	SDC 1	Metering used to measure the demand and energy at a specific point in the system upon which an invoice will be prepared and payments shall be made between power supplier and User.
Safety Coordinator	CC	A Person or Persons nominated by NTDC and each User to be responsible for the co-ordination of Safety Precautions at each Connection Point when work (which includes testing) is to be carried out on a System

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ITEM	Sub-Code	DEFINITION
		which necessitates the provision of Safety Precautions on HV Apparatus
Schedule Day	SDC 1 Appendix A	The period from 0000 hours until 2400 hours on the same day.
Scheduling	SDC	The process of compiling a Generating Schedule as set out in SDC1, and the term "Scheduled" and like terms shall be construed accordingly.
Second-tier Users	CC	The Users having bilateral contracts with another licensee through the NTDC transmission system for acquiring power.
Secondary Response	CC 3	It is the increase in active power output of the online generators or reduction in active load demand that can be increasingly applied in the short-term following the fall in frequency available within the time scale of 10-30 seconds after achieving its maximum value within 30 seconds following the fall in frequency, subject to agreed Unit Load Controller Adjustments where applicable, and must be sustainable for 30 minutes following the fall in frequency.
Short Term Planned Maintenance Outage or STPM Outage	SDC	An Outage designated as an STPM Outage, the duration of which shall not, unless NTDC in its absolute discretion agrees, exceed 72 hours but not including any overrun of such Outage.
Single Line Diagram	PC Appendix A	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.
Single Point of Connection	CC	A single Point of Connection, with no interconnection through the User's System to another Point of Connection.
Site Common Drawings	CC 4.4	Drawings prepared for each Connection Site which incorporate Connection Site layout drawings, electrical layout drawings, common protection/ control drawings and common service drawings.
Spinning Reserve	SDC 1	As defined in OC 5.2 of this Code which is available within 10 minutes of the initial frequency fall.
Standing Instruction	SDC	An Instruction for a specified action notified to a Generator in advance by NTDC whereby, when the specified circumstances arise, the Generator will take the specified action as though a valid Instruction had been issued by NTDC. This shall include: a) The date on which an Outage is to begin. b) The time at which an Outage is to begin.
Start-Up	SDC 1 Appendix A	The action of bringing a Generator from shutdown to synchronous speed.
Start-up Price	SDC	That element of the generation prices for a CDGU which relates to the start-up of the CDGU.
Station Transformer	PC 2.1	A transformer supplying electrical power to the auxiliaries of a Generator, which is not directly

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ITEM	Sub-Code	DEFINITION
		connected to the Generator terminals.
Subsequent Schedule	SDC 1	A Schedule prepared subsequent to the Generation Schedule following a re-optimization of that Generation Schedule or another Subsequent Schedule, within the applicable Control Phase time scale.
Sustained Load Diagram	SDC 1	A Schedule setting out the Sustained Response Capability of a CDGU annexed to the Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA) for that CDGU and submitted to NTDC pursuant to the Planning Code.
System	Grid Code	Bulk power transmission system of NTDC.
System Constrained Capacity	PC Appendix A	That portion of transmission capacity which is not available due to a system or transmission constraint.
System Energy Requirements	OC 2	Total MWhr requirements of the entire NTDC system which is based on summation of all the measured energy on all the Connection Points of the NTDC system with its Users consuming electric power.
System Fault Dependability Index (DP)	PMC	A measure of the ability of Protection to initiate successful tripping of circuit breakers, which are associated with a faulty item of Apparatus. It is calculated using the formula: DP = 1 - F1/A Where: A = Total number of system faults F1 = Number of system faults where there was a failure to trip a circuit breaker.
System Operating Voltage	OC 4.9	Bus Voltage as a percentage of the Nominal System Voltage of the Total System during normal system operation (including both normal and contingency operating conditions but excluding transient and abnormal system conditions).
System Margin	OC 5	The Margin in any period between (i) Offered Availability and (ii) The sum of Forecast Demand and the Operating Margin, for that period.
System or Transmission Constraint	OC, PC, SDC 1	A limitation on the Use of Transmission System due to lack of transmission capacity or other system conditions.
Target System Frequency	OC 4	Freqeucny Levels of the NTDC bulk transmission system as stated in this Grid Code for the normal steady-state operation of the NTDC bulk supply tranmission system as contained in the Opeating Code (OC 4.8)
Target Voltage Levels	OC 4.9	Voltage limits for the normal and contingency operation of the NTDC bulk supply transmission system as contained in the Operating Code (OC 4.9).
Technical Parameters	Code Management	Such parameters which define the design and operation of the electrical system and its facilites that are owned/operated by NTDC.
Telemetering	OP 6, OP 7, CC	A process in which measurements are made at some remote location and the results are transmitted through telecommunication facilities. The transmission of the values of measured variables using telecommunication techniques is also called telemetering.

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ITEM	Sub-Code	DEFINITION
Temperature Adjusted Peak Capability	SDC	In relation to a gas turbine CDGU, the Peak Capability adjusted by the temperature correction factor in accordance with Schedule to the relevant Power Purchase Agreement (PPA)/Power Station Operation & Dispatch Agreement (PSODA).
Thermal Efficiency	SDC 1	Is the quantity of BTU's required for the fuel to generate a kWh of electrical energy.
Thermal Loadings	OC 4	Electrical loadings (MW/MVAR) of the electrical transmission facilites of NTDC bulk supply system.
Tolerance Frequency Band	SDC & OC 4	Protected periods of operation of the system at the frequency in the range of 49.5 Hz – 50.5 Hz as defined in OC 4.8.
Total Collapse	OC 8	Breakdown of the national interconnected electrical system due to a failure or severe contingency that causes the interruption of the electrical services of the entire system.
Total Harmonic Distortion	CC	The departure of a waveform from sinusoidal shape, that is caused by the addition of one or more harmonics to the fundamental, and is the square root of the sum of the squares of all harmonics expressed as a percentage of the magnitude of the fundamental.
Total Shutdown	OC 8	The situation existing when all generation of the system has ceased resulting in the shutdown of the power system, that it is not possible for the power system to begin to function again without NTDC directions relating to a Black Start.
Total System	Grid Code	Bulk power transmission system of NTDC.
Transmission Connected Consumers	CC 1 & CC 5.4	A consumer receiving electricity directly from the NTDC Transmission system irrespective of the supplier of electrical power and energy.
Transmission Connection Point	SDC	A point at which a User's or Code Participant's Plant and /or Apparatus connects to the bulk power transmission system of NTDC.
TSEP	OC	Transmission System Expansion Plan
Unit Control Board	SDC	A switchboard through which electrical power is supplied to the auxiliaries of a Generator and which is supplied by the station transformer. It may be interconnected with the station main control board.
Unit Load Controller	SDC	A device which regulates the generation level when the Generator is operating in Frequency Sensitive Mode to ensure (as far as possible) that it does not exceed or fall short of acceptable limits as set in the Grid Code (OC 4.8) and NEPRA Performance Standards (Transmission)-Rules.
Unit Load Controller Response Time Constant	SDC	The time constant expressed in units of seconds, of the power output increase that occurs in response to a step change in system frequency.
Unit Nomination	SDC 1 Appendix G	In relation to a Generator means the Unit Nomination and covered in SDC 1.4.2.3.C submitted day ahead by each Generator.
User	CC1	A term used to refer to the Code Participant or Person to

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ITEM	Sub-Code	DEFINITION
		whom the Grid Code applies; who is directly or indirectly connected and using the bulk transmission network of NTDC for the purposes of acquisition, transmission, distribution, and/or consumption of electrical power and energy.
User Site	CC 4.4	A site owned (or occupied pursuant to a lease, licence or other agreement) by a User in which there is a Connection Point. For the avoidance of doubt, a site owned by NTDC but occupied by a User as aforesaid, is a User Site.
User System	CC 1	Any system owned or operated by a User comprising: (i) Generator; or (ii) Electrical systems consisting (wholly or mainly) of electric facilities used for the transmission or distribution of electricity from Connection Points onwards. The User system includes any sub-transmission assets operated by such User or other Person, and any plant and/or apparatus and meters owned or operated by the User or other Person in connection with the transmission, distribution and delivery of electric power but does not include any part of the NTDC bulk power transmission system.
Voltage Regulation	OC 4.9	Is the process that is used to control the System Operating Voltage, and maintain it within the tolerable limits as specified in OC 4.9 of the Grid Code.
Warning Notice	SDC	A Notice issued by NTDC to a Generator pursuant to the Operating Code informing the Generator that it has failed to comply with a Dispatch Instruction.

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
APPROVED BY THE AUTHORITY
NEPRA

(Annexure-A)
DEFINITION

Sr. No.	Item	Definition	Reference
1.	Act	Means the Regulation of Generation, Transmission and Distribution Electric Power Act, 1997 (XL of 1997).	Application and Modification Procedure Rules-1999
2.	Affiliate (a) Control (b) Ownership	In relation to any person, means any person who owns or controls, or is owned or controlled by, or is under common ownership or control with, the person, and for that purpose of this definition. Means the right, power or ability to influence or determine any decision in respect of the conduct of affairs of the person under control. Means the ownership or the right to own the shares or voting securities of the persons owned.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999 Transmission Licence to NTDC
3.	Agreement and Agreements	Means the fuel Supply Agreement, the Implementation Agreement, the Power Purchase Agreement and any or all them.* * Security Package * Project Co-ordination Agreement	Generation Licence to IPP
4.	Ancillary Services	Means the services ancillary o incident to the safe, reliable, stable and efficient availability and utilisation of electrical energy and net capacity and include without limitation, the following, namely:- (a) energy imbalance service; (b) spinning reserve service; (c) supplemental reserve service; (d) reactive supply voltage control service; and (e) regulation and frequency response service.	Licensing Rules (Generation) 1999 Transmission Licence to NTDC
5.	Applicable Documents	Means the distribution licence, the second-tier supply authorisation, NERPA rules and regulations, the grid code, the distribution code and any documents issued under any of the foregoing or pursuant to the exercise of the Authority's powers under the act, in each case of a binding nature applicable to the Licensee or where applicable, to its affiliates and to which the Licensee or any of its affiliates may be subject.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999 Transmission Licence to NTDC
		Means the rules and regulations issued in pursuance of the Act by the Authority, from time to time, relating to the generation, distribution and transmission licenses, the grid and distribution codes and any documents, instruments, approvals or authorizations issued or granted by the Authority in exercise of its power under the Act	Feel Rules 2002
6.	Applicant	Means any person who applies for a distribution licensee for provision of electric power service or modification thereof..	Eligibility Criteria for Consumers of Distribution Companies 2003
7.	Application	Means an application made by a person in accordance with the provisions of these regulations and shall, where the context so admits, include the documents-in-support, and "application" shall be construed accordingly.	Application and Modification Procedure Rules-1999
8.	Auditors	Means the licensee's auditors for the time being	Licensing Rules (Distribution) 1999;

APPROVED BY THE AUTHORITY

Sr. No.	Item	Definition	Reference
		holding office in accordance with the requirements of the Companies Ordinance, 1984 (XLVII of 1984), or such other auditors as may be appointed in respect of the licensee by the Authority from time to time in accordance with these or the distribution/generation licence.	Licensing Rules (Generation) 1999
9.	Authorised/Authorized	Means in relation to any matter, authorised in writing by the Authority.	Licensing Rules (Distribution) 1999
10.	Authorised Electricity Operator	Means any person other than the Licensee, who is authorised by the Authority through a licence or otherwise for the purpose of using the Licensee's transmission system.	Transmission Licence to NTDC
11.	Authority	Means the National Electric Power Regulatory Authority constituted under section 3 of the Act.	Transmission Licence to NTDC
12.	Authority Proposed Modification	Means a modification to a licence proposed by the Authority.	Application and Modification Procedure Rules-1999
13.	Authorized Officer	Means the authorized by the Authority to perform functions under these Regulations.	NEPRA Service Regulations 2003
14.	Available	Means a generating unit or tie-line transfer that is both (a) available in accordance with the Grid Code and (b) declared as available for the generation of electricity.	Transmission Licence to NTDC
15.	Average Energy Charge	For the purpose of Article 23 means energy charges calculated on the basis of the average of the month uniformly for the 24 hour period of each day of the month.	Transmission Licence to NTDC
16.	Balancing Services	For the purpose of Article 8 means services to be rendered under a balancing arrangement for the purpose of bilateral contracts for dispatching plants, access to additional generation for system needs and establish a price for each operating time period at which differences between contractual and real time positions are settled.	Transmission Licence to NTDC
17.	Bulk Power Consumer (BPC)	Means in respect of and within the Service Territory, such consumer who receives or purchases, electric power in the amount, voltage level and frequency equal to or grater than the characteristics of supply set out in the distribution licence, provided that, the Authority may change he characteristics o supply for bulk-power consumers located within the Service Territory at the time and in the manner set out in the distribution licence.	Licensing Rules (Distribution) 1999
		Means a consumer who purchases or receives electric power, at one premises, in an amount of one megawatt or more or in such other amount and voltage level and with such other characteristics as the Authority may determine and the Authority may determine different amounts and voltage levels and with such other characteristics for different areas.	NEPRA Act 1997
18.	Capacity Charge	For the purpose of Article 23 means monthly capacity charge for the distribution companies, proportional to the maximum demand recorded at each metering points on the basis of a per kW demand charge determined by dividing the total capacity transfer charge by the summation of the peak demand of each distribution company recorded at feed points.	Transmission Licence to NTDC
19.	Common Distribution System	Means the distribution system as defined in the distribution licence other than the dedicated distribution	Eligibility Criteria for Consumers 2

Sr. No.	Item	Definition	Reference
		system.	Distribution Companies 2003
20.	Communication	Means any information, comment, representation, pleadings, correspondence, or evidence filed with the Registrar, the presiding officer or the Authority in connection with any proceedings.	Tariff Standards and Procedures Rules 1998
21.	Competent Authority	Means the Authority, the appointing authority or any officer/senior employee of NEPRA who is designated by the Authority to exercise the powers of the Competent Authority.	NEPRA Service Regulations 2003
22.	Competitive Market Operation Date (CMOD)	Means a date on which the first competitive trading period of a bilateral contracts market shall commence.	Transmission Licence to NTDC
23.	Concession Territory	Means the territory outside the Service Territory of the licensee defined by the administrative/geographical boundaries as delineated in Schedule-I to this Licence.	Distribution Licence
		Means the territory outside the Service Territory of the distribution licensee defined by the administrative/geographical boundaries as delineated in a distribution licence.	Eligibility Criteria for Consumers of Distribution Companies 2003
24.	Connecting Point	For the purposes of this Consumer Eligibility Criteria means the point where the dedicated distribution system of the applicant is connected with the existing common distribution system.	Eligibility Criteria for Consumers of Distribution Companies 2003
25.	Connection	Means the provision of electric power supply services.	Performance Standards (Distribution) Rules 2003
26.	Connection Charges	Means the charges made or levied or to be made or levied for the carrying out of works and provisions and installation of electrical plant, electric lines and circuits and ancillary distribution system together with charges in respect of maintenance and repair of such items in so far as not otherwise recoverable as use of system charges and in respect of disconnection and the removal of electrical plant, electric lines and circuits, and ancillary meters following disconnection, or such, other charges as may be specified in or pursuant to the distribution licence.	Licensing Rules (Distribution) 1999
		Means the charges made or levied or to be made or levied for carrying out works for the installation and maintenance of licensee interconnection facilities.	Licensing Rules (Generation) 1999
27.	Consents	Means all permissions or approvals required from any public sector entity.	Licensing Rules (Distribution) 1999 Transmission Licence to NTDC
		Means all permissions, approvals or consents required by the licensee from any public sector entity for the purposes of the distribution business.	Licensing Rules (Generation) 1999
28.	Consumer	Means a person or his successor-in-interest who purchases or receives electric power for consumption and not for delivery or re-sale to others, including a person who owns or occupies a premises where electric power is supplied.	NERPA Act 1997
29.	Consumer Eligibility Criteria	Means the criteria for the eligibility of consumers to obtain supply of electric power developed by the Authority.	Licensing Rules (Distribution) 1999
30.	Consumer Service	Means the manual of instructions developed by the	Licensing Rules (Distribution) 1999

Sr. No.	Item	Definition	Reference
	Manual	licensee and approved by the Authority detailing instructions and guidance to the consumers other than bulk-power consumers occupying domestic, agricultural, industrial or commercial premises for obtaining electric power distribution services, as more fully described in rule 9.	
31.	Core Business	Means each of the transmission business and tie-line business.	Transmission Licence to NTDC
32.	Cost per Unit of Energy	For the purpose of Article 20 means the cost per kilo watt-hour (kWh) of electricity as determined and verified by an independent assessor.	Transmission Licence to NTDC
33.	Dedicated Distribution System	Means that part of the distribution system, required to supply power for the sole consumption of an applicant and not for supplying power to any other consumer and shall comprise of the distribution system from the connecting point upto the interconnection point of the applicant including the metering and service wire and such other connection arrangements.	Eligibility Criteria for Consumers of Distribution Companies 2003
34.	Dispatch	Means the issuance of instructions to the licensee by the national grid company, the relevant national power control center or any other entity established under the pooling and settlement arrangement, as may be decided from time to time in this regard by the Authority, to schedule and control the operation of the generation facilities in order to make available or commence, increase, decrease or cease the delivery of electric power or the ancillary services, in accordance with the applicable documents.	Licensing Rules (Generation) 2000
35.	Distribution	Means the ownership, operation, management or control of distribution facilities for the movement or deliver or sale to consumers of electric power but shall not include he ownership, operation, management and control of distribution facilities located on private property and used solely to move or deliver electric power to the person owning, operating, managing and controlling those facilities or to tenants thereof.	NEPRA Act 1997
36.	Distribution Business	Means the business of distribution of electric power carried on or to be carried on by the licensee pursuant to and in accordance with the terms of the distribution licence granted to the licensee.	Licensing Rules (Distribution) 1999
37.	Distribution Code	Means the distribution code referred to in rule 15.	Licensing Rules (Distribution) 1999
38.	Distribution Company	Means a person engaged in the distribution of electric power.	NEPRA Act 1997
39.	Distribution Facilities	Means electrical facilities operating at the distribution voltage and used for the movement or delivery of electric power.	NEPRA Act 1997
40.	Distribution System	Means the distribution facilities situated within the Service Territory owned or operated by the licensee for distribution of electric lines or circuits, electric plant, meters, interconnections facilities or other facilities operating at the distribution voltage, and shall also include any other electric lines, circuits, transformers, sub-stations, electric plant, interconnection facilities or other facilities determined by the Authority as forming part of the distribution system, whether or not operating at the distribution voltage.	Licensing Rules (Distribution) 1999
41.	Distribution Voltage	Means any voltage below the minimum transmission	NEPRA Act 1997

Sr. No.	Item	Definition	Reference
		voltage.	
42.	Document-in-Support	Means the documents to be provided with the application for the licence of subsequently, in accordance with regulation 3.	Application and Modification Procedure Rules-1999
43.	Economic Dispatch	Means system of establishing economic precedence of electric power from available generating units or tie-line transfers directed by the Licensee or any other entity established under competitive trading arrangements. Means the allocation of demand to individual generation plants or units to effect the most economical production of electricity for optimum system economy, security and reliability with due consideration of incremental generation costs, incremental power purchase costs, incremental transmission and distribution losses, load flow considerations and other operational considerations as determined solely by the national grid company, the relevant national power control center or any other entity established under the pooling and settlement arrangement, as the Authority may, from time to time in this regard, decide.	Transmission Licence to NTDC Licensing Rules (Generation) 1999
44.	Electric Power	Means electrical energy or the capacity for the production of electrical power.	NEPRA Act 1997
45.	Electric Power Services	Means the generation, transmission or distribution of electric power and all other services incidental thereto.	NEPRA Act 1997
46.	Emergency	Means cases where the patient requires immediate medical attention and any delay may be detrimental to his/her health.	NEPRA Service Regulations 2003
47.	Encumbrance	Means any mortgage, charge, right of possession, assignment by way of security, right of possession or other form of security interest.	Transmission Licence to NTDC
48.	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.	Licensing Rules (Generation) 1999
49.	Financial Year	Means a consecutive period of twelve calendar months commencing on the first day of July o any year and ending on the 30th day of June of the following year.	Fee Rules 2002
50.	Fuel Supply Agreement	Means the Fuel Supply Agreement dated_____ as mentioned, modified, updated, revised or restated between the Licensee and the Fuel Supplier thereof.(i)	Generation Licence to IPP
51.	Generation	Means the ownership, operation, management or control of generation facilities for delivery or sale of electric power and not solely for consumption by the person owning, operating, managing, and controlling those facilities.	NERPA Act 1997
52.	Generation business	Means the business of availability and provision of electric power or ancillary services or other related business through the construction, ownership, management, control or operation of the generation facilities or the licensee interconnection facilities carried out, or to be carried out, by the licensee, whether itself or through an agent or sub-contractor approved in this behalf by the Authority, pursuant to and in accordance with the terms of the generation licence granted to the licensee and, where applicable, includes the second-tier supply business carried out by the licensee.	Licensing Rules (Generation) 2000
53.	Generation company	Means a person engaged in the generation of electric power.	NEPRA Act 1997

Sr. No.	Item	Definition	Reference
54.	Generation facility	Means the electrical facility used for the production of electric power.	NEPRA Act 1997
55.	Glossary of Standards	Means as provided in Schedule-I of Performance Standards (Distribution) Rules 2003	Performance Standards (Distribution) Rules 2003
56.	Grid Code	Means the grid code prepared by the national grid company or in the absence of the national grid company by the transmission licensees pursuant to the transmission licenses and approved by the Authority, as from time to time revised with the approval of the Authority. Means the grid code prepared by the national grid company with the approval of the Authority.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999
57.	Hydro licensee	Means a generation licensee constructing, owning, operating or managing hydel generation facilities.	Licensing Rules (Generation) 1999
58.	Implementation Agreement	Means the Implementation Agreement dated_____ as amended, modified, updated, revised or restated between the Licensee and the President of Pakistan.[iii]	Generation Licence to IPPs
59.	Incremental generation cost	Means the additional cost that would be incurred by producing the next available unit of electrical energy.	Licensing Rules (Generation) 1999
60.	Information	Includes documents, accounts, reports, records, data, returns or estimates of any description.	Application and Modification Procedure Rules-1999
61.	Information direction	Means a direction issued by the authority or the presiding officer to any person to provide information to the Authority	Tariff, Standards and Procedures 1998
62.	Inter Connection Point	Means the point where the metering installation and protection apparatus of the consumer is connected to the dedicated distribution system.	Eligibility Criteria for Consumers of Distribution Companies 2003
63.	Interconnection Facility/Facilities	Means the equipment, including, without limitation, electrical lines or circuits, transformers, switch-gear, safety and projective devices, meters or electrical plant, used for interconnection services. Means plant and equipment, including the electrical lines or circuits, transformers, switchgears, safety and protective devices or meters used for interconnection services.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999 DRC
64.	Inter-connection service	Means the connection of one company's electrical facilities to another company's electrical facilities.	NEPRA Act 1997
65.	Intervention request	Means an intervention request filed under rule 6.	Tariff, Standards and Procedures 2002
66.	KESC	Means the Karachi Electric Supply Corporation, a public limited company, incorporated under the Companies Act, 1913.	NEPRA Act
67.	kV	Means kilo-volts or 1,000 volts.	Performance Standards (Distribution) Rules 2003
68.	Laws	Include all statutes, rules and regulations made pursuant thereto, judicial decisions, administrative practices or direction having the force of law in Pakistan, in each case as may be applicable to the Licensee or its affiliates.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999 Transmission Licence to NTDC
69.	Licence	Means a licence issued for generation, transmission or distribution under this Act.	NEPRA Act 1997
70.	Licensee	Means a holder of a licence.	NERPA Act 1997
71.	Licensee interconnection	Means the interconnection facilities constructed, owned, operated or managed by the licensee.	Licensing Rules (Generation) 1999

Sr. No.	Item	Definition	Reference
	facilities		
72.	Licensee proposed modifications	Means a modification to the licence proposed by the licensee.	Application and Modification Procedure Rules-1999
73.	Licensee's investment programme	Means the licensee's investment programme referred to in rule 17.	Licensing Rules (Distribution) 1999
74.	Licensee's power acquisition programme	Means the licensee's power acquisition programme referred to in rule 12.	Licensing Rules (Distribution) 1999
75.	Load Shedding	Means the process of deliberately removing either manually or automatically pre-selected consumer's load demand from the power system as per scheduled programme on a rotating and proportionate basis for each class of consumers notified earlier by the DISCOs	Performance Standards (Distribution) Rules 2003
76.	Long Duration Power Supply Interruption	Means loss of electric supply to one or more consumers for a duration of more than three minutes.	Performance Standards (Distribution) Rules 2003
77.	Metering Installation	Means the metering and associated equipment required to be installed for recording consumption/usage of electric power of an applicant.	Eligibility Criteria for Consumers of Distribution Companies 2003
78.	Minimum transmission voltage	Means sixty-six kilovolts or such other voltage that the Authority may determine to be the minimum voltage at which electrical facilities are operated when used to deliver electric power in bulk.	NEPRA Act 1997
79.	Motion	Means any oral or, if so directed by the Authority, written application in relation to any matter of procedure under these rules.	Tariff, Standards and Procedures 1998
80.	National grid company	Means the person engaged in the transmission of electric power and granted a licence under section 17.	NEPRA Act 1997
81.	NEPRA (Fees and Penalties) rules	Means the rules developed by the Authority in respect of the payment of fees by the licensees and the procedure for imposition and payment of fines and penalties levied by the Authority.	Application and Modification Procedure Rules-1999
82.	NEPRA rules and regulations	Means the relevant rules and regulations made by the Authority under the Act.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999
83.	Net capacity	Means the aggregate of the maximum rating of the generation facilities constructed, owned, managed, controlled or operated by the licensee under its generation licence, modified for ambient limitations, which is established in the manner specified in the grid code, the generation licence or a power acquisition contract entered into by the licensee, less the capacity used to supply the auxiliary needs.	Licensing Rules (Generation) 1999
84.	NTDC	Means National Transmission and Dispatch Company	Performance Standards (Distribution) Rules 2003
85.	Operator	Means a person authorized by the distribution company to operate its electrical facilities.	Performance Standards (Distribution) Rules 2003
86.	Ordinance	Means the Companies Ordinance, 1984.	Application and Modification Procedure Rules-1999
87.	Penalty	Means a penalty, which may be imposed under these Regulations.	NEPRA Fee and Fine Rules 2002
88.	Person	Shall include an association of persons, concern, company, firm or undertaking.	NEPRA Act 1997

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89.	Petition	Means a petition made to the Authority for the determination, modification or revision of tariff	Tariff, Standards and Procedures 1998
90.	Planned Power Supply Interruption	Means planned or scheduled outage of electrical supply to one or more consumers. In the event of Planned Power Supply Interruption, notice shall be served to all affected consumers at least forty-eight hours in advance of any such planned outage excluding defense establishments where Planned Power Supply Interruptions will only be taken through mutual agreement.	Performance Standards (Distribution) Rules 2003
91.	Pleadings	Means the petition, the replies to the petition and rejoinders to replies.	Tariff, Standards and Procedures 1998
92.	Point of Outage	Means the point in the distribution system of a distribution company beyond which electric service is interrupted including without limitation: Grid station, 11 kV feeders, 400/230 volts line, and transformer.	Performance Standards (Distribution) Rules 2003
93.	Pooling and settlement arrangements	Means any arrangements implemented by or under the directions of the Authority for the spot or market based sales and purchases of electric power through an electric power exchange or other means.	Licensing Rules (Distribution) 1999
		Means the arrangements for establishing or implementing a wholesale market for the sale and purchase of electrical energy, net capacity or ancillary services under the relevant NEPRA rules and regulations.	Licensing Rules (Generation) 1999
94.	Power acquisition contract	Means a contract or other arrangement for the acquisition by the licensee, whether through sale and purchase for consideration or otherwise, of electric power including, where applicable a contract for purchase of electric power on the basis of difference in prices of electric power between the rates pursuant to the pooling and settlement arrangements and the rates determined according to the method stated in such contract.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999
95.	Power Purchase Agreement	Means the Power Purchase Agreement dated_____ as amended, modified, updated, revised or restated between the Licensee and the power purchaser thereof.[iii]	Generation Licence to IPPs
96.	Power Supply Interruption	Means loss of electric supply to one or more consumers.	Performance Standards (Distribution) Rules 2003
97.	Prescribed	Means prescribed by rules made under this Act.	NERPA Act 1997
98.	Presiding Officer	Means the presiding officer appointed by the Authority under sub-rule (5) of rule 9 and, for the purpose of these rules, where the context so admits, shall also mean the Authority.	Tariff, Standards and Procedures 1998
99.	Proceedings	Means the entire process commencing from the date of filing of petition with the Registrar or, where the authority initiates the process of determination of tariff, the date of such initiation by the Authority, and ending on the date the Authority makes its final determination on a petition, and shall include any stage during the proceedings.	Tariff, Standards and Procedures 1998
100.	Prospectus	Means a report prepared by the applicant setting out: i) a brief introduction of the applicant ii) the salient features of t	Application and Modification Procedure Rules-1999

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		iii) the facility or the system in respect of which the licence is sought; iv) the proposed investment; and v) the social and environmental impact of the proposed *facility* or system in a non-technical and *commonly* understood language.	
101.	Prudent utility practices	Means the practices of an operator of an electric power undertaking seeking in good faith to perform its obligations and in the conduct of its undertaking exercising that degree of skill, diligence, prudence and foresight which would reasonably be expected from a skilled and experienced operator and complying with the relevant Laws and codes.	Licensing Rules (Distribution) 1999
		Means the practices of an operator of an electric power undertaking seeking in good faith to perform its obligations and in the conduct of its undertaking exercising that degree of skill, diligence, prudence and foresight which would reasonably be expected from a skilled and experienced operator complying with the Laws and applicable documents.	Licensing Rules (Generation) 1999
102.	Public conveyance	Means a plane, train, or other mode of conveyance used for travel and is not owned by the employee.	NEPRA Service Regulations 2003
103.	Public sector entity	Means any authority, agency, division or instrumentality of the Federal or Provincial Government or a local authority but does not include the Authority.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999 Transmission Licence to NTDC
104.	Public sector project	Means generation, transmission or distribution facilities constructed, owned, managed or controlled by the Federal Government, a local authority or any body owned or controlled by any such Government or Authority.	NEPRA Act 1997
105.	Reactive supply and voltage control service	Means the provision of reactive power through changes to the generator reactive output to maintain transmission line or distribution line voltage.	Licensing Rules (Generation) 1999
106.	Regulation and frequency response service	Means the provision for moment-to-moment variations in the demand or supply for maintaining scheduled interconnection frequency.	Licensing Rules (Generation) 1999
107.	Regulations	Means regulations made under this Act	NEPRA Act 1997
108.	Rules	Means the National Electric Power Regulatory Authority rules made under section 46 of the Act.	Transmission Licence to NTDC
		Means the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000, as amended from time to time.	Licensing Rules (Generation) 1999
109.	Rural Area	Means the area falling within the jurisdiction of all rural local bodies, including without limitation union councils, tehsil councils and zila councils.	Performance Standards (Distribution) Rules 2003
110.	Sale period	For the purpose of Article 23 means the period of a month, day, 4 hour, hour or half an hour during which the generation charges for all the power stations are averaged out on a weighted average basis to determine the sale rate and transfer price for sale to	Transmission Licence to NTDC

Sr. No.	Item	Definition	Reference
		distribution companies or other entities receiving electric power through central power purchasing agency.	
111.	Schedule	Means the Schedule to these rules.	Fee Rules 2002
112.	Second-tier Supplier	Means any licensee authorized to carry out the second-tier supply business.	Licensing Rules (Distribution) 1999
113.	Second-tier supply authorization	Means an authorization to engage in the second-tier supply business.	Licensing Rules (Distribution) 1999
114.	Second-tier supply business	Means the authorised business, if any, of the licensee or any of its affiliates as a supplier, whether or not carried out pursuant to a power acquisition contract, of electric power to one or more bulk-power consumers within or without the Service Territory.	Licensing Rules (Distribution) 1999
		Means the authorized business, if any, of the licensee or any of its affiliates as a supplier of electric power or ancillary services to a bulk power consumer.	Licensing Rules (Generation) 1999
115.	Separate business	Means each of the transmission business of the Licensee, tie-line business of the Licensee, the provision of settlement services and any other business of the Licensee, undertaken separately.	Transmission Licence to NTDC
		Means each of the distribution business, the second-tier supply business or any other business taken separately from one another and from any other business of the licensee or any affiliate of the licensee.	Licensing Rules (Distribution) 1999
		Means each of the generation business, the second-tier supply business, the provision of ancillary services or any other business taken separately from one another and from any other business of the licensee or any affiliate of the licensee.	Licensing Rules (Generation) 1999
116.	Service territory	Means the area specified in the distribution licence within which the licensee is authorised to conduct the distribution business and, subject to the provisions of rule 7, the second-tier supply business.	Licensing Rules (Distribution) 1999
117.	Short Duration Power Supply Interruption	Means loss of electric supply to one or more consumers for a duration of three minutes or less excluding momentary interruptions of duration less than one second.	Performance Standards (Distribution) Rules 2003
118.	SHYDO	Means the Sarhad Hydel Development Organization, established under the Sarhad Hydel Development Organization Act, 1993 (NWFP Act No. 1 of 1993).	NEPRA Act 1997
119.	Small Power Producers	Means owner of a generation facility of below 100 MW gross capacity, who was engaged in generation and sale of electric power as on 22nd April, 2000 and who has not signed any power purchase agreement with WAPDA or KESC or an implementation agreement with the Government of Pakistan.	Transmission Licence to NTDC Distribution Licence
120.	Spinning reserve service	Means the provision of additional capacity from generating units that are on-line, loaded to less than their maximum output, and available to serve system demand immediately should be contingency occur.	Licensing Rules (Generation) 1999
121.	Step Potential	Means difference of voltage between the steps of an operator, human being or animal coming in contract or operating electrical facilities of the distribution	Performance Standards (Distribution) Rules 2003

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		company.	
122.	Supplemental reserve service	Means the provision of additional capacity from generating units that can be used to respond to a contingency within the period defined in this behalf in the grid code.	Licensing Rules (Generation) 1999
123.	System Average Interruption Duration Index (SAIDI)	Means the average duration of consumer Power Supply Interruptions per consumer occurring in a given year. SAIDI is the average time the consumers of a distribution company who remained without power. It is determined by dividing the aggregated sum of all consumers power supply interruption durations in minutes by the total number of consumers served by a distribution company in a given year.	Performance Standards (Distribution) Rules 2003
124.	System Average Interruption Frequency Index (SAIFI)	Means the average frequency of consumer Power Supply Interruptions per consumer occurring in a given year. SAIFI is calculated by dividing the total annual number of consumer Power Supply Interruptions by the total number of consumers served by a distribution company in a given year.	Performance Standards (Distribution) Rules 2003
125.	Tariff	Means the rates, charges, terms and conditions for generation of electric power, transmission, inter-connection, distribution services and sales of electric power to consumers by a licensee	Tariff, Standards and Procedures 1998
126.	Technical limits	Means the limits and constraints relating to the operation, maintenance and dispatch of a generation facility, as agreed to between an applicant for a licence and the Authority at the time of grant of the generation licence or subsequently as determined by the Authority, or between the licensee and any purchaser, procurer or recipient of electric power or ancillary services from the licensee, consistent with the technical functional specifications set out in the schedule to the generation licence pursuant to sub-rule (2) of the rule 3, the grid code and any applicable distribution code and not inconsistent with the applicable documents.	Licensing Rules (Generation) 1999
127.	Tie-line	Means interconnection facility for the transfer of electric power between the Licensee and other utilities not governed by the Act.	Transmission Licence to NTDC
128.	Total system	Means the Licensee's transmission system and the transmission and distribution systems of all authorised electricity operators located in Pakistan.	Transmission Licence to NTDC
129.	Transmission	Means the ownership, operation, management of control of transmission facilities.	NEPRA Act 1997
130.	Transmission Business	Means the business of transmission of electric power carried on or to be carried on by the Licensee pursuant to and in accordance with the terms or this Licence in planning, development, construction and maintenance of the Licensee's transmission system and operation of such system for the transmission and dispatch of electric power including the balancing services and inter-connection services.	Transmission Licence to NTDC
131.	Transmission facilities	Means electrical transmission facilities including electrical circuits, transformers and sub-stations operating at or above the minimum transmission voltage but shall not include: a. electrical circuits forming the immediate connection	NEPRA Act 1997

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THE AUTHORITY

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		between generation facilities and the transmission grid to the extent that those circuits are owned by a generation company and are directly associated with that company's generation facilities; and b. specified facilities operating at or above the minimum transmission voltage which the Authority, upon an application by a licensee under section 20 determines, shall be owned and operated by a distribution licensee.	
132.	Transmission System	Means one or more systems comprising electrical facilities including, without limitation, electrical wires or circuits, electrical plant, transformers, sub-stations, switches, meters, interconnection facilities or other facilities operating at or above minimum transmission voltage constructed, owned, managed, controlled or operated by the Licensee or by one or more special purpose transmission licensees and used for transmission of electric power from the generation facility to sub-stations or to or from other generation facilities or between sub-stations or to or from any interconnection facilities or from the distribution facilities of one licensee to the distribution facilities of another licensee or from a generation facility to a distribution facility or a bulk-power consumer.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999 Transmission Licence to NTDC
133.	Unit commitment	Means turning-on and bringing up to speed any one or more of the generation units comprised in the generation facilities of the licensee and synchronizing and connecting such units to the transmission system for the deliver of electric power or ancillary services and, where the context so admits, includes the process by which the determination as to which units are to be committed is made.	Licensing Rules (Generation) 1999
134.	Urban area	Means the area falling within the jurisdiction of all urban local bodies or development authorities, including without limitation, town committees, municipal committees, municipal corporations, metropolitan corporations and cantonment boards.	Performance Standards (Distribution) Rules 2003
135.	Use of system	Means the use of the distribution system for the transport of electric power by and for and on behalf of the licensee and, in relation to a second-tier supplier other than the licensee, for and on behalf of such second-tier supplier. Means the use of the transmission system or one or more distribution systems for the transport or deliver of electric power or ancillary services.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999
136.	Use of system charges	The charges made or levied or to by made or levied by the licensee for the use of the system for the purpose of the distribution business or the second-tier supply business or in respect of the use of the distribution system by a second-tier supplier but shall not include connection charges.	Licensing Rules (Distribution) 1999
		The charges made or levied by the national grid company, a special purpose transmission licensee or a distribution licensee, as the case may be, for the use by the licensee of their respective systems for the purposes of its generation business.	Licensing Rules (Generation) 1999

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137.	WAPDA	Means the Pakistan Water and Power Development Authority established under the Pakistan Water and Power Development Authority Act, 1958 (W.P.Act XXXI of 1958)	NEPRA Act 1997
138.	WAPDA relevant manuals	The instructions, manuals or guidelines used by WAPDA in relation to the matters to which such instructions, manuals or guidelines relate.	Licensing Rules (Distribution) 1999 Licensing Rules (Generation) 1999
139.	Year	Means a financial year.	NEPRA Service Regulations 2003
140.	Year or Annual	For the purpose of these Rules means the period of twelve months beginning on 1st July and ending on 30th June.	Performance Standards (Distribution) Rules 2003

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