

# NEPAL GRID CODE

**Electricity Regulatory Commission**  
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## INTRODUCTION:-

### 1.1 GENERAL

The **Nepal Grid Code** (hereafter referred to as “**Grid Code**”) has been formulated in exercise of powers conferred by Clause 12 (ka) of Electricity Regulatory Commission Act, 2074 and Clause 6 (1) of Electricity Regulatory Commission Regulation, 2075. For the fulfilment of the objectives of the **Act and Regulation**, the Electricity Regulatory Commission (ERC) form a Grid Code Sub Committee with stakeholders. The mandate of this **Grid Code subcommittee** is to propose the NEA Grid Code with minor review as per the prevailing electricity regulatory commission act and regulation. The coordinated approach for operation, maintenance and development of the **Transmission System** to ensure equitable management of technical matters in the interest of all stakeholders connected to the **Grid** including.

The **Grid Code** is a document that governs the boundary between the **Grid Owner, System operator, Grid planner, Transmission licensee** and **Grid Users** and establishes procedures for operations of facilities that will use the **Transmission System**. The **Grid Code** specifies criteria, guidelines, basic rules, procedures, responsibilities, standards and obligations for the connection, operation, maintenance and development of the **Grid System** of Nepal to ensure economic and reliable use of use of the **Grid**.

The Prepared Grid Code draft has 11 chapters. It identifies stakeholders basically the Grid Owner, System Operator, Grid Planner and Grid Users like Grid Constructor, Generators, Distributors and High Voltage Consumers. The Grid Owner has given the major Responsibility to make the Grid Predictable, Reliable, accessible and economical including Grid Safety.

The Grid Code is concerned with the operation, maintenance and development of the Grid and does not offer details on designs or operation of generating plants or distribution systems except where compatibility of Equipment at the Connection Point is mandatory and operational efficiency of the Grid is likely to be adversely affected.

Chapter 1 of the Grid Code deals with the effectivity of the Grid Code. It also provides definitions of special terms used in the Grid Code.

Chapter 2 of the Grid Code deals with the setting up of a Grid Code Management Committee to enforce and monitor compliance of the Grid Code. This Committee should have a wide representation of the stake holders so as to minimize potential conflicts. Formation of various sub committees for planning and Grid operation is also discussed. It also specifies procedures for dispute resolution and the approval process for revision of the Grid Code.

Chapter 3 of the Grid Code describes the types of study to be conducted for Grid planning and the criteria to be adopted in these studies. The Grid planning subcommittee will assist the System Planning Department in these studies

Chapter 4 of the Grid Code stipulates the minimum standards to be maintained by the System Operator regarding quality and reliability of supply in the Power System. It also specifies safety standards for protection of personnel working in the Grid. Some of these standards are governed by the Electricity Regulation, 2050 (1993), pursuant to Electricity Act, 2049 (1992) and any revision thereto. This Chapter also provides performance targets to be achieved by the Grid Owner on availability of the Grid and energy loss in the transmission network.

Chapter 5 of the Grid Code lays down the technical requirements of the Equipment and the User Systems at the Connection Point including Renewable Generator and International Connection. It specifies procedures for processing a Grid Connection request, which include conducting Grid Impact Studies and testing the Equipment prior to energizing the Connection.

Chapter 6 of the Grid Code is about managing the operation of the Grid through coordination of Generation Outage and Grid Outage programs and adopting various techniques for controlling grid voltage and frequency to ensure an efficient and reliable Power System. It also provides safety procedures and measures to be adopted by each Party at the Connection Point when working in this area.

Chapter 7 of the Grid Code establishes the rules, procedures and requirements for real time dispatch and control of generation scheduling, including ancillary services, in order to ensure efficiency, security and reliability of the Power System. This Chapter also talks about procedures and various techniques to tackle emergency conditions in the Power System.

Chapter 8 of the Grid Code covers the types of test to be performed on Equipment installed by Generators and other Grid Users to assess their compliance with their guaranteed data and the procedures for carrying out these tests. This Code applies only to those Tests which affect the Systems of the Grid Owner and Users and/or the System of any Externally Connected Party but not to the Tests which have no effect on the Grid.

Chapter 9 of the Grid Code sets out the technical requirements for metering and the technical standards for metering Equipment. Procedures for meter reading and maintenance of metering equipment are also presented in this Chapter.

Chapter 10 of the Grid Code discusses specific exemptions from the Grid Code, that are granted to the Grid Owner and Users as well. Some of the requirements stipulated in the Grid Code cannot be met immediately but they have been incorporated with the sole purpose of improving the System over a period of time. Such requirements are treated as transitory provisions, wherein the relevant Party

is required to make necessary arrangements to meet these provisions within the stipulated dead line.

Chapter 11 of the Grid Code is devoted entirely to report preparation. It includes details on the types of report required, the agency responsible for their preparation, the recipient of the report and the submission time.

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**ABBREVIATIONS AND ACRONYMS**

ALD	Automatic Load Dropping
AVR	Automatic Voltage Regulator
CT	Current Transformer
DPD	Detailed Planning Data
GCM	Grid Code Management
GCMC	Grid Code Management Committee
HV	High Voltage
IEC	International Electro-technical Commission
IPP	Independent Power Producer
kV	Kilovolt
LCGP	Least Cost Generation Expansion Plan
LDC	Load Dispatch Center
MLD	Manual Load Dropping
MVA	Mega Volt-ampere
MVAR	Mega Volt-ampere Reactive
MW	Mega Watt
NEA	Nepal Electricity Authority
Pf	Power Factor
PLC	Power Line Communication
PPA	Power Purchase Agreement
PT	Potential Transformer
SCADA	Supervisory Control and Data Acquisition
SO	System Operator
SPD	System Planning Department
TDP	Transmission Development Plan
TSO	Transmission and System Operation
VLC	Voluntary Load Curtailment

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## CHAPTER 1

### GENERAL CONDITIONS

#### 1.1 OBJECTIVE

The objectives of this Chapter are:

- (a) To specify the effective date of the Grid Code; and
- (b) To define significant terms used in the Grid Code.

#### 1.2 SCOPE OF APPLICATION

1.2.1 The provisions of this Chapter apply to all Parties including the following:

- (a) Grid Owner;
- (b) System Operator;
- (c) Grid Constructor
- (d) Generators;
- (e) Distributors;
- (f) Traders, and
- (g) Any other entity with a User System connected to the Grid

1.2.2 The Grid Owner shall endeavor to reach agreement with Grid Users who are governed by existing contracts to comply with the provisions of this Grid Code.

#### 1.3 AUTHORITY

1.3.1 This Grid Code shall be effective from the date of approval from ERC

1.3.2 Notwithstanding anything contained in the Grid Code, the provisions stipulated in prevailing laws and any revisions thereof shall govern.

1.3.3 In the event of conflict between any provision in the Grid Code and any contract or agreement entered into prior to the date the Grid Code becomes effective, such contract or agreement shall have precedence over the Grid Code.

1.3.4 In the event of conflict between any provision in the Grid Code and any contract or agreement entered into after the date the Grid Code becomes effective, the provisions of the Grid Code shall have precedence over such contract or agreement unless specified otherwise.

#### **1.4 OWNER'S RESPONSIBILITY**

Neither the System Operator nor the Grid Owner shall be held responsible for its actions based on data and information submitted by Users of the Grid, provided they are reasonable and carried out according to the Best Industry Practice.

#### **1.5 DOCUMENT CONTROL**

The GCMC secretariat shall maintain a record of all Parties to whom the Grid Code Document is distributed. They shall also notify all amendments to the Parties and keep a record of the same.

#### **1.6 INTERPRETATIONS**

1.6.1 The word "shall" wherever it occurs in the Grid Code shall mean mandatory compliance of rules, regulations, requirements and any other provisions stated therein.

1.6.2 The word "singular" shall include the plural and vice versa, unless specifically stated otherwise.

1.6.3 Any reference to gender shall include all other genders.

#### **1.7 DEFINITIONS**

1.7.1 In the Grid Code the following words and phrases shall have the following meanings unless more particularly defined in a Chapter, Section or Subsection of the Grid Code.

1.7.2 Standard engineering terms that are not otherwise defined are understood to have their usual meanings.

1.7.3 The definition given in a Chapter, Section or Subsection of the Grid Code shall prevail in case of inconsistencies.

**Defined Term****Definition****Accountable Person.**

A person who has been duly authorized by the Grid Owner or a User to sign the Fixed Asset Boundary on their respective behalf.

**Amended Connection Agreement**

An agreement between a User and the Grid Owner, which specifies the terms and conditions pertaining to the renovation or modification of the User System or Equipment at an existing Connection Point in the Grid.

**Ancillary Service.**

Support services such as Frequency Regulating and Contingency Reserves, Reactive Power Support, and Black Start capability which are essential in maintaining Power Quality and the Reliability and Security of the Grid.

**Automatic Load Dropping (ALD).**

The process of automatically and deliberately removing pre-selected Demand from a Power System in response to an abnormal condition in order to maintain the integrity of the Power System.

**Availability.**

The long-term average fraction of time that a Component or System is in service and satisfactorily performing its intended function.

**Backup Protection.**

A form of protection that operates independently of the specified Components in the primary protective System. It may duplicate the primary protection or may be intended to operate only if the primary protection fails or is temporarily out of service.

**Backup Reserve.**

Refers to a Generating Unit that has Fast Start capability and can synchronize with the Grid to provide its declared capacity for a minimum time period as agreed.

<b>Best Industry Practice.</b>	The practices and methods not specified in specific standards but that are generally accepted by the power industry to be sound and which ensure the safe and reliable planning, operation, and maintenance of a Power System.
<b>Black Start.</b>	The process of recovery from Total System Blackout using a Generating Unit with the capability to start and synchronize with the Power System without Grid power supply.
<b>Business Day.</b>	Any day on which the government office is open for business.
<b>Capability and Availability Declaration.</b>	Refers to the data submitted by the Generator for its Scheduled Generating Unit, which is used by the System Operator in preparing the day-ahead Generation Schedule. It includes declaration of Generation Scheduling and Dispatch parameters.
<b>Central Dispatch.</b>	The process of issuing Dispatch Instructions to the Grid Owner, Generator, Distributor and/or High Voltage Consumer by the System Operator to achieve an economic operation while maintaining Power Quality, Stability, Reliability and Security of the Grid.
<b>Check Meter.</b>	The tariff metering system installed, owned and maintained by receiver of electricity.
<b>Completion Date.</b>	The date, specified in the Connection Agreement or Amended Connection Agreement, when the User Development is scheduled to be ready for full commercial operation.
<b>Component.</b>	A piece of Equipment, a line or circuit, a section of line or circuit, or a group of items, which is viewed as a unit for a specific purpose.
<b>Connection.</b>	The electric lines and electric Equipment used to join a User System with the Grid.

<b>Connection Agreement.</b>	An agreement between a User and the Grid Owner, which specifies the terms and conditions pertaining to the connection of the User System or Equipment to a new Connection Point in the Grid.
<b>Connection Date.</b>	The date, specified in the Connection Agreement or Amended Connection Agreement, when the User Development is ready for physical connection to the Grid.
<b>Connection Point.</b>	The point of connection of the User System or Equipment to the Grid.
<b>Connection Point Drawings.</b>	The drawings prepared for each Connection Point, which indicate the equipment layout, common protection and control, and auxiliaries at the Connection Point.
<b>Contingency Reserve.</b>	Generating capacity that is intended to take care of the loss of the largest synchronized Generating Unit or the power import from a single Grid interconnection, whichever is larger. Contingency Reserve includes Spinning Reserve and Backup Reserve.
<b>Critical Loading.</b>	Refers to the condition when the loading of transmission lines or substation Equipment is between 90 percent and 100 percent of the continuous rating.
<b>Declared Available Capacity.</b>	The estimated net capacity of the Generating Units announced by the Generator that equals the Dependable Capacity less any reductions due to Scheduled Outage, Forced Outage or Maintenance Outage.
<b>Declared Data.</b>	The data provided by the Generator, Distributor and/or High Voltage Consumers in accordance with the most recent parameters.
<b>Demand.</b>	The active Power and/or reactive power at a given instant or averaged over a specified interval of time, that is actually delivered or is expected to be delivered by an electrical Equipment or a supply System

<b>Demand Control.</b>	The reduction in Demand for the control of frequency when the Grid is in an Emergency State.
<b>Demand Forecast.</b>	The projected Demand and Active Energy related to a Connection Point in the Grid.
<b>Detailed Planning Data. (DPD).</b>	Additional data, which the Grid Owner requires, for conducting more accurate Grid planning study.
<b>Dispatch Instruction.</b>	Refers to the instruction issued by the System Operator to the Generators with Scheduled Generating Units and/or the Generator whose Generating Units will provide Ancillary Services to implement the final Generation Schedule in real time.
<b>Dispatch.</b>	The process of apportioning the total Demand of the Grid through the issuance of Dispatch Instructions to the Scheduled Generating Units and the Generating Units providing Ancillary Services in order to achieve the operational requirements of balancing Demand with generation that will ensure the Security of the Grid.
<b>Distribution System.</b>	The system of electric lines and electrical equipment at voltage levels of 33KV and below.
<b>Distributor.</b>	An Electric Cooperative, private corporation, government- owned utility, or existing local government unit that has an exclusive franchise to operate a Distribution System.
<b>Electrical Diagram.</b>	A schematic representation, using standard electrical symbols, which shows the connection of Equipment or Power System Components to each other or to external circuits.
<b>Electric Cooperative.</b>	A cooperative or corporation authorized to provide electricity services pursuant to NEA Cooperative Rural Electrification Regulations, 2060.

<b>Embedded Generator.</b>	A person or entity that generates electricity using a Generating Plant that has no direct connection to the Grid and is connected to the Distribution System or the System of any User.
<b>Emergency State.</b>	The Grid operating condition when a Multiple Outage Contingency has occurred without resulting in Total System Blackout and any of the following conditions is present: (a) generation deficiency exists; (b) Grid transmission voltages are outside the limits of 0.90 and 1.10; or (c) the loading level of any transmission line or substation Equipment is above 110 percent of its continuous rating.
<b>Equipment.</b>	All apparatus, machines, conductor, etc. used as part of, or in connection with, an electrical installation.
<b>Event.</b>	An unscheduled or unplanned occurrence of an abrupt change or disturbance in a Power System due to fault, Equipment Outage or Equipment mal-operation.
<b>Fast Start.</b>	The capability of a Generating Unit or Generating Plant to start and synchronize with the Grid within 5 minutes.
<b>Fault Clearance Time.</b>	The time interval from fault inception until the end of the arc extinction by the circuit breaker.
<b>Fiscal Year.</b>	Based on Bikram Sambat (Nepalese Calendar) year beginning on the first day of the month of Shrawan and ending on the last day of the following month of Asadh
<b>Forced Outage.</b>	An Outage that results from emergency conditions directly associated with a Component, requiring that it be taken out of service immediately, either automatically or as soon as switching operations can be performed. Also, an Outage caused by human error or the improper operation of Equipment. This excludes Scheduled Outages and Maintenance Outages.



<b>Frequency Control.</b>	A strategy used by the System Operator to maintain the frequency of the Grid within the limits prescribed by the Grid Code by the timely use of Frequency Regulating Reserve, Contingency Reserve, and Demand Control.
<b>Frequency Regulating Reserve.</b>	Refers to a Generating Unit that assists in Frequency Control by providing automatic Primary and/or Secondary Frequency response.
<b>Generating Plant.</b>	A facility, consisting of one or more Generating Units, where electricity is produced from some other form of energy by means of a suitable apparatus.
<b>Generating Unit.</b>	The combination of an alternator and a turbine set or a reciprocating engine and all of its associated equipment, which together represents a single electricity generating machine.
<b>Generation Schedule.</b>	Refers to the schedule that indicates the hourly output of the Scheduled Generating Units and the list of Generating Units that will provide Ancillary Services for the next Schedule Day.
<b>Generator.</b>	Any person or entity with a license, which has among its objectives the establishment and operation of generating stations.
<b>Grid.</b>	The system of High Voltage (66 kV or above) electric lines and electrical equipment owned and/or operated by the Grid Owner for the purpose of the transmission of electricity between Power Stations, Distribution Systems.
<b>Grid Constructor.</b>	The transmission licensee who is responsible for constructing transmission lines and substations within the Grid.

<b>Grid Impact Studies.</b>	A set of technical studies which are used to assess the possible effects of a proposed expansion, reinforcement, or modification of the Grid or a User Development and to evaluate Significant Events.
<b>Grid Owner.</b>	The licensee who is responsible for operation, maintenance and expansion of the Grid.
<b>High Voltage (HV).</b>	A voltage level of 66kV and above.
<b>High Voltage Consumer.</b>	A person to whom electricity is provided and who has dedicated supply at 66 KV or higher voltage.
<b>IEC.</b>	International Electro-Technical Commission.
<b>IEC Standard.</b>	The international standard for electro-technical Equipment approved and published by IEC.
<b>Implementing Safety Coordinator.</b>	The Safety Coordinator assigned by the Grid Owner or the User to establish the requested Safety Precaution in the Grid or User System.
<b>IPP.</b>	Independent Power Producer owning a Generating Plant, who is not classified as a Public Sector Entity.
<b>Island Grid.</b>	A Generating Plant or a group of Generating Plant and its associated load, which is isolated from the rest of the Grid but is capable of generating and maintaining a stable supply of electricity to the customers within the isolated area.
<b>Isolation.</b>	The electrical separation of a part or Component from the rest of the electrical Power System to ensure safety when that part or Component is to be maintained or when electric service is not required.

<b>Load Dispatch Center.</b>	The control center located in Kathmandu which is responsible for managing the operation of the Power System through coordination of generation, transmission and distribution on a real time basis.
<b>Main Meter.</b>	The tariff metering system installed, owned and maintained by the supplier of electricity.
<b>Maintenance Outage.</b>	An Outage which is not part of a Scheduled Outage and which, if postponed by more than two days, could cause harm to Equipment and/or personnel.
<b>Maintenance Program.</b>	A set of schedules, which are coordinated by the Grid Owner and the System Operator, specifying planned maintenance for Equipment in the Grid or in any other User System.
<b>Manual Load Dropping (MLD).</b>	The process of manually and deliberately removing pre-selected Demand from a Power System in response to an abnormal condition and in order to maintain the integrity of the Power System.
<b>Metering Point.</b>	The point identified in the Power Purchase Agreement or Connection or Amended Connection Agreement, where energy is measured.
<b>Minimum Stable Loading.</b>	The minimum demand that a Generating Unit can safely maintain for an indefinite period of time.
<b>Multiple Outage Contingency.</b>	An Event caused by the failure of two or more Components of the Grid including Generating Units, transmission lines, and/or transformers.
<b>Nepal Electricity Authority (NEA).</b>	A public sector power utility with a license for generation, transmission and distribution of electricity throughout the country, pursuant to NEA Act 2042
<b>NEA Distribution &amp; Consumer Services.</b>	An entity within the NEA organization, which serves as Distributor

**NEA Engineering Services.**

An entity within the NEA organization, which is responsible for hydropower project development and which provides engineering services to various entities within the NEA.

**NEA Generation.**

An entity within the NEA organization, which serves as Generator and developer of NEA-owned Generating Plants.

**NEA, Power Trading Department.**

An entity within the NEA organization, which is responsible for negotiation and processing of Power Purchase Agreements with IPP's and cross-border power traders.

**NEA, Transmission & System Operation.**

An entity within the NEA organization, which is comprised of following three departments:

- Grid Operations which fulfills the role of Grid Owner for the purposes of the Grid Code
- System Operator
- Transmission Line and Substation Construction which fulfills the role of Grid Constructor for the purposes of the Grid Code

**Negative Sequence Unbalance Factor.**

The ratio of the magnitude of the negative sequence component of the voltages to the magnitude of the positive sequence component of the voltages, expressed in percent.

**Normal State.**

The Grid operating condition when the System frequency, voltage, and transmission line and equipment loading are within their normal operating limits, the Operating Margin is sufficient, and the Grid configuration is such that any fault current can be interrupted and the faulted equipment isolated from the Grid.

<b>Operating Margin.</b>	The margin of generation over the total Demand plus losses that is necessary for ensuring power quality and security. It is the sum of Frequency Regulating Reserve and Contingency Reserve and system losses.
<b>Operating Program.</b>	A periodic program prepared by the Grid Owner and the System Operator based on data submitted by Generators and Users which specifies the expected Availability and aggregate capability of generation to meet forecasted Demand.
<b>Outage.</b>	The reduction of capacity or taking out of service of a Generating Unit, transmission system or distribution system.
<b>Output Usable.</b>	That portion of registered capacity which is available for dispatch.
<b>Partial System Blackout.</b>	The condition when a part of the Grid is isolated from the rest of the Grid and all generation in that part of the Grid has shutdown or tripped off.
<b>Party.</b>	Any person, company, organization, authority, firm or association subject to the provisions of the Grid Code; provided, however, that any non-NEA Users shall have mutually agreed with NEA to be subject to the Grid Code.
<b>Point of Grounding.</b>	The point on the Grid or the User System at which Grounding can be established for safety purposes.
<b>Point of Isolation.</b>	The point on the Grid or the User System at which Isolation can be established for safety purposes.
<b>Power Line Carrier (PLC).</b>	A communication Equipment used for transmitting data signals through the use of power transmission lines.
<b>Power Purchase Agreement or PPA.</b>	The agreement between a Generator and a buyer in which, subject to certain conditions, the buyer agrees to purchase the electrical output of the Generator.

<b>Power Quality.</b>	The quality of the voltage, including its frequency and resulting current that are measured in the Grid, Distribution System, or any User System.
<b>Power System.</b>	The combination of the Grid, Distribution System and Generating Plants.
<b>Power System Master Plan.</b>	Twenty (20) year plan for the Power System reviewed annually and updated every five (5) years covering all issues relating to the Power System.
<b>Primary Response.</b>	The automatic response of a Generating Unit to Frequency changes, released increasingly from zero to five second from time of Frequency change, and which is fully available for the next 25second.
<b>Reactive Power Capability Curve.</b>	A diagram which shows the reactive power capability limit versus the Real Power within which a Generating Unit is expected to operate under normal conditions.
<b>Registered Equipment Data.</b>	Data submitted by a User to the Grid Owner at the time of Connection of the User System to the Grid.
<b>Reliability.</b>	The probability that a System or Component will perform a required task or mission for specified time in a specified environment.
<b>Safety Coordinator.</b>	A person designated and authorized by the Grid Owner or the User to be responsible for the coordination of Safety Precautions at the Connection Point when work or testing is to be carried out on a System which requires the provision of Safety Precautions for HV Equipment.
<b>Safety Rules.</b>	The rules that seek to safeguard personnel working on the Grid or User System from the hazards arising from the Equipment or the Grid or User System.
<b>Safety-Plate.</b>	A label conveying a warning against possible interference or intervention as

	defined in the safety clearance and tagging procedures.
<b>Schedule Day.</b>	The period from 00:00 hours to 24:00 hours each day.
<b>Schedule Generating Plant.</b>	A Generating Plant whose Generating Units are subject to Central Dispatch by the System Operator.
<b>Scheduled Generating Unit.</b>	A Generating Unit within a Scheduled Generating Plant.
<b>Scheduled Outage.</b>	The Outage of a Component or Equipment planned by Generator and/or Grid Owner and which is approved by the System Operator.
<b>Scheduling.</b>	The process of determining the Generators that shall provide Energy and Ancillary Services taking into account the operational constraints in the Grid for a period of time in the future.
<b>Secondary Response.</b>	The automatic response to Frequency which is fully available 25 seconds from the time of Frequency change to take over from the Primary Response, and which is sustainable for at least 30 minutes.
<b>Security.</b>	The continuous operation of a power system in the Normal State, ensuring safe and adequate supply of power, even when some parts or Components of the System are on Outage.
<b>Significant Event Notice.</b>	A notice issued by the System Operator or any User if a Significant Event has transpired on the Grid or the User System, as the case may be.
<b>Significant Event.</b>	An Event on the Grid or the System of any User that has a serious or widespread effect on the Grid or the User System.

<b>Single Outage Contingency.</b>	An Event caused by the failure of one Component of the Grid including a Generating Unit, transmission line, or a transformer.
<b>Site.</b>	Refers to a substation or switchyard in the Grid or the User System where the Connection Point is situated.
<b>Small Generator.</b>	A Generator whose Generating facility at the Connection Point has an aggregate capacity of 5MW or below.
<b>Spinning Reserve.</b>	The component of Contingency Reserve which is synchronized to the Grid and ready to take on load.
<b>Stability.</b>	The ability of the dynamic Components of the Power System to return to a normal or stable operating point after being subjected to some form of change or disturbance.
<b>Standard Planning Data (SPD).</b>	The general data required by the Grid Owner as part of the application for a Connection Agreement or Amended Connection Agreement.
<b>Start-Up.</b>	The process of bringing a Generating Unit from Shutdown to synchronous speed.
<b>Supervisory Control and Data Acquisition (SCADA).</b>	A system of remote control and telemetry used to monitor and control a Power System.
<b>System.</b>	Refers to the Grid or Distribution System or any User System. Also a group of Components connected or associated in fixed configuration to perform a specified function.
<b>System Operator.</b>	The entity which owns, operates and maintains the Load Dispatch Center. System Operator is responsible for Central Dispatch, provision of Ancillary Services, and operation and control to ensure safety, Power Quality, Stability, Reliability, and Security of the Grid.



<b>System Test Procedure.</b>	A procedure that specifies the switching sequence and proposed timing of the switching sequence, including other activities deemed necessary and appropriate by the Test Committee in carrying out the System Test.
<b>System Test.</b>	The set of tests which involve simulating conditions or the controlled application of unusual or extreme conditions that may have an impact on the Grid or the User System.
<b>Total System Blackout.</b>	The condition when all generation in the Grid has ceased, the entire System has shutdown, and the System Operator must implement a Black Start to restore the Grid to its Normal State.
<b>Transmission Development Plan (TDP).</b>	The program for expansion, reinforcement, and rehabilitation of the Grid which is prepared by the System Planning Department.
<b>User.</b>	A person or entity that uses the Grid and related facilities.
<b>User Development.</b>	The System or Equipment to be connected to the Grid or to be modified, including the relevant proposed new connections and/or modifications within the User System that requires a Connection agreement or an Amended Connection agreement.
<b>User System.</b>	Refers to a System owned or operated by a User.
<b>Voltage Unbalance.</b>	Refers to the Negative Sequence Unbalance Factor or the Zero Sequence Unbalance Factor.
<b>Voluntary Load Curtailment (VLC).</b>	The agreed self- reduction of Demand by identified industrial Customers to assist in Frequency Control when generation deficiency exists.
<b>Week.</b>	A period of seven (7) days which starts at 00:00 hours on Sunday and ends at 24:00 hours on Saturday.

**Zero Sequence  
Unbalance Factor.**

The ratio of the magnitude. of the zero sequence components of the voltages to the magnitude of the positive sequence components of the voltage, expressed in percent.

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## CHAPTER 2

### GRID CODE MANAGEMENT

#### 2.1 OBJECTIVE

The objectives of the Grid Code Management (GCM) are:

- (a) To specify the process for the enforcement, interpretation, revision and recommendation pertaining to all aspects of management and operation of the Grid Code.
- (b) To ensure compliance and enforcement of the Grid Code at planning operation and maintenance level; and

#### 2.2 SCOPE OF APPLICATION

The provisions of the Grid Code Management apply to all Parties, including the following:

- (a) Grid Owner(s);
- (b) System Operator;
- (c) Grid Constructor;
- (d) Generator;
- (e) Distributor; and
- (f) Any other entity with a User System connected to the Grid.

#### 2.3 GRID CODE MANAGEMENT COMMITTEE

##### 2.3.1 Functions of Grid Code Management Committee

ERC shall establish a Grid Code Management Committee (GCMC) within one week for the effective administration of the Grid Code which shall have the following functions:

- (a) Monitor implementation of the Grid Code;
- (b) Review, evaluate, and when appropriate, approve suggestions for amendments to the Grid Code submitted by any User of the Grid;
- (c) Recommend to the ERC for the amendments of the Grid Code that the Committee believes to be desirable or necessary;
- (d) Issue guidance on implementation of the Grid Code to the Users of the Grid when request
- (e) Recommend to ERC for the necessary actions against a Party who fails to comply with any provision of the Grid Code; and
- (f) Prepare Grid Code Management Committee reports on the activities of the committee for submission to ERC.

##### 2.3.2 Membership of the GCMC

2.3.2.1 The composition of the Grid Code Management Committee shall be as follows:

- (a) ERC shall assign /appoint a chairperson of the GCMC;
- (b) The Chief of System Operation shall assume the role of the member secretary of the GCMC;
- (c) Other members of the GCMC shall include the followings:
  - (1) One member from Grid Operation Department of the NEA;
  - (2) One member from Grid Constructor of the NEA;
  - (3) One member from System Planning Department of the NEA;
  - (4) One member from Generation of the NEA;
  - (5) One member from Technical Services Department under Distribution and Consumer Services of the NEA;
  - (6) One member from Ministry of Water Resources;
  - (7) One member from System Planning of RPGCL
  - (8) One member from Grid Constructor of RPGCL
- (d) Representative from Generation of the NEA. Independent Power Producers, High Voltage Consumers and private Distributors shall be invited to the GCMC meeting as and when required.

2.3.2.2 Members from the participating organizations within NEA shall preferably be the rank of directors/departmental incharge. Member from the Ministry of Water Resources shall be not below the rank of second class Gazetted Officer. All members shall have sufficient knowledge in the field of Grid operation, planning and development.

### 2.3.3 GCMC Operating Cost

2.3.3.1 The operating cost of the GCMC and its sub committees, including permanent staffs, shall be borne by the ERC, which shall be recovered from Grid service charges.

2.3.3.2 The GCMC shall prepare and submit the budget requirements for the following fiscal year to ERC by the end of the month of Falgun (mid March) of the current year. The budget shall include any allowances to be given to GCMC members and its invitees.

2.3.3.3 The GCMC shall operate the budget in accordance with the approved rules and regulations of ERC.

2.3.3.4 The salaries of all the GCMC members and the subcommittee members shall be the responsibility of their respective employers or sponsoring organizations.

#### 2.3.4 GCMC Rules and Procedures

2.3.4.1 The GCMC shall establish its own rules relating to the conduct of its business. These include:

- (a) Administration and operation of the committee;
- (b) Establishment and operation of GCMC subcommittees;
- (c) Evaluation of Grid operation results;
- (d) Coordination of dispute resolution process;
- (e) Monitoring of Grid Code enforcement;
- (f) Revision of Grid Code provisions; and
- (g) Coordination with other relevant Acts.

2.3.4.2 The GCMC shall decide issues based on majority voting with at least six members in favor of the resolution.

## 2.4 GRID CODE MANAGEMENT SUBCOMMITTEES

### 2.4.1 Grid Planning Subcommittee

2.4.1.1 A Grid Planning Subcommittee shall be established with the following functions:

- (a) Review and advise on Grid planning procedures and standards in the system planning
- (b) Technically support and assist the System Planning and Impact Studies;
- (c) Technically support and assist the Grid Constructor with the major Grid reinforcement and expansion plans;
- (d) Technically support and assist the Grid Operation with the reinforcement, up gradation and equipment replacement plans;
- (e) Technically support and assist the system operator with the necessary dispatch, scheduling and communication plans;
- (f) Form a taskforce to assist in conducting the grid impact study; and
- (g) Submit reports to GCMC as and when required.

2.4.1.2 The Grid Planning Subcommittee shall be composed of following members:

- (a) The GCMC shall appoint the chairperson of the subcommittee;
- (b) One member each from the System Planning Department of rank not below Deputy Manager: the representative from NEA shall assume the role of member secretary of the Subcommittee;
- (c) One member each from the Grid Constructor;
- (d) One member each from the Grid Operation Department
- (e) One member from the System Operator
- (f) One member from the Technical Services Department of Distribution and Consumer Services of the NEA; and
- (g) One member from Generation of the NEA.

2.4.1.3 The members including the Chairperson shall be engineers having sufficient technical background and experience in planning. All members shall be not below the rank of director or departmental head of relevant Departments unless specified otherwise.

#### 2.4.2 Grid Operation and Reliability Subcommittee

2.4.2.1 A Grid Operation and Reliability Subcommittee shall be established with the following functions:

- (a) Technically review and make recommendations on the Grid operation procedures and standards adopted in Grid Operation periodically. Technically review and make recommendations on Grid reliability and protection procedures adopted in the Grid Operation
- (b) Form a taskforce to assist in preparing grid operation procedure and standards:
- (c) Submit reports to GCMC as and when required.

2.4.2.2 The Grid Operation and Reliability Subcommittee shall be composed of following members:

- (a) The Director or Departmental Head of the Grid Operation Department of the NEA shall act as the chairperson of the subcommittee;
- (b) One member: from the Grid Operation Department: and representative from the NEA shall assume the role of member secretary of the Subcommittee;
- (c) One member from the System Operator ;
- (d) One member each from the Grid Constructor ;
- (e) One member from the Distribution and Consumer Services of the NEA; and
- (f) One member from the Generation Department of NEA.

2.4.2.3 The members shall be electrical/electronics/mechanical engineers with sufficient technical background and experience in Grid operation and/or protection. All members shall be not below the rank of Deputy Manager of relevant Departments unless specified otherwise.

#### 2.4.2.4 Other Grid Management Subcommittees

The GCMC may establish other ad hoc subcommittees as and when necessary.

### **2.5 GRID CODE DISPUTE RESOLUTION**

2.5.1.1 In the event of any conflict between any provision of the grid code and any contract or agreement between the grid owners and user, the provision of the Grid Code shall prevail.

2.5.1.2 In the event of any dispute regarding interpretation of any part of the Grid Code provision between the User and the Grid Owners parties may request to the Commission for its decision. The Commission decision shall be final and binding.

2.5.2.1 When the dispute arises between stakeholders, the parties attempt to settle the dispute amicably by negotiation.

2.5.1.3 The dispute which cannot be settled amicably within 30 days after receipt by one party of the other party request, for such amicable settlement may be referred to GCMC for mediation.

2.5.2.3 If the dispute is not resolved amicably, the party may request to ERC as per Dispute Settlement provision of ERC Act and Regulation. ERC may refer dispute settlement to GCMC for mediation. GCMC shall complete the mediation within 30 days.

### **2.6 COMPLIANCE MONITORING**

2.6.1 The GCMC shall ensure, to the extent reasonably possible, that all Parties comply with the provisions of this Grid Code and shall investigate all suspected non-compliance with provisions of the Grid Code by any Party including the Grid Owner and the System Operator.

2.6.2 Any Party that has reason to believe that another Party has failed to comply with provisions of the Grid Code may notify the GCMC. Such notice shall be in writing and shall include the Party suspected of non-compliance, the provision allegedly not complied with, the circumstances related to the alleged non-compliance and the date and time the alleged non-compliance occurred.

2.6.3 The GCMC shall investigate any alleged non-compliance. The GCMC shall notify the Party alleged to be in non-compliance that a complaint has been



made. Such notice shall be in writing and shall include the provision allegedly not complied with, the circumstances related to the alleged non-compliance and the date and time the alleged non-compliance occurred.

2.6.4 Within 15 days of receiving a notice from the GCMC under section 2.6.3, the alleged non-compliant Party shall respond, in writing, to the allegation of non-compliance.

2.6.5 If the alleged non-compliant Party admits that an instance of non-compliance has occurred, the GCMC shall evaluate the non-compliance and prepare a report that includes the details of the non-compliance, an assessment of the impact of such non-compliance on the operation and management of the Grid, an assessment of the likelihood of such non-compliance continuing to occur and an assessment as to whether the non-compliance warrants an amendment to the Grid. Such report shall be issued to all Parties.

2.6.6 If the non-compliant Party denies that an instance of non-compliance has occurred or fails to respond to the notice sent by the GCMC within the stipulated time, the GCMC shall investigate the complaint and determine whether the alleged Party was in non-compliance with the Grid Code.

2.6.7 Following the investigation by the GCMC, the GCMC shall prepare a report that includes their determination as to whether the alleged Party was in non-compliance, the details of the non-compliance, an assessment of the impact of such non-compliance on the operation and management of the Grid, an assessment of the likelihood of such non-compliance continuing to occur and an assessment as to whether the non-compliance warrants an amendment to the Grid Code. Such report shall be issued to all Parties.

## **2.7 GRID CODE ENFORCEMENT**

### **2.7.1 Enforcement Process**

2.7.1.1 The Grid Code Management Committee shall initiate sanctions against the Party or the Parties it has determined to be in non-compliance with any provision of the Grid Code.

2.7.1.2 The procedures for the enforcement process shall be as follows:

- (a) The GCMC shall serve a notice in writing to the non-compliant Party with the specifics of the non-compliance along with the recommended course of action necessary to rectify the non-compliance;
- (b) The offending Party shall respond in writing its reaction to the notice within five (5) days of receiving the notice from the GCMC. Its reaction shall state whether or not it will comply with the course of action recommended by the GCMC;

- (c) If the GCMC is satisfied with the response, it shall notify the Party in writing that the issue has been resolved; and
- (d) If the GCMC is not satisfied with the response or if the event of non-compliance was of a serious nature that impacted the security, reliability and efficient operation and management of the Grid, the GCMC shall document the non-compliance committed by the Party and submit a report to ERC, including the recommended course of action which could include warnings, disciplinary action and, in the extreme case, disconnection.

## **2.8 GRID CODE REVISION**

- 2.8.1 The GCMC Secretary shall present all proposed revisions of the Grid Code to the GCMC for its consideration.
- 2.8.2 The Grid Owner shall send to the Commission following reports at the conclusion of each Review Meeting of the Panel.
  - (a) A report on the outcome of such review.
  - (b) Any proposed revisions to the Grid Code as the Licensee reasonably thinks necessary for the achievement of the defined objectives.
  - (c) All written representations or objections from Users arising during the review.
- 2.8.3 All revisions to the Grid Code shall require approval of the Commission. The Commission shall publish revisions to the Grid Code once approved by the Commission.
- 2.8.4 The Licensee shall present proposals to the Commission to allow relaxation, where Users have justified difficulties in meeting the Grid Code requirements
- 2.8.5 The revision number and date of issue shall appear on every page of the Grid Code.
- 2.8.6 Every change from the previous version shall be clearly marked in the margin. In addition, a revision sheet shall be placed at the front of the revised version that lists the number of every changed sub-Section, together with a brief description of change.
- 2.8.7 The Licensee shall keep an up-to-date list of the recipients and locations of all serviced copies of the Grid Code

## **2.9 GRID CODE MANAGEMENT COMMITTEE MEETING**

The GCMC shall meet at least three times in a year. It shall hold meetings as often as required to handle problems and issues referred to it.

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## **CHAPTER 3**

### **GRID PLANNING**

#### **3.1 OBJECTIVE**

The objective of the Planning Code is to specify:

- (a) Responsibilities of the System Planning Department (SPD), System Operator, Grid Owner, Grid Planning Subcommittee and other Users in planning the development of the Grid;
- (b) Different technical studies that need to be conducted in the planning process;
- (c) Planning procedures that need to be followed by all Users including the SPD and the System Operator; and
- (d) Type of data required by the SPD from various Users and timescales for submission of that data.

#### **3.2 SCOPE OF APPLICATION**

The provisions of the Planning Code apply to all Parties, including the following:

- (a) System Planning Department (SPD), NEA;
- (b) Grid Owner;
- (c) System Operator;
- (d) Generators;
- (e) Distributors; and
- (f) Any other entity with a User System connected to the Grid.

#### **3.3 PLANNING RESPONSIBILITIES**

##### **3.3.1 The System Planning Department (SPD), NEA**

3.3.1.1 The System Planning Department is responsible for Grid planning. Specific activities of the Department include:

- (a) Annually, reviewing performance of the Grid for the immediate past year in terms of its capability to serve future generation and Demand;
- (b) Projection of Demand growth in the Grid;
- (c) Identifying constraints in the Grid that could pose an operational risk and at the same time reduce efficiency through outages and poor quality power supply;
- (d) Assessing through various technical studies impact of new Connections (Generators, Distributors or other Users) or modification of existing facilities at the Connection Point; and
- (e) Planning expansion of the Grid in coordination with Generation Expansion Plan to meet future Demand growth.

### 3.3.2 Other Users

Users (Generators, Distributors and Other agencies) shall cooperate with the SPD in providing necessary planning data at the time required by the Grid Code section 3.4.

## 3.4 GRID PLANNING PROCEDURES

### 3.4.1 General Planning Procedures

In general, the following procedures shall be adopted in planning new Grid developments or reinforcements or conducting Grid Impact Studies:

- (a) Collection of details from the Grid Owner on the past performance of the Grid, with focus on congestion and reliability problems of the Grid;
- (b) Collection of details from the Grid Owner on the past loadings of transmission lines and substations;
- (c) Collection of Demand forecast including any new specific loads from Distributors and other Users and preparation of a cohesive Demand Forecast for 15 years ahead;
- (d) Collection of details on committed future expansion projects on Generation, Transmission and Distribution;
- (e) Identifying Grid reinforcement requirements;
- (f) Preparation of short term (5 years) Grid expansion plan;
- (g) Development of long term (15 years) Grid expansion plan (TDP);
- (h) Analyzing impact on the Grid from new Connections and/or modifications in the existing Connection facilities.

### 3.4.2 Submission of Planning Data

#### 3.4.2.1 Demand Forecast Data

3.4.2.1.1 By the 15<sup>th</sup> day of the month of each Bhadra (end of August), Distributors, High Voltage Consumers and other Users shall submit to the Grid Owner (through Distributors) annual minimum, maximum and average demand and energy consumption for each Distribution System on monthly basis for the immediate past fiscal year. The values of Energy and Demand consumed by supply areas served directly by Generator switchyard at the Connection Point shall also be included in the Data submitted by Distributors but shown separately. The values for High Voltage Consumers shall also be indicated separately to avoid duplication

3.4.2.1.2 Distributors shall provide the Grid Owner annual energy and Demand Forecast for High Voltage Consumers at each Connection Point separately from the Distribution System by the 15<sup>th</sup> day of the month of each Bhadra (end of August).

3.4.2.1.3 Distributors shall provide the Grid Owner, by the 15<sup>th</sup> day of the month of each Bhadra (end of August), annual energy and Demand Forecast for existing High Voltage Consumers at each Connection Point, if the load is expected to increase by more than 1 MW over the previous year.

3.4.2.1.4 Distributors shall provide the Grid Owner, by the 15<sup>th</sup> day of the month of each Bhadra (end of August), area specific loads arising from irrigation, industrial development centers, town developments, etc.

3.4.2.1.5 For the purpose of Impact Studies proposed for new Grid substation or modification to existing connections, the proposal shall contain details of projected load at the new substations and the number of loads expected at existing neighboring substations, net of load transferred to the new substation,

3.4.2.1.6 The Grid Owner shall forward to the SPD and the System Operator all Planning Data received from existing as well as prospective Users within seven days from the day it receives such data.

#### 3.4.2.2 Connection Facilities Data

3.4.2.2.1 By the end of the month of each Aswin (mid October), the Grid Owner shall provide the SPD following information for the previous fiscal year on existing Grid substations:

- (a) Active load in MW on maximum peak day;
- (b) Reactive load in MVAR on maximum peak day;
- (c) Power factor on maximum peak day;
- (d) Active load in MW on minimum peak day;
- (e) Reactive load in MVAR on minimum peak day;
- (f) Power factor on minimum peak day; and
- (g) Annual maximum load of each power transformer and each feeder.

3.4.2.2.2 Distributor shall seek from the Grid Owner prior approval to any permanent major shifting of load (above 1 MW) among neighboring substations and any major changes in the system configuration.

3.4.2.2.3 By the end of the months of each Aswin (mid October), Generator shall provide the SPD following details on existing switchyard for the previous fiscal year:

- (a) Maximum load on transformer, MW;
- (b) Maximum reactive load on transformers, MVAR;
- (c) Power factor;
- (d) Dates of maximum load on transformers; and

3.4.2.2.4 By the end of the month of each Aswin (mid October), Grid Owner, and other Users (through the Grid Owner) shall submit to the SPD any changes to the Standard Planning Data specified in Appendix A and

Detailed Planning Data for their equipment at each Connection Point specified in Appendix B.

### **3.5 GRID DEVELOPMENT AND REINFORCEMENT PLANS**

#### **3.5.1 Grid Demand Forecast**

- 3.5.1.1 The SPD shall review the Demand Forecast for the immediate past fiscal year vis-à-vis the actual Demand data submitted by Distributors and prepare new Demand Forecast for the following 15year period.
- 3.5.1.2 The Demand Forecast draft report shall be submitted to the planning subcommittee for comment and suggestion by each Aswin 15 ( end of september).
- 3.5.1.3 The SPD shall prepare the report on Grid Demand Forecast, incorporating comments provided by the planning subcommittee to The GCMC for approval. by the end of the month of each Kartik (mid November)
- 3.5.1.4 The GCMC shall approve the final report by the end of Mangsir (mid of December)

#### **3.5.2 Generation Expansion Plan**

- 3.5.2.1 To meet Demand Forecast based on the final report on Grid Demand Forecast pursuant to Section 3.5.1.3 above, the SPD shall review the Least Cost Generation Expansion Plan developed in the previous fiscal year, considering generation program of existing Generators, newly committed generation projects and the level of study of various other potential projects.
- 3.5.2.2 For preparation of the Least Cost Generation Expansion Plan (LCGP), Generators shall make available to the SPD commissioning date of ongoing and committed generation projects by the end of the month of each Kartik (mid November).
- 3.5.2.3 For preparation of the LCGP, Grid Owner Services shall make available to the SPD list of candidate projects with details including project cost, earliest commissioning date, monthly peaking capacity, generation capability and five hydrological conditions (95%, 80%, 50%, 15% and 5%) by the end of the month of each Kartik (mid November).
- 3.5.2.4 Power Trader shall provide the SPD details on committed import and export power latest by the end of the month of each Kartik (mid November).
- 3.5.2.5 Power Trader shall provide the SPD details of Power Purchase Agreements signed in the previous fiscal year and technical features of IPP projects by the end of the month of each Kartik (mid November).

- 3.5.2.6 The Least Cost Generation Expansion Plan (LCGP) shall be submitted to the Planning sub committee by the end of the month of each Poush (mid January). After incorporating comment of Planning Sub committee it shall be submitted to ERC for approval.

### 3.5.3 Short-Term Grid Operational Plan

- 3.5.3.1 The SPD shall conduct an annual review of the performance of the Grid with a planning horizon of five (5) years, considering current and forecast Demand, proposed generation pattern, commissioning date of ongoing and committed transmission line and substation projects.
- 3.5.3.2 Since maintaining voltage is a serious problem, the study shall pay special attention on the requirements of capacitors and reactors.
- 3.5.3.3 The report on the Short-Term Grid Operational Plan, prepared on the basis of the above review, shall contain:
- (a) Annual projections of Grid Demand;
  - (b) Details of Generators;
  - (c) Details of annual topology;
  - (d) Details of load flow, short circuit analyses and stability studies for normal and single contingency condition;
  - (e) Alternative scenarios of above studies with alternative Demand forecast and Generators; and
  - (f) Recommendations of the SPD on the Short-Term Grid Operational Plan, including anticipated deficiencies in generation and proposed Grid plan, which could pose operational problems in the future.
- 3.5.3.4 The study shall identify deficiencies in the Grid and evaluate alternative transmission plans on technical and economical basis to mitigate, if not completely eliminate, the Grid problems. The report shall contain reinforcement plans that require immediate implementation.
- 3.5.3.5 The report on the Short-Term Grid Operational Plan shall be submitted to the GCMC for approval by the end of the month of each Magh (mid February) with the attachment of planning sub committee suggestion .
- 3.5.3.6 The System Operator shall notify Users of any planned development in the Grid that may have an impact on the User System.



### 3.5.4 Transmission Development Plan

- 3.5.4.1 The SPD shall review every year the existing Transmission Development Plan (TDP) along lines similar to the short-term grid operational plan.
- 3.5.4.2 The report on TDP shall be submitted to the by the end of the month of each Falgun (mid March).
- 3.5.4.3 Final TDP report shall be made ready by the SPD not later than the month of each Chaitra (mid-April).

### 3.5.5 Power System Master Plan

- 3.5.5.1 The SPD shall review every year the existing Power System Master Plan, consolidating all studies on Demand forecast, Least Cost Generation Expansion Plan and Transmission Development Plan, including short-term grid operational plan.
- 3.5.5.2 The Power System Master Plan shall be made ready by the end of the month of each Jestha (mid June).

## 3.6 GRID PLANNING STUDIES

### 3.6.1 General Planning Criteria

- 3.6.2.1 In transmission planning, several different studies are conducted in order to verify the following when subjected to various disturbances. These studies shall be carried out periodically and prior to authorizing any new Connection Point or modification in the existing Connection Point:
  - (a) The steady-state behavior of the Grid;
  - (b) Maximum transfer capability of transmission lines, which will ensure security of the Grid; and
  - (c) Behavior of the Grid after transients produced by disturbances or switching operations.
- 3.6.2.2 Presently, the SPD uses deterministic approach in transmission line planning and this method shall be continued till alternative methodology is approved by the GCMC.
- 3.6.2.3 The following prevailing criteria shall be adopted for supply reliability in planning a second circuit for existing radial line:
  - (a) (N-1) condition should be established for radial lines that supply more than 50 MW load.
  - (b) Where a second circuit can be added to existing towers, a minimum of 35 MW load is required for justification of (N-1) supply on radial circuits.

- (c) Planning of transmission lines from new power plants shall be determined on direct comparison of investment cost and transmission losses.
- (d) Unless otherwise economically justifiable, double circuits or multiple circuits should be an absolute requirement only for plants where the size is beyond the maximum sustainable system fault.
- (e) Transformer installations shall comply with (N-1) criteria either through installation of excess capacity in the order of the largest transformer unit in the same region or transformer spares shall be shared in the same region.

3.6.2.4 The quality of supply is governed by voltage and frequency. For planning purpose, the following variations in voltage and frequency are permissible:

- (a) Voltage variation in normal operation: +/- 5% of nominal voltage.
- (b) Voltage variation during emergencies: +/- 10% of nominal voltage
- (c) Frequency variation during emergencies: +/- 5% of nominal frequency.

3.6.2.5 The maximum permissible loading on transmission lines and substations shall be as follows:

(a) For Normal Conditions:

- Transmission line loading: <100% of thermal capacity of line @ 85°C;
- Transformer loading: <100% of rated transformer capacity.

(b) For Single Outage Conditions:

- Transmission line loading: <120% of thermal capacity of line @ 85°C;
- Transformer loading: <120% of rated transformer capacity.

(c) For Severe Outage Conditions:

- Transmission line loading: <120% of thermal capacity of line @ 85°C;
- Transformer loading: <120% of rated transformer capacity.

### 3.6.2 Load Flow Study

3.6.2.1 Load flow studies shall be performed to evaluate the behavior of the Grid for the existing and planned Grid facilities under forecast maximum and minimum load conditions and to study the impact of connection of new generation facilities, loads or transmission lines.

3.6.2.2 For new transmission lines the load conditions that produce the maximum flows through the existing and new lines shall be identified and evaluated.

- 3.6.2.3 Based on the results of these studies, single contingency cases shall be developed and analyzed. Multiple contingencies shall also be analyzed for outages of multiple transmission circuits on common structure and/ or rights-of-way.
- 3.6.2.4 The design of the connection of the new facilities or modification of existing facilities shall be considered satisfactory when the following conditions are achieved:
- (a) No overloading of transmission lines or other equipment occurs during normal conditions;
  - (b) Short term overloading of transmission lines and equipment remains within the pre-established emergency limits for all credible contingencies;
  - (c) Generator active and reactive power output remain within the unit capability curves; and
  - (d) Voltage profiles are within the pre established normal and emergency limits.

### 3.6.3 Short Circuit Study

- 3.6.3.1 Short circuit studies shall be conducted to evaluate the effect on the existing Grid equipment of the connection of new generation facilities, the connection of new transmission lines, the construction of new Connection Points or other modifications in the Grid topology.
- 3.6.3.2 These studies should identify equipment especially circuit breakers that may fail when interrupting possible short circuit currents. Other equipment such as switchyard devices and substation buses that could be permanently damaged when current passing through it overcomes their design limits should also be identified.
- 3.6.3.3 Alternative Grid configurations (topology) may be studied to reduce the short circuit current to acceptable values. Such topology changes shall be subjected to load flow and stability analysis to ensure that the changes do not cause steady-state load flow or stability problems.
- 3.6.3.4 Study results shall be considered satisfactory for all feasible and credible conditions when:
- a) Short-circuit currents are not beyond the design limit of any existing equipment; and
  - b) The proposed Grid configurations (topology) are suitable for flexible and safe operation.

### 3.6.4 Transient Stability Study

- 3.6.4.1 Transient stability studies shall simulate outages of critical Grid elements such as major transmission lines and large generators. The Grid performance is satisfactory if:
- (a) The Grid remains stable after credible contingencies for all forecast load conditions;
  - (b) The Grid remains controllable after non-credible contingencies. In the case of Grid separation, no total blackouts should occur in any Grid electrical island.
- 3.6.4.2 Transient stability studies shall be mandatory for all new 132/220/400 kV lines or substations and for the connection of new generating units equal to or larger than 100 MW at 220kV, and 50 MW at 132 kV. In other cases, GCMC shall determine the need of performing transient stability studies.

### 3.6.5 Steady-State Stability Analysis

Periodic studies shall be performed to determine if the Grid is vulnerable to steady state stability problems. Such problems surface on heavily loaded systems where small disturbances may cause steady-state oscillations, which, if undamped, can lead to major system disturbances. The studies shall identify solutions such as installation of power system stabilizers or identification of safe operating conditions.

S. No.	Section	Date of Amendment	Amendments to Grid Code
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**CHAPTER 4****PERFORMANCE STANDARDS FOR GRID****4.1 OBJECTIVE (T-1)**

The objective of the Performance Code is to specify:

- (a) Minimum technical standards to ensure efficient and reliable operation of Grid; and
- (b) Safety standards to ensure protection for personnel.

**4.2 SCOPE OF APPLICATION (T-1)**

The provisions of the Performance Code apply to all Parties including the following:

- (a) Grid Owner;
- (b) System Operator;
- (c) Generators;
- (d) Distributors; and
- (e) Any other entity with a User System Connection to the Grid.

**4.3 POWER QUALITY (T-1)****4.3.1 Voltage Variations**

The System Operator shall ensure that the power supply voltage in the Grid at major Connection Point during normal operating conditions shall not deviate by more than +/- 10% of its nominal value.

**4.3.2 Frequency Variation**

The System Operator shall ensure that the fundamental frequency in the System is maintained between 48.75 Hz and 51.25 i.e. +/- 2.5% of 50 Hz, which is the nominal value of fundamental frequency.

#### 4.4 TRANSMISSION LOSS (T-1)

##### 4.4.1 Classification of Loss

4.4.1.1 Transmission Loss shall include Technical Loss, Non-Technical Loss and Station Loss.

4.4.1.2 Technical Loss shall be the aggregate of conductor loss, transformer loss and loss due to metering inaccuracy.

4.4.1.3 Non-Technical Loss shall be the aggregate of energy loss due to meter-reading errors and tampering of energy meters and other measurement equipment.

4.4.1.4 Station Loss is the aggregate of auxiliary consumption required for proper operation of the Grid substation.

4.4.1.5 Transmission Loss shall be derived from the following formulae:

Transmission Loss in percent =  $(\text{Total Received Energy} - \text{Total Transmitted Energy} - \text{Total Station Loss}) / \text{Total Received Energy} \times 100$ .

Where:

Total Received Energy is defined as the sum of active energy received by the Grid Owner from Generators, Distributors, other Users and import at each Metering Point with adjustments, if any.

Total Transmitted Energy is defined as the sum of active energy supplied by the Grid Owner to Generators, Distributors, other Users and export at each Metering Point with adjustments, if necessary.

##### 4.4.2 Maximum Transmission Loss

4.4.2.1 The Grid Owner shall ensure that the Transmission Loss does not exceed 4.5% of the Received Energy.

4.4.2.2 By the end of the current fiscal year and annually thereafter, the Grid Owner shall submit to the Grid Code Management Committee the Station Loss (auxiliary consumption) at each Grid substation. This shall be accompanied by full details of operating equipment, their estimated load and monthly energy consumption.

#### **4.5 SAFETY STANDARDS (T-1)**

##### 4.5.1 General

The Grid Owner shall operate and maintain the Grid in a safe manner in accordance with the provisions in the Electricity Regulation 2050 (1993) and any amendments thereof. Other provisions not covered by this regulation shall be in accordance with the Best Industry Practice.

##### 4.5.2 Measurement of Safety

The Grid Owner shall operate and maintain the Grid to ensure the personnel and equipment safety measurements do not exceed .....  
(Refer to Chapter 10: Exemption & Transitory Provisions for the value).



S. No.	Section	Date of Amendment	Amendments to Grid Code
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**CHAPTER 5****GRID CONNECTION REQUIREMENTS****5.1 OBJECTIVE (T-1)**

The objectives of the Connection Code are as follows:

- (a) To specify technical, design and operational criteria of Equipment at Users' Connection Point;
- (b) To specify procedures for implementing Connection;
- (c) To specify data required by the Grid Owner from Users and vice versa; and
- (d) To list guaranteed performance parameters from Generators, Distributors and other Grid Users under Data Registration.

**5.2 SCOPE OF APPLICATION (T-1)**

The provisions of the Connection Code apply to all Parties including the following:

- (a) Grid Owner;
- (b) System Operator;
- (c) Grid Constructor;
- (d) Generators;
- (e) Distributors;
- (f) High Voltage Consumers; and
- (g) Any other entity with a User System connected to the Grid.

**5.3 GRID TECHNICAL, DESIGN AND OPERATIONAL CRITERIA (T-2)****5.3.1 General**

- 5.3.1.1 Connection Point shall be as agreed in the Connection Agreement.
- 5.3.1.2 The Grid Owner shall operate and maintain the Equipment on its side at the Connection Point.
- 5.3.1.3 The Generators shall operate and maintain the Equipment on their side at the Connection Point.

- 5.3.1.4 The Distributors and High Voltage Consumers shall operate and maintain the Equipment on their side at the Connection Point.
- 5.3.1.5 The voltage level of Connection Point shall be as decided by the Grid Owner on the basis of Impact Study.

### 5.3.2 Grounding Requirements

The grounding system at the Connection Point shall be designed to keep rise in touch and step voltages in and around switchyards where operators are likely to be present within acceptable safety limits specified by IEEE standard. The earth resistance at the Connection Point shall not exceed one ohm.

### 5.3.3 Insulation Level and Clearances

- 5.3.3.1 User installations shall be designed and installed with proper Basic Insulation Level and shall be coordinated with respect to the level of dielectric strength of all electrical equipment in the Grid.
- 5.3.3.2 The clearance for overhead transmission and distribution lines shall be maintained in accordance with the Electricity Regulation 2050 and any amendments thereof.

### 5.3.4 Power Factor

- 5.3.4.1 Distributors shall maintain power factor between 0.80 lagging and 0.95 leading and the Grid Owner may disconnect the User for failing to maintain this standard.
- 5.3.4.2 Generators shall maintain power factor between 0.85 lagging and 0.95 leading.

### 5.3.5 Equipment Standard

- 5.3.5.1 All Equipment at the Connection Point shall comply with the requirements of the IEC standards or their equivalent standards. The equipment shall be designed, manufactured and tested in accordance with the quality assurance requirements of ISO 9000:2000 series.
- 5.3.5.2 The standards prevailing at the time the Connection Point was designed or modified rather than the standards at the time of testing and commissioning shall apply to the Equipment at the Connection Point.

### 5.3.6 Maintenance Standards

- 5.3.6.1 The Connection Point shall be maintained in accordance with manufacturers' recommendations in a manner that shall not pose any threat to the security of any personnel or Equipment.
- 5.3.6.2 The Grid Owner and the Grid Users each shall maintain a log containing maintenance records and results of tests of their Equipment at the Connection Point and each shall make their log available to the other when requested.

#### **5.4 PROCEDURE FOR GRID CONNECTION, MODIFICATION & USE OF GRID (T-3)**

##### 5.4.1 Application for Connection

- 5.4.1.1 Any User intending to use the services of the Grid shall make an Application for Connection in accordance with standard application form given in appendix E- directly to the Grid Owner, or through distribution licensee as applicable, during the design phase of their project. The Department shall forward such application to the Grid Owner within seven days from the receipt of the application.
- 5.4.1.2 The prospective Users shall submit the standard application form, the Standard Planning data described in Appendix A along with the data and information listed in the sections 5.4.1.3 to 5.4.1.5 as appropriate. This data should be adequate for Grid Owner to carry out necessary studies to assess the impact of the proposed User development on the Grid. However, Grid Owner may require additional data including those specified in Appendix B and this will be requested when the need arises. Any delay in providing any of the required data will delay the assessment and the offer for Connection.
- 5.4.1.3 Data Required from Generators

In addition to the data requirements described in 5.4.1.2, prospective Generators seeking connection to the Grid shall provide the following data and information:

- (a) Purpose and nature of the proposed Connection or modifications;
- (b) Description of proposed development works at the Connection Point;
- (c) Confirmation that the User has necessary business license of the company from the Government;
- (d) Connection Date and Completion Date of the proposed User development;
- (e) Proposed single line diagram of the power generating plant and the Connection facilities;
- (f) Layout and Schedule of high voltage equipment to be installed in the switchyard where the connection to the Grid is to be made;

#### 5.4.1.4 Data Required from Distributors

In addition to the data requirements described in 5.4.1.2, prospective Distributors seeking connection to the Grid shall provide the following data and information:

- (a) Purpose and nature of the proposed Connection or modifications;
- (b) Description of proposed development works at the Connection Point;
- (c) Confirmation that the User has necessary business license of the company from the Government;
- (d) Connection Date and Completion Date of the proposed User development;
- (e) Number and rating of the power transformers, tap changing details;
- (f) Connection points (requested location);
- (g) Voltage level, method of connections such as High voltage O/H lines, U/G cables etc.;
- (h) Details of downstream networks in the form of layout maps, single line diagrams

#### 5.4.1.5 Data Required from High Voltage Consumer

In addition to the data requirements described in section 5.4.1.2, High Voltage Consumers requesting connection to their facilities shall provide the following data and information:

- (a) Purpose and nature of the proposed Connection or modifications;
- (b) Description of proposed development works at the Connection Point;
- (c) Confirmation that the User has necessary business license of the company from the Government;
- (d) Connection Date and Completion Date of the proposed User development;
- (e) Maximum and minimum load in MW;
- (f) Daily consumption schedule in week days and week end days;
- (g) Annual maintenance schedule of the plant;
- (h) Type of load, starting characteristics, short circuit level required;

#### 5.4.1.6 Data Required From Renewable Generators

Grid Owner shall specify standard connection procedure and data requirements of Renewable Generators (Solar, Wind, Biomass) to the Grid. It may include performance standards, operation, schedules, safety, metering and reporting including communication.

5.4.1.7 Users shall pay all cost of facilities required to connect to the Grid. If in future, some of the facilities benefit the Grid, the User shall make available to the Grid Owner such facilities subject to the technical capabilities.

5.4.1.8 Data Required from Grid Owner

Prospective Users intending to use the Grid may request the Grid Owner to provide them with relevant data and information about the technical parameters of the Grid to plan their system for interfacing with the Grid. The Grid Owner shall within a reasonable period of time furnish such data and information about the Grid.

#### 5.4.2 Processing of Application

- 5.4.2.1 The Grid Owner shall process the application of any User within ninety days from the receipt of the application, provided all necessary information, Planning Data and relevant Government license are included in the application. The User shall furnish any additional data or information requested by the Grid Owner, which is deemed necessary by the Grid Owner, for conducting Grid Impact Studies.
- 5.4.2.2 If the nature and complexity of the Connection is such that the prescribed time limit is not adequate, the Grid Owner shall make a preliminary proposal within the prescribed time limit with detail report to be presented within the extended time period approved by the GCMC. The applicant shall be informed by the Grid Owner of such extended time.
- 5.4.2.3 Based on the application and the results of the Impact Studies, the Grid Owner's offer for connection shall inform the applicant whether the application is acceptable or not and if not, the measures that the User needs to undertake to make the User's proposal acceptable.
- 5.4.2.4 The Grid Owner's offer for connection shall also specifically mention any works required to be done on the Grid to satisfy the requirements of the Connection and for obtaining necessary statutory clearances, way leaves, which could consume time and affect project schedule.
- 5.4.2.5 If the User does not reply to the offer for connection within 30 days from the date of report submission, the offer automatically lapses.

#### 5.4.3 Grid Impact Studies

- 5.4.3.1 The System Planning Department (SPD) with the assistance of the Planning Subcommittee shall conduct necessary technical studies for evaluating the impact on the Grid of the new Connection or modification to the existing Connection. This technical study shall be completed within two months from receipt of User's acceptable application.
- 5.4.3.2 The cost of such Impact Studies shall be to the account of the User.
- 5.4.3.3 The interested User shall take all measures to ensure that proposed User Development of the Connection to the Grid will not result in the degradation of the Grid. User's application shall be rejected if Grid Impact Studies prove that the User Development works cause degradation of the Grid, unless the User agrees to undertake counter measures proposed by the Grid Owner.

- 5.4.3.4 To enable the SPD to carry out Impact Studies, User shall provide all necessary Planning Data requested by the Grid Owner. Any delay on the part of User to submit the Planning Data will hamper commencement of Grid Impact Studies. A minimum of two months study period is required for each set of Planning Data.
- 5.4.3.5 Prospective Users seeking connections to the Grid may have the following options to secure connections:
- (a) Looping connections from the Grid transmission lines; and
  - (b) Connection from the Grid substations.
- 5.4.3.6 Tee Off connections from the Grid to Generators, Distributors and High Voltage Consumers shall not be permitted.

#### 5.4.4 Connection Agreement

- 5.4.4.1 If the User accepts the Grid Owner's offer for connection within the prescribed time or any extension thereof, the Grid Owner and the User shall sign a Connection Agreement or Amended Connection Agreement, as the case may be.
- 5.4.4.2 In case the User is an Independent Power Producer and accepts the Grid Owner's offer for Connection within the prescribed time or any extension thereof, the Grid Owner and the Independent Power Producer shall sign a Memorandum of Understanding (MOU) which shall be a part of the Power Purchase Agreement (PPA). Such MOU included in the PPA shall also be considered as Connection Agreement.
- 5.4.4.3 For the construction of any Grid Facilities, the Grid Constructor and the User shall abide by the executed Connection Agreement or Amended Connection Agreement as the case may be.
- 5.4.4.4 The Connection Agreement shall cite the obligations of each Party and include provisions for the submission of information and reports, Safety Rules, Electrical Diagrams, Testing and Commissioning programs, statement of readiness to connect, certificate of approval to connect and other requirements prescribed by the Grid Code.
- 5.4.4.5 Within 30 days from signing the Agreement, the User shall submit to the Grid Owner and the Grid Constructor the Detailed Planning Data pertaining to the proposed User Development.
- 5.4.4.6 The Grid Code shall prevail in the technical matters regarding Connection.



- 5.4.4.7 The System Operator shall ensure that the Grid Owner, Grid Constructor and Users comply with the technical and design criteria specified in the Grid Code.

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#### 5.4.5 Amended Connection Agreement

- 5.4.5.1 The User seeking modification after the application is approved by the Grid Owner and prior to the actual Connection to the Grid or the User seeking a modification in the existing Connection shall sign an Amended Connection Agreement with the Grid Owner.
- 5.4.5.2 The Amended Connection Agreement shall cite the obligations of each party and include provisions for the submission of information and reports, Safety Rules, Electrical Diagrams, Testing and Commissioning programs, statement of readiness to connect, certificate of approval to connect and other requirements prescribed by the Grid Owner.
- 5.4.5.3 Generators seeking connection to the Grid with a view to selling the generated power to a bulk power consumer using the Grid may need to sign an Amended Connection Agreement at the sending end Connection Point for wheeling additional power through the Connection Point and for any necessary modifications, assuming Generators are already connected to the Grid. Again, the receiving end or the point where the High Voltage Consumer is located may or may not require a new Connection and accordingly appropriate Agreement shall be signed. and procedures specified herein followed by all parties.

#### 5.4.6 Submittals Prior to Connection

- 5.4.6.1 At least 60 working days prior to the date on which energizing the Connection Point is requested, User shall have, regarding its facilities and its associated Connection Point:
  - (a) complied fully with the requirements of the Scheduling and Dispatch Code and shall also have submitted the data and information required;
  - (b) complied fully with the requirements of the Grid Management Code;
  - (c) submitted specifications of major Equipment and other details not included in the Planning Data;
  - (d) submitted Details of the protection arrangements and settings;
  - (e) submitted Electrical Diagram of the User's Equipment at the Connection Point;
  - (f) submitted Proposed Maintenance Program;
  - (g) submitted Test and Commissioning procedures for the Connection Point and the User Development;
  - (h) submitted a written request for energizing the Connection Point, including the earliest energizing date requested;

- (i) submitted to the Grid Owner following information necessary for the Grid Owner to prepare a site responsibility schedule giving the following information:
  - a listing of all User equipment (such as transformers, tap changers, active supply and controls, protection systems, etc.) which will affect the Grid; and
  - a list of the User's operational staff who will be responsible for giving and receiving data and information required under the Grid Management Code and the Scheduling and Dispatch Code, giving their names, job titles, responsibilities and, if not at the Connection Point, their normal working locations.
- (j) submitted to the Grid Owner a written confirmation that all Equipment and systems at the Connection Point conform fully with the requirements of the Grid Code and the Connection Code (subject to any exemptions granted by the Grid Owner).

5.4.6.2 Prior to the requested date for energizing the Connection Point, the Grid Owner shall have prepared, agreed with, and submitted to the User a site responsibility schedule giving the following information:

- (a) a list of Grid and User-owned Equipment at the Connection Point;
- (b) a list of service provided by the Grid Owner and the User at the Connection Point;
- (c) a schedule of telecommunications, metering, Grid protection, telemetry and control Equipment; and
- (d) a list of individuals of the Grid Owner, who will be responsible for giving and receiving data and information required under the Grid Management Code and the Scheduling and Dispatch Code, giving their names, job titles, responsibilities.; and
- (e) Details of the local safety procedures and the names of the Safety Coordinators.

#### 5.4.7 Commissioning Committee

5.4.7.1 The Grid Owner, Grid Constructor, the System Operator and the prospective User shall form a Commissioning Committee not later than 45 days prior to energizing the Connection Point.

5.4.7.2 The Commissioning Committee shall comprise of members from Grid Owner and the User with sufficient experience and knowledge to safely commission the new Connection Equipment and the chairperson shall be from the Grid Owner.

5.4.7.3 The responsibilities of this Committee are:

- (a) To determine if the User's facilities fully comply with all requirements of the Grid Code;
- (b) To confirm if the required communications, metering, protection and control systems meet all standards of the Grid Code;

- (c) Approve energization of Connection Point; and
- (d) To finalise a test program and switching schedule for energisation of equipment at the Connection Point.

#### 5.4.8 Inspection and Certification of Connection Points

- 5.4.8.1 The Grid Owner, on behalf of the Commissioning Committee, shall agree a date for the inspection of the Connection Point with the User. The Grid Owner shall carry out the inspection of the Connection Point and witness any tests required by the Commissioning Committee to ensure that the Connection facilities meet the requirements of the Grid Code/Connection Agreement and that energizing the Connection Point will not jeopardize the safe and secure operation of the Grid.
- 5.4.8.2 If the Commissioning Committee is satisfied that the Connection Point is in compliance with the Grid Code and ready for energizing, the Grid Owner shall issue a Connection Point Certificate to the User. Otherwise, the Grid Owner shall report the results of the inspection, in writing, to the User with details of why, in the Grid Owner's reasonable opinion, the Connection Point is not ready for energizing.
- 5.4.8.3 In the case where the Grid Owner has reported that the Connection Point is not ready for energizing, the User shall make the changes to the Connection Point Equipment and systems as required and shall inform the Grid Owner when a further inspection can take place. The Grid Owner and the User shall agree to a date for this inspection.

#### 5.4.9 Energizing the Connection Point

- 5.4.9.1 At least two weeks prior to the proposed date for energization of the Connection Point, the Commissioning Committee will issue a commissioning schedule and switching program for energization.
- 5.4.9.2 Following the issue of the Connection Point Certificate, the physical connection to the Grid shall be made in accordance with the testing and commissioning schedule issued by the Commissioning Committee.
- 5.4.9.3 Upon the energizing of the Connection Point, the Grid Constructor shall transfer all responsibility for the Connection Facilities to the Grid Owner.

### 5.5 REQUIREMENTS FOR LARGE GENERATORS

#### 5.5.1 Requirements relating to Connection Point

- 5.5.1.1 Large Generators means Generating Units with aggregate generating capacity above 5 MW.

5.5.1.2 The Connection Point shall be controlled by a circuit breaker of adequate rating.

5.5.1.3 Disconnecting switches shall be provided and arranged such that the breaker can be isolated for maintenance.

## **5.6 REQUIREMENTS FOR DISTRIBUTORS AND OTHER GRID USERS**

### 5.6.1 Requirements relating to Connection Point

5.6.1.1 The Connection Point shall be controlled by a circuit breaker of adequate rating.

5.6.1.2 Disconnecting switches shall be provided and arranged such that the breaker can be isolated for maintenance.

## **5.7 REQUIREMENTS FOR PROTECTION**

### 5.7.1 General Principles

5.7.1.1 The Grid Owner shall be responsible for conducting system studies to determine protection settings.

5.7.1.2 Each and every piece of electrical Equipment must be covered by protection.

5.7.1.3 Relay settings shall not be altered without consultation and agreement with the Grid Owner and other affected Users.

5.7.1.4 Protection shall not be bypassed or disconnected without consultation with the Grid Owner. If the protection problem cannot be solved quickly, the unprotected equipment shall be removed from service forthwith.

5.7.1.5 The Grid Owner shall be responsible for investigating malfunction of protection scheme or other related issues.

5.7.1.6 The Grid Owner shall convene periodic meetings among all Users to discuss protection issues. Users shall promptly carry out any corrective measures agreed to during these meetings.

### 5.7.2 Generating Unit

- 5.7.2.1 The Grid Owner and the Generator shall be responsible for the protection system of electrical equipment and facilities at their respective sides of the Connection Point.

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- 5.7.2.2 The Fault Clearance Time shall be specified in the Connection Agreement or Amended Connection Agreement. The Fault Clearance Time for a fault on the Grid where the Generator's Equipment are connected or on the Generator's System where the Grid Owner's Equipment are connected shall not be longer than 120 ms for 132 kV and 220 kV and 150 ms for 66kV systems.
- 5.7.2.3 A circuit breaker fail protection shall be provided by the Generator or the Grid Owner, depending on who has installed the circuit breaker at the Connection Point.
- 5.7.2.4 In the event the primary protection system fails to interrupt the fault within the prescribed Fault Clearance Time, the breaker fail protection shall operate and interrupt the fault current within 200 ms of fault occurrence.
- 5.7.2.5 Each Generating Unit shall be provided with protection against loss of excitation.
- 5.7.2.6 Each Generating Unit shall be provided with protection against pole slipping.
- 5.7.2.7 Protection shall be provided on each Generating Unit against over current, earth fault, out-of-step and frequency.
- 5.7.2.8 Other protection requirements shall be as per Best Industry Practice.

### 5.7.3 Transmission Line

- 5.7.3.1 The minimum protection scheme for short 132 kV lines shall consist of pilot wire differential or current differential through fiber optics or directional comparison relays with over-current and earth fault relays as backup.
- 5.7.3.2 The minimum protection scheme for long 132 kV lines shall consist of one protection distance relay and carrier transfer trip with over-current and earth-fault relays as backup.
- 5.7.3.3 The distance protection scheme shall be of the permissive under-reaching or blocking scheme with protection zones 2 and 3 delayed trip.
- 5.7.3.4 The distance protection relays shall have in-built facilities for fault locator, event recorder and disturbance recorder.
- 5.7.3.5 Out-of step relays shall be provided with both primary and backup protection to check operation of relays due to power swing.



- 5.7.3.6 Each relay line terminal shall be provided with circuit breaker-failure protection for each circuit breaker.
- 5.7.3.7 Each line terminal breaker shall include single-pole tripping and three-pole tripping with single shot auto-reclosure.

#### 5.7.4 Distribution Lines

- 5.7.4.1 The minimum protection scheme for non-parallel lines shall consist of non-directional over-current and earth-fault relays.
- 5.7.4.2 The minimum protection scheme for parallel scheme shall consist of directional over-current and earth-fault relays.

#### 5.7.5 Transformers

- 5.7.5.1 If the Generator is connected to the Grid, the high voltage side of the transformer shall be connected in Wye with neutral brought out for earthing.
- 5.7.5.2 If the Grid transformer with primary voltage equal to or greater than 66 kV is connected to the Distribution System, the high and low voltage sides of the transformer shall be connected in Wye with neutral brought out for earthing.
- 5.7.5.3 Differential scheme shall be provided for all size of transformers of capacity higher than 5MVA with over current and earth fault as backup.
- 5.7.5.4 Over-current and earth-fault relays shall be provided for all capacity transformers with directional features for parallel transformer operations.
- 5.7.5.5 Restricted earth-fault relays shall be provided for all transformers with capacity equal to or higher than 30 MVA.
- 5.7.5.6 Other protection requirements regarding gas-operated relays, and oil and winding temperature protection shall be as per Best Industry Practice.

### **5.8 FIXED ASSET BOUNDARY DOCUMENT REQUIREMENTS**

#### 5.8.1 Fixed Assets Boundary Document

- 5.8.1.1 Two weeks prior to the Completion Date specified in the Connection Agreement or Amended Connection Agreement, the Grid Owner shall prepare the Fixed Asset Boundary Document.

- 5.8.1.2 The Fixed Asset Boundary Document shall provide following information for each Equipment installed at the Connection Point:
- (a) The ownership of Equipment;
  - (b) The responsibility for control of Equipment;
  - (c) The responsibility for operation of Equipment;
  - (d) The responsibility for protection of Equipment;
  - (e) Safety Rules and Safety Coordinator or any other person responsible for safety;
  - (f) Operational procedures;
  - (g) Maintenance programs; and
  - (h) Accountable Managers.
- 5.8.1.3 Unless otherwise mentioned in the Connection Agreement or Amended Connection Agreement, accountability and responsibility for construction, installation, testing and commissioning, control, operation and maintenance of Equipment shall be vested in the owners of the Equipment.
- 5.8.1.4 Necessary site access shall be provided by the User owning the Connection site to the other User for installation, operation, and maintenance.
- 5.8.1.5 Six weeks prior to the Completion Date, the Grid Owner and the User shall exchange names of their Accountable Managers, who are duly authorized to sign the Fixed Asset Boundary Document on behalf of respective owners of the facilities at the Connection Point.
- 5.8.1.6 User shall provide all information required to the Grid Owner in the preparation of the Fixed Asset Boundary Document.
- 5.8.1.7 The Fixed Asset Boundary Document shall show all cables emanating from each of the owner's side.
- 5.8.1.8 The Grid Owner shall make available to User two copies of the Fixed Asset Boundary Document for verification. One of the copies shall be returned by the User with stamp of confirmation or comments, if any, to be incorporated in the Document.
- 5.8.1.9 After confirmation of its accuracy, the Accountable Managers shall sign the Fixed Asset Boundary Document.
- 5.8.1.10 Two copies of the signed Fixed Asset Boundary Document shall be distributed to the User. The date of issue, the issue number and the date of implementation of the Fixed Asset Boundary Document shall be stamped on each and every of one its pages.

- 5.8.1.11 Whenever a modification is required, the Grid Owner or the User, as the case may be, shall immediately inform the other party. The two shall discuss the change and, if determined necessary, revise and issue revised Fixed Asset Boundary Document. The revised Fixed Asset Boundary Document shall indicate the revisions, the new issue number and the new date of issue.

## **5.9 ELECTRICAL DIAGRAM REQUIREMENTS**

### **5.9.1 Responsibilities of the Grid Owner and Users**

- 5.9.1.1 The User shall prepare the Electrical Diagrams and Connection Point Diagrams in standard format in consultation with the Grid Owner.
- 5.9.1.2 The User shall prepare and submit to the Grid Owner Electrical Diagrams and Connection Point Diagrams for all equipment on the User's side of the Connection Point in accordance with the Connection Agreement or Amended Connection Agreement.
- 5.9.1.3 The Grid Owner shall prepare and submit to the User Electrical Diagrams and Connection Point Diagrams for all equipment on the Grid Owner's side of the Connection Point in accordance with the Connection Agreement or Amended Connection Agreement.
- 5.9.1.4 If the Connection Point is in the User's side, the User and if the Connection Point is in the Grid Owner's side, the Grid Owner shall prepare and distribute to the other composite Electrical Diagrams and Connection Point Diagrams for the entire Connection point.

### **5.9.2 Preparation of Electrical Diagrams**

- 5.9.2.1 The Electrical Diagrams and Connection Point Diagrams shall provide an accurate record of the actual physical layout of equipment, circuit ratings and connections.
- 5.9.2.2 The Electrical Diagrams and Connection Point Diagrams shall be prepared using the Site and Equipment Identification pursuant to Section 5.11.
- 5.9.2.3 The title block in each Electrical Diagram and Connection Point Diagrams shall include the names of the authorized persons and their signatures, and revision dates, if any.
- 5.9.2.4 The composite Electrical Diagrams and the Connection Point Diagrams shall be the basis for all operational, planning and design activities.

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## **5.10 GRID DATA REGISTRATION**

### **5.10.1 Responsibilities and Obligations to Submit Data**

- 5.10.1.1 Grid Users shall be responsible for submitting to the Grid Owner latest-data (including single-line diagram) specified in Appendix A and B and in the same manner the Grid Owner shall be responsible for submitting specified latest-data to the Grid Users.
- 5.10.1.2 Grid Owner and Users shall provide each other the name, address and phone/fax number of persons responsible for sending their data.
- 5.10.1.3 Any changes to their data for any reason whatsoever shall immediately be notified to others concerned for prompt correction to their database.
- 5.10.1.4 In case any data is missing or not supplied by a party, the other party shall, if and when necessary depending upon the urgency of such data, estimate the data. Such an estimate shall be based upon corresponding data for similar Equipment or upon other information found appropriate by the party.
- 5.10.1.5 Planning Data shall be updated, confirmed and replaced with validated actual values of parameters and information about the Equipment at the time of Connection. These data shall be registered as the Registered Equipment Data, which can be used in evaluating other connection applications or in preparing the Grid Development Plan.

## **5.11 SITE AND EQUIPMENT IDENTIFICATION**

### **5.11.1 General requirements**

- 5.11.1.1 The Grid Owner shall develop and establish a standard system for identification of its Site and Equipment. The system of identification shall be such that any Site or Equipment in Electrical Diagrams, Connection Point Drawings, operation instructions, notices, etc. shall be clearly differentiable from one another.
- 5.11.1.2 The identification for the Site shall include a unique identifier for each substation and switchyard where a Connection Point is located.
- 5.11.1.3 The identification for Equipment shall be unique for each transformer, breaker, isolator, etc. at the Connection Point.

### **5.11.2 Identification of Equipment at Site**

- 5.11.2.1 Each and every piece of Grid Owner's/ User's Equipment located at Site shall have numbering and nomenclature in accordance with the Grid Owner's system.
- 5.11.2.2 Before the installation of Grid Owner's Equipment on a User's Site and within the time frame specified in the Connection Agreement or Amended Connection Agreement, the Grid Owner shall provide the User in writing the operation diagram with the proposed new Equipment to be installed, its proposed numbering, identification and the date of installation at the User's Site.
- 5.11.2.3 Within fifteen days of the notification, the User shall inform the Grid Owner of its acceptance of the proposal if the proposed numbering and nomenclature do not create any confusion with other Equipment or of its rejection if problems are foreseen and the numbering/nomenclature needs to be changed before installation.
- 5.11.2.4 No Equipment, which has numbering/nomenclature that could be confused with other Equipment already at Site, shall be installed at Site.
- 5.11.2.5 User's Equipment on Grid Owner's Site shall have numbering and nomenclature in accordance with the system used by the Grid Owner.
- 5.11.2.6 Before the installation of User's Equipment on Grid Owner's Site and within the time frame specified in the Connection Agreement or Amended Connection Agreement, the User shall provide the Grid Owner in writing the proposed new Equipment to be installed at the Grid Owner's Site, its proposed numbering, identification and the date of installation or a proposal for altering the numbering/nomenclature of existing Equipment.
- 5.11.2.7 Within fifteen days of the notification, the Grid Owner shall inform the User in writing of its acceptance of the proposal if the proposed numbering and nomenclature does not create any confusion with other Equipment or of its rejection if problems are foreseen, along with details of numbering/nomenclature which will be adopted for the Equipment.
- 5.11.3 Changes in Numbering and/or Nomenclature
- 5.11.3.1 If the Grid Owner decides for a good reason that the numbering and/or nomenclature of Grid Owner's Equipment on User's Site or User's Equipment on Grid Owner's Site need to be changed, the above procedures shall be followed by both parties.

5.11.3.2 Grid Owner or User, as the case may be, who wish to install Equipment shall be responsible for the provision and erection of clear and unambiguous labeling showing the numbering and nomenclature.

5.11.3.3 International Connection

5.11.3.3.1 International connection will be

- a) Synchronous Connection
- b) Asynchronous Connection

5.11.3.3.2 The Procedure of International Connection and execution of agreement shall be done by Nepal Electricity Authority in consultation with the Line Ministry

S. No.	Section	Date of Amendment	Amendments to Grid Code
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## CHAPTER 6

### GRID OPERATION MANAGEMENT

#### 6.1 OBJECTIVE

The Objectives of the Grid Operation Management Code are:

- (a) To define operational responsibilities of the System Operator, Grid Owner and Grid Users;
- (b) To specify operating states and operating criteria for safe, reliable, secure and efficient operation of the Grid;
- (c) To describe strategies adopted for the management of system frequency and voltage control;
- (d) To specify operational requirements for Generators, Distributors and other non-NEA Grid Users;
- (e) To co-ordinate operation and maintenance programs of Generators, Grid Owner and other Grid Users; and
- (f) To specify procedures for coordination of safety when work or test is to be carried out; and

#### 6.2 SCOPE OF APPLICATION

The provisions of the Grid Management Code apply to all Parties, including the following:

- (a) Grid Owner;
- (b) System Operator;
- (c) Generators;
- (d) Distributors; and
- (e) Any other entity with a User System connected to the Grid.

#### 6.3 OPERATIONAL RESPONSIBILITIES

##### 6.3.1 Operational Responsibilities of the System Operator

The System Operator is responsible for:

- (a) Operating and maintaining power quality in the Grid during normal conditions;
- (b) Ensuring that active and reactive load-generation balance is maintained during emergency conditions;
- (c) Directing Grid recovery efforts following emergency conditions;
- (d) Dispatching capacity needed to supply Ancillary Services;
- (e) Maintaining normal frequency in Power Islands and ensuring quick resynchronization of the Power Islands;

- (f) Conducting technical studies to determine safe operating limits that will protect the Grid from instability problems arising from Single or Multiple Outage contingencies and proposing solutions to mitigate, if not eliminate, such problems;
- (g) Coordinating operational activities of Generators, Grid Owner and other Grid Users;
- (h) Operating and maintaining communication equipment in the Grid;
- (i) Coordinating final Maintenance Programs of Generators, Grid Owner and other Grid Users;

#### 6.3.2 Operational Responsibilities of the Grid Owner

The Grid Owner is responsible for:

- (a) Maintaining all Grid equipment and facilities, including protection system
- (b) Coordinating Grid protection among all Grid Users at each Connection Point;
- (c) Ensuring safe and economic Grid operating procedures are followed;
- (d) Executing instructions of the System Operator;
- (e) Preparing Grid maintenance and operation reports and Significant Event report jointly with the System Operator.

#### 6.3.3 Operational Responsibilities of Generators

Each Generator is responsible for:

- (a) Maintaining its Generating Units to deliver capacities as declared to the System Operator and in the Connection Agreement;
- (b) Providing timely planning and operational data to the System Operator and the Grid Owner;
- (c) Ensuring that Generating Units are not disconnected during emergencies unless for the safety of equipment and/or personnel;
- (d) Executing dispatch instructions of the System Operator.

#### 6.3.4 Operational Responsibilities of Distributors and Grid Users

The Distributors and Grid Users are responsible for:

- (a) Maintaining its equipment and facilities to ensure power quality in the Grid;
- (b) Ensuring that its System does not degrade the Grid and taking proper remedial measures, if necessary;
- (c) Providing and maintaining voltage-control equipment in its System;
- (d) Providing and maintaining Reactive Power supply to meet its own requirements;
- (e) Maintaining Automatic Demand Dropping scheme, as necessary;
- (f) Executing dispatch instructions of the System Operator;
- (g) Informing Grid Owner immediately regarding any change in planning data on User's side whether temporary or permanent including the date and time of change and expected date and time of reverting to original data.

## 6.4 GRID OPERATING STATES AND OPERATING CRITERIA

### 6.4.1 Grid Operating States

6.4.1.1 The Grid is considered to be in the Normal State when:

- (a) The System Frequency is within the limits of 49.5 Hz and 50.5 Hz;
- (b) The voltage at all Connection points is within the limits of 0.95 and 1.05 of the nominal value;
- (c) The loadings of all transmission lines and substations are below 90% of their continuous ratings;
- (d) The Grid configuration is such that any fault can be isolated from the Grid; and
- (e) The Operating Margin is adequate.

6.4.1.2 The Grid is considered to be in the Alert State under any one of the following conditions:

- (a) The System Frequency is outside the limits of 49.5 and 50.5 Hz but within the limits of 48.75 Hz and 51.25 Hz;
- (b) The voltage at all Connection points is outside the limits of 0.95 and 1.05 of the nominal value but within 0.9 and 1.1 of the nominal value;
- (c) The loadings of transmission lines and substations are at a critical stage and overloading of transmission lines and substations is imminent;
- (d) The Contingency Reserve is less than the capacity of the largest synchronized generating unit or import from a single Grid interconnection, whichever is higher;
- (e) A disturbance has occurred (natural calamities, such as flood, landslide, etc., or other calamities such as insurgence) which poses a threat to the operation of the Grid.

6.4.1.3 The Grid is considered to be in the Emergency State when corrective measures undertaken by the System Operator fail to arrest further degradation of the Grid without resulting in Total System Blackout and under any one of the following conditions:

- (a) There is generation deficiency;
- (b) Spinning reserve drops below the requirement;
- (c) The System Frequency is outside the limits of 48.75 Hz and 51.25 Hz;
- (d) The voltage at major Connection Points is outside the limit of 0.9 and 1.10 of the nominal value and voltage collapse is imminent;
- (e) The loading level of any transmission line or substation is above 110% of its continuous rating; or
- (f) Grid disturbances have resulted in cascading Outages, Islanding or Total System Blackout

6.4.1.4 The Grid is considered to be in Restorative State when Generating units, transmission lines, substation equipment and loads are being energized and synchronized to restore the Grid to its Normal State.

## 6.4.2 Grid Security

- 6.4.2.1 The Grid shall be operated and maintained in the Normal State.
- 6.4.2.2 The Grid shall be operated with adequate Frequency Regulating Reserve and Contingency Reserve in order to maintain the Grid even under Single Outage Contingency;
- 6.4.2.3 The Grid voltage shall be maintained at a safe level with adequate margin to reduce the vulnerability of the Grid voltage instability, transient instability and dynamic instability problems.
- 6.4.2.4 The Grid Frequency shall be controlled by the Frequency Regulating Reserve during Normal State and timely use of Contingency Reserve and Demand Control during any other operating states.
- 6.4.2.5 In some cases following a Significant Event, it becomes impossible to avoid disintegrating the Grid into Power Islands to prevent system collapse. Under such circumstances, the Grid shall be separated into several self-sufficient Power Islands. Once favorable conditions return, the Power Islands shall be resynchronized gradually to restore the Grid to the Normal State.
- 6.4.2.6 The Grid shall have sufficient Black Start and Fast Start Capability available at strategic locations to facilitate quick restoration of the Grid to the Normal State following a Total System Blackout.
- 6.4.2.7 As far as possible, Primary and Backup Protection shall be available in the Grid at all times. When all or part of a protection scheme fails or is out of service, the Grid Owner shall either take the protected equipment out of service or leave it in service for a limited period of time as long as adequate backup protection is available or install a temporary protection scheme.
- 6.4.2.8 The protection system on the User side shall be coordinated with the Grid protection system to provide necessary speed, sensitivity and selectivity.
- 6.4.2.9 Grid security shall require the operation of Generating Units at their short term emergency thermal equipment ratings, where justified.
- 6.4.2.10 No operator shall disconnect any part of the Grid without the specific approval from the System Operator except:
  - (a) under an emergency, which otherwise would result in system collapse or
  - (b) for safety of personnel or Equipment.
- 6.4.2.11 No equipment or line segment that was disconnected from the Grid shall be reconnected without approval from System Operator.

- 6.4.2.12 A protection group shall be formed within the organization of the Grid Owner. This group shall be responsible for coordination of protection and relay settings and shall review the schemes every six months.

## **6.5 SYSTEM FREQUENCY MANAGEMENT**

### **6.5.1 Frequency Management through Generation Control**

- 6.5.1.1 The normal frequency range will be 49.5–50.5 Hz (nominal frequency: 50Hz). The System Operator shall take appropriate actions to restrict frequency deviations within this normal range.
- 6.5.1.2 The Grid Frequency shall be controlled through timely use of Frequency Regulating Reserve and Contingency Reserve.
- 6.5.1.3 The Frequency Regulating Reserve is comprised of Primary Response and Secondary response of Generating units.
- 6.5.1.4 The System Operator may issue an instruction to each Generator to operate the Generating Units in the Frequency Sensitive Mode as Primary Response and/or Secondary Response.
- 6.5.1.5 All Generating Units providing Primary Response for frequency regulation shall operate on free-governor mode for automatic adjustments of the Generating Unit's power output to changes in frequency. The maximum response time of the governing system of the Generating Unit shall not exceed five (5) seconds.
- 6.5.1.6 All Generating Units providing secondary response shall provide frequency regulation through Automatic Generation Control or manual adjustment of power output with specific Dispatch Instructions from the System Operator. The maximum response time of the governing system of the Generating Unit shall not exceed twenty-five (25) seconds.
- 6.5.1.7 No dead bands or time delays shall be set intentionally in the governors.
- 6.5.1.8 The rate for changing the governor settings to change the power output shall be one (1) percent per minute or as provided in the manufacturer's specifications.
- 6.5.1.9 At no times shall the Generator override the free-governing mode or Automatic Generation Control mode of a Generating Unit, which is providing Primary or Secondary Response.
- 6.5.1.10 Generating Units which do not participate in the load frequency control shall be set to run independent of the Grid frequency.

- 6.5.1.11 The Contingency Reserve is comprised of Spinning Reserve and Backup Reserve.
- 6.5.1.12 Generating Units providing Spinning Reserve shall be at all times synchronized with the Grid and automatically respond to any sudden loss or significant reduction in generating capacity.
- 6.5.1.13 Generating Units providing Backup Reserve shall have Fast Start capability.
- 6.5.1.14 Each Generating Unit must at all times have the capability to operate automatically so as to provide response to changes in frequency in order to contain and correct the System frequency within the statutory requirements.
- 6.5.1.15 When the frequency rises above 50.5 Hz, the Dispatched Generating Unit, which is operating above Minimum Stable Loading, shall decrease their Output at a minimum rate of 2% of output per 0.1 Hz for deviation of System frequency above 50.5 Hz until the frequency is restored within the normal range.
- 6.5.1.16 In the event of sustained rising frequency beyond 51.0 Hz, the Generator shall take immediate actions to reduce the power output of Generating Unit without the need to receive instructions from the System Operator. Remedial actions may include desynchronizing Generating Units from the Grid. The Generator shall immediately report such actions to the System Operator.
- 6.5.1.17 When the frequency falls below 49.5 Hz, the Dispatched Generating Unit shall increase their power output at a minimum rate of 2% of power output per 0.1 Hz for deviation of System Frequency below 49.5 Hz until the frequency is restored within the normal range.
- 6.5.1.18 In the event of sustained falling frequency below 49.0 Hz, the Generator shall synchronize necessary Generating Units that have been declared available without the need to receive instructions from the System Operator. The Generator shall immediately report such actions to the System Operator.
- 6.5.1.19 In the event the System frequency stabilizes above 51.25 Hz, after all actions have been taken on the Generating units, the System Operator shall issue instruction to reduce the power output of some Generating Units so that the frequency returns to below 50.5 Hz. and ultimately to Target Frequency.
- 6.5.1.20 A System frequency induced change in the power output of a Generating Unit, which assists to target frequency, must not be countermanded by a Generator except when it is done purely on safety grounds relating to either personnel or plant. It is accepted that the reduction in power output may not be to below the Minimum Stable Loading level.
- 6.5.1.21 Dispatched Generating Unit may trip after a time if the power output has reduced to below the Minimum Stable Loading level in response to a large

excess of System Frequency. All effort shall be made by the Generator to prevent such tripping provided the System Frequency is below 52 Hz.

6.5.1.22 If the System Frequency is at or above 52 Hz, the requirement to avoid tripping does not apply and the Generator is required to take action to protect the Generating plant.

6.5.1.23 Where under frequency relays are installed at the Generators, these may be utilized to establish operating reserve for frequency control. Generators may not alter the under frequency relay settings or remove them without the permission of the System Operator, except for safety reasons during:

- (a) synchronization and generation from standstill;
- (b) generation from zero generated output; and
- (c) increase in generated output.

## 6.5.2 Frequency Management through Demand Control

### 6.5.2.1 General Principles

6.5.2.1.1 Demand Control means reduction in system Demand carried out to maintain balance between generation and demand for the purpose of frequency control.

6.5.2.1.2 The term Demand Control is used to describe any or all of the following methods of achieving a demand reduction.

- (a) Demand Control initiated by the System Operator;
- (b) Demand Control by Disconnection initiated by Users (not initiated by the System Operator);
- (c) Demand Control initiated by Users through Customer voltage reduction;
- (d) Automatic under frequency Demand disconnection; and
- (e) Emergency manual Demand disconnection.

### 6.5.2.2 Demand Control Initiated by System Operator

6.5.2.2.1 If Demand Control is necessary to implement for balancing deficiency in generation caused by non availability of Generators or power transfer not being available from external connections or Grid break down, the System Operator shall issue a public notice as early as possible, citing the reason for and amount of demand reduction required, the location and the date, time and duration of Demand Control.

6.5.2.2.2 In the event a prolonged Demand Control is envisioned as a result of a protracted shortage in generation, the System Operator shall issue a public notice seven days prior to the commencement of such Demand Control citing the reason and amount for demand reduction required, the locations and the dates, timings and duration of Demand Control.



- 6.5.2.2.3 Demand control to be applied due to instant and temporary supply shortages shall be discussed in Chapter 7, Scheduling and Dispatch.
- 6.5.2.2.4 The User shall provide the System Operator the amount of Demand reduction actually achieved within half an hour of the implementation of Demand Control.
- 6.5.2.2.5 The User shall not reconnect the affected customers until instructed by the System Operator.

#### 6.5.2.3 Demand Control Initiated by User

- 6.5.2.3.1 If a User intends to implement day ahead Demand Control through Customer Disconnection at the Connection Point, the User shall notify the System Operator at least by 16:00 hours day ahead with details of the proposed location, date, time and the duration of the disconnection along with the magnitude of the proposed demand reduction.
- 6.5.2.3.2 The User shall provide the System Operator with the amount of Demand reduction actually achieved within half an hour of the implementation of Demand Control.
- 6.5.2.3.3 In case of severe generation deficiency, Users often resort to Voluntary Load Curtailment (VLC) schemes wherein the Customers are formed into weekday groups and each group voluntarily reduces their respective loads for a certain period of the day in each week fixed for the group.
- 6.5.2.3.4 The User shall notify the System Operator as early as possible details of the proposed location, date, time and the duration of the implementation of each Customer group in the VLC scheme along with the magnitude of the proposed demand reduction.
- 6.5.2.3.5 The User shall provide the System Operator with the amount of Demand reduction actually achieved by each Customer group in the VLC scheme within half an hour of the implementation of Demand Control.

## 6.6 VOLTAGE MANAGEMENT

- 6.6.1 The System Operator shall conduct load flow studies of the System for different loading conditions and determine the optimum generation that would also provide acceptable voltage profile at each Connection Point.
- 6.6.2 Generating Units shall be equipped with Automatic Voltage Regulators. Power System Stabilizer, if provided, shall be tuned properly in consultation with the System Operator.

6.6.3 If acceptable voltage level cannot be achieved through optimum generation, the control of the voltage shall be achieved by managing the Reactive Power Supply in the Grid. These include the operation of the following equipment:

- (a) Synchronous Generating Units;
- (b) Synchronous condensers;
- (c) Static VAR compensators;
- (d) Shunt reactors and capacitors; and
- (e) On-Load tap changing transformers.

## **6.7 OPERATIONAL REQUIREMENTS FOR LARGE GENERATORS**

6.7.1 Each Generating Unit shall be capable of delivering continuously its active power output as guaranteed in the Generator's Declared Data within the Grid frequency range of 49.5-50.5 Hz. Any decrease in the Active Power output outside this frequency range shall not be more than the proportionate value of Grid frequency decay.

6.7.2 Each Generating Unit shall be capable of generating its active power and reactive power outputs, as guaranteed in the Generator's Declared Data, within the voltage variations of +/- 10% during normal operation.

6.7.3 Each Generating Unit shall be capable of generating its active power output, as guaranteed in the Generator's Declared Data, within the limits of 0.85 lag and 0.95 lead at the Generating Unit's terminals, in accordance with its Reactive Power Capability Curve.

6.7.4 All Generating Units shall remain in synchronism for at least fifteen (15) seconds in the event the Grid frequency varies in the range of 47.5-52.5 Hz, unless the Generator decides that it may damage the Generating units.

6.7.5 Generators shall have the capability to operate in Island mode and operate in this mode as and when instructed by the System Operator.

6.7.6 Generating Units shall be capable of picking up minimum 5% additional load over the maximum continuous ratings for five (5) minutes or the limit specified by their manufacturers.

6.7.7 Generator shall be responsible for providing protection against Grid Frequency excursion outside the range of 47.5-52.5 Hz, and the Generator shall have to drop the Generating Unit(s) from the Grid and operate in the Island Mode.

6.7.8 Generating Units shall be synchronous generators; induction generators shall not be permitted.

### 6.7.9 Speed-Governing System

- 6.7.9.1 Generating Units shall be capable of contributing to Frequency Control by continuous regulation of the active power.
- 6.7.9.2 Generating Units shall be fitted with a fast-acting automatic generation control system, with an overall speed-droop characteristic of five (5) percent or less to provide Frequency Control during normal operating conditions.
- 6.7.9.3 The System Operator shall be able to control the speed governing system from remote Load Dispatch Center.
- 6.7.9.4 The Generating Unit, when it becomes isolated from the Grid, shall provide Frequency Control to the resulting Island Grid.

### 6.7.10 Excitation Control System

- 6.7.10.1 Generating Units shall be capable of contribution to Voltage Control by continuous regulation of the reactive power supplied to the Grid or, in the case of Embedded Generating Units, to the User System.
- 6.7.10.2 Generating Units shall be fitted with a continuously acting automatic excitation control system to control the terminal voltage without instability over the entire operating range of the Generating Units.
- 6.7.10.3 Generators shall provide power system stabilizers, if results of Impact Studies conducted by the System Planning Department demand it.
- 6.7.10.4 Black Start Capability
- 6.7.10.5 The Generators shall have Black Start Capability.

### 6.7.11 Fast Start Capability

- 6.7.11.1 The Generator shall indicate in its application for a Connection Agreement or an Amended Connection Agreement if its Generating Unit has Fast Start facilities.
- 6.7.11.2 The Grid Owner shall specify in the Connection Agreement or Amended Connection Agreement the requirement for Fast Start capability in the Generating Units, if necessary. With this facility, the Generating Unit shall automatically Start-up in response to frequency relays with setting below 47.5 Hz.

## **6.8 OPERATIONAL REQUIREMENTS FOR DISTRIBUTORS AND NON NEA GRID USERS**

6.8.1 Distributors and High Voltage Consumers shall provide Reactive Power compensation as close as possible to the Demand in the User's System to maintain the power factor in the User's System not less than 0.8 lagging and to maintain the Grid voltage within the prescribed range of +/- 10% of nominal voltage during normal operation.

### **6.8.2 Automatic Load Dropping**

6.8.2.1 For the purpose of Demand Control through Automatic Load Dropping pursuant to Section 7.9.4, the Distributor or High Voltage Consumer shall specify the manner in which Demand in the Distribution System or User System shall be split into discrete MW blocks. The number of blocks and the under frequency settings shall be specified by the System Operator by the month of every Chaitra (mid April) every year.

6.8.2.2 Under frequency relays to be used in the ALD scheme shall be fully digital with suitable characteristics for following load dropping scheme:

- (a) Group A for frequency level <49.0 Hz
- (b) Group B for frequency level <48.0 Hz

6.8.2.3 The input voltage shall be AC 110 volts and shall be sourced from the primary System so that the frequency to the under frequency relay shall be the same as that of the primary System.

6.8.2.4 Grid Owner shall install under frequency relays to cover about 50% of the System peak demand on feeders spread all over the distribution network to provide a reasonably uniform disconnection in the Distribution System.

## **6.9 COMMUNICATION REQUIREMENTS**

### **6.9.1 General Requirements**

6.9.1.1 Telecommunication facilities shall be installed between the System Operator at Load Dispatch Center and Generators, Distributors and other Users at their respective control centers in order to ensure adequate monitoring and control of the Grid and exchange of information during normal and emergency conditions. Such facilities shall also be established between adjacent Grid substations.

6.9.1.2 The communication and SCADA system for the Grid and the Connection Points shall be planned and designed by the System Operator.

- 6.9.1.3 The Grid Owner shall be responsible for providing communication equipment and SCADA equipment at Grid substations and related system development at LDC.
  - 6.9.1.4 The communication and SCADA equipment at Connection Points on User's side and related development at LDC shall be the responsibility of Generators and other Users. Other equipment such as transducers, cables, modems, etc shall also be provided along with the main equipment necessary for interconnection with the SCADA system of the Load Dispatch Center.
  - 6.9.1.5 The communication and SCADA equipment installed by Users at Connection Points shall be compatible with those installed by the Grid Owner at the remote end in the Grid, including the Load Dispatch Centre.
  - 6.9.1.6 A combination of communication media may be used. These could be Power Line Carrier (PLC), microwave radio or fiber optics. Base radios Cellular phones and e-mail could serve as backup communication.
  - 6.9.1.7 The System Operator and Generators are authorized to tape all telephonic communication regarding Declared Available Capacity and Schedule and Dispatch Instructions. Parties shall make available to each other a copy of the transcript of such recording on request.
  - 6.9.1.8 The System Operator and Distributors are authorized to tape all telephonic communication regarding Declared Available Capacity and Schedule and Dispatch Instructions. Parties shall make available to each other a copy of the transcript of such recording on request.
  - 6.9.1.9 The System Operator and Users are authorized to tape telephonic communication regarding Safety. Parties shall make available to each other a copy of the transcript of such recording on request.
- 6.9.2 Communication for Large Generators
- 6.9.2.1 Fiber optical cables, where technically and economically feasible, shall be the preferred communication media between Load Dispatch Center and Generators.
  - 6.9.2.2 Power Line Carrier shall be the communication media, where fiber optics is not practical.
  - 6.9.2.3 Two independent voice communication and two data transfer channels shall be installed, one serving as backup for the other. These shall be used only for operational purposes.
  - 6.9.2.4 Users shall also arrange one public communication channel for general administrative use and for backup as well.

- 6.9.2.5 Another separate public communication channel shall be made available for facsimile.
- 6.9.2.6 Remote Terminal Unit (RTU), which provides the Load Dispatch Center with telemetry equipment facilities for monitoring real time data and remote control at the Connection Point, shall be installed.

### 6.9.3 Communication for Small Generators (less than 5MW)

- 6.9.3.1 The minimum communication system for Small Generators shall comprise of at least one public telephone line.
- 6.9.3.2 Another separate public communication channel shall be made available for facsimile.

### 6.9.4 Communication for Grid Owner

- 6.9.4.1 Fiber optics shall be used on short lines wherever feasible otherwise Power Line Carrier Communication system shall be installed as the main communication media between Load Dispatch Center and all Grid substations and between adjacent substations.
- 6.9.4.2 Two independent voice communications and two data transfer channel shall be installed.
- 6.9.4.3 One public communication channel for general administrative use and for backup as well shall be installed.
- 6.9.4.4 Another communication for facsimile shall be installed.
- 6.9.4.5 RTU shall be installed at all Grid substations.

### 6.9.5 Communication for Other Users

- 6.9.5.1 Public telephone lines shall be the communication media between Load Dispatch Center and Distributors and High Voltage Consumers.
- 6.9.5.2 Users shall also arrange one public communication channel for general administrative use and for backup as well and another line for facsimile.

## 6.10 GRID OPERATING AND MAINTENANCE PROGRAMS

### 6.10.1 Grid Outage Program:

- 6.10.1.1 By the end of the month of every Falgun (mid March) in each fiscal year, Users shall provide to the System Operator in writing a three-year rolling provisional User Outage Program involving Equipment connected to the Grid

at the Connection Point. This Program shall include the following information:

- (a) Identification of the Equipment and the MW capacity involved;
- (b) Reasons for the maintenance;
- (c) Expected duration of the maintenance work;
- (d) Preferred start date and completion date;
- (e) If there is flexibility in the dates, the earliest start date and the latest completion date

6.10.1.2 By 15<sup>th</sup> day of every Chaitra, System Operator in consultation with the Grid Owner shall prepare a three-year rolling provisional annual Grid Outage Program with focus on Grid Outage. In preparing this Grid Outage Program, the Grid Owner shall endeavor to accommodate the Users' Program to the extent possible.

6.10.1.3 By the end of the month of every Chaitra (mid April), the System Operator shall provide the Users in writing the three-year rolling provisional annual Grid Outage Program. If the proposed Outage Program differs with the provisional User Outage Program and the User is not satisfied with the proposed modifications, the User shall notify the System Operator and seek to resolve the matter.

6.10.1.4 By the 15<sup>th</sup> day of the month of every Baisakh (mid May), the System Operator shall provide the Grid Owner and Users three-year rolling final annual Grid Outage Program incorporating the revisions agreed during the discussion between the System Operator and the Users pursuant to Section 6.10.1.3 above.

#### 6.10.2 Generator Outage Program:

6.10.2.1 By the end of the month of every Falgun (mid March) in every fiscal year each Generator, including Embedded and non-Embedded Generating Plants, shall submit to the System Operator, in writing, a three- year rolling Generator Outage Program with following details as per Annual Generator Outage Form given in Appendix D-1.

- (a) Dispatch Unit and the MW capacity concerned;
- (b) Reasons for the Outage;
- (c) Expected duration of proposed Outage;
- (d) Preferred start date for each Outage; and
- (e) If there is flexibility, the earliest start date and the latest completion date.

6.10.2.2 The System Operator shall determine the peak generating capacity required in the system from forecast Demand and the total peak generating capacity available in the System from the Generator Schedule and Outage Program. Taking into consideration the availability of import, if necessary, the requirement of Operating Margin, and the constraints and Outages in the Grid, Distribution System and other User System, the System Operator shall

calculate the Output Usable required from the Generators to meet the monthly MW requirements of the System for accommodating the outage requests.

- 6.10.2.3 By the end of the of the month of every Chaitra (mid April), the System Operator shall notify in writing each Generator of any amendments suggested to their proposed annual Generator Outage Program, citing reasons for the suggested amendments and the MW shortfalls, if any, that would result without such amendments.
- 6.10.2.4 If the amendments proposed by the System Operator are not satisfactory to the Generators, both parties mutually or through the Operation and Reliability Sub Committee shall discuss the matter and seek to resolve it. It may be that the resolution of the problem may also require the involvement of other Users, including the Grid Owner. If required, such meetings shall be convened by System Operator.
- 6.10.2.5 By the end of the month of every Baisakh (mid May), the System Operator shall notify each Generator in writing the three-year rolling final annual Generation Outage Program incorporating all revisions agreed to pursuant to Section 6.10.2.4 above. If the final annual Generation Outage Program differs from or conflicts with the Generator Outage Program proposed by the Generators, and the conflict cannot be resolved, the Grid Owner shall Plan its Grid Outage Program on the basis of the final annual Generation Outage Program.

#### 6.10.3 Generation Schedule Program:

- 6.10.3.1 By the end of the month of every Falgun (mid March) each Generator, including Embedded and non-Embedded plants, shall submit in writing a 3-year rolling annual Availability and Capability declaration for its Generating Units to the System Operator. The information shall be presented in accordance with the Annual Availability Declaration Form given in Appendix:D

Annual availability declaration shall include following additional information:

- (a) Generating unit Availability (start time and date);
- (b) Time required to synchronize; and
- (c) Generation Scheduling and Dispatching parameters:
  - Generating Unit maximum MW and MVAR capacity;
  - Generating unit minimum stable loading;
  - Generating unit restricted operating zones;
  - Generating unit best efficiency zone; and
  - Generation Price Data.



6.10.3.2 At the end of the month of every Baisakh, the System Operator shall notify in writing, the final 3-year rolling annual Generation Schedule to Generators, Grid Owner, Distributors and other Grid Users.

6.10.4 Grid Operating Program:

6.10.4.1 The System Operator shall consolidate the Generator Outage Program, Grid Outage Program and annual Generation Schedule and prepare a final annual Grid Operating Program. This 3-year rolling final annual Grid Operating Program shall be issued by the System Operator to concerned Parties by the 15th day of the month of every Jestha (mid June).

6.10.4.2 The first year of the three-year rolling Grid Operating Program shall become the annual Grid Operating Program for the following year.

6.10.4.3 Monthly, weekly and daily Grid Operating Programs are discussed in Chapter 7: Scheduling and Dispatch.

## 6.11 SAFETY COORDINATION AT CONNECTION POINTS

### 6.11.1 Guidelines for Safety Procedure Implementation

6.11.1.1 The Grid Owner and User(s) shall each develop and adopt Safety Rules and safety instructions for implementation of safety precautions on their HV Line/Equipment. The Safety Rules and safety instructions of the Grid Owner and User(s) shall govern all works/testing on the Grid System or the User's System respectively.

6.11.1.2 Safety coordination procedures shall be established for enforcement of safety precautions on HV Line/Equipment when works/testing are to be carried out on the Grid or the User System

6.11.1.3 No Party shall access any other Party's Equipment without permission of the other Party concerned.

6.11.1.4 The safety officer designate from work-requiring shall serve as Safety Coordinator, who shall be responsible for coordinating & ensuring implementation of safety precautions on the Grid System and on the other User(s) System involved.

### 6.11.2 Safety Officer

To facilitate work at Connection Points, the Grid Owner and User(s) shall each assign a safety officer who shall be responsible for coordination of safety precautions on HV Line/Equipment at their respective sides of the Connection Point.

### 6.11.3 Safety / Safety Precautions Registration

The Grid Owner and User(s) shall maintain safety log-books with records of all messages/orders/implementations concerned with safety precaution coordination & implementation. The safety logs shall be retained for atleast three (3) years.

### 6.11.4 Isolation & Grounding Procedure

6.11.4.1 Isolation of HV Line/Equipment for safety precaution implementation shall be implemented in the following way;

- (a) Isolation may be performed by locking an Isolator/Disconnect switch in "OPEN" position. A "Safety-Plate" shall be fixed at the location of Isolation.
- (b) Isolation may be performed by such other method in accordance with the Safety Instructions of the Grid Owner or of the User. A "Safety-Plate" shall be fixed at the location of Isolation.
- (c) Isolation may be performed by providing an adequate physical separation of HV Line/Equipment from live-parts in accordance with the Safety Instructions of the Grid Owner or of the User. A "Safety-Plate" shall be fixed at the location of Isolation.

6.11.4.2 Grounding of HV Line/Equipment for Safety Precaution implementation shall be implemented in the following way:

- (a) Grounding may be performed by locking the Grounding switch in "CLOSED" position. A "Safety-Plate" shall be fixed at the location of Grounding.
- (b) Grounding may be performed by such other method in accordance with the Safety Instructions of the Grid Owner or of the User. A "Safety-Plate" shall be fixed at the location of Grounding.
- (c) Grounding may be performed by providing an adequate contact to Ground of HV Line/Equipment in accordance with the Safety Instructions of the Grid Owner or of the User. A "Safety-Plate" shall be fixed at the location of Grounding.

6.11.4.3 To minimize the risk of inadvertent, accidental or unauthorized operation of the isolating/grounding equipment, a padlock shall be placed at the operating mechanism and all locking keys shall be kept in a safe place or shall be carried personally by the safety implementing officer.

6.11.4.4 The part of installation where work is to be carried out shall be isolated from all sources of supply and such isolations shall be easily viewable as specified in Clause 6.9.5.1 and 6.9.5.2 . The isolation shall be in the form of an air gap or equally effective insulation, which shall ensure that the point of isolation does not fail electrically. Parts of the electrical installation still carrying voltage after complete isolation of the installation, for example capacitors and cables, shall be discharged with suitable devices.

- 6.11.4.5 The dead condition shall be verified on all structures of the electrical installation at or as near as practicable to the work location. This includes, for example, the use of voltage indicating devices built into the equipment and /or the use of separately applied detecting devices. These latter devices shall have been tested and proved to be in good working condition immediately prior to the work.
- 6.11.4.6 At the work location for all high and some low voltage installations, all parts, which are to be worked on, shall be earthed and short-circuited. Earthed and short circuiting equipment or devices shall be first connected to the earthing point and then to the components to be short circuited. Earthing and short-circuiting equipment or devices shall be visible, whenever possible, from the work location. Otherwise, the earth connections shall be applied as close to the work as is reasonably practical.
- 6.11.4.7 If, during the course of activity, conductors are to be broken or joined and there is danger from potential differences on the installations, suitable measures such as bonding and /or earthing shall be taken at the work location before the conductors are broken or joined.
- 6.11.4.8 In all cases, it shall be ensured that the earthing and short-circuiting equipment or devices and cables and connectors for bonding used for this purposes are suitable and adequately matched to the fault rating of the electrical installation where they are installed. Precautions shall be taken to ensure that the earth remain secure during the time the work is in progress. If the earth connections are removed during measurement or testing, special precautions shall be taken to prevent danger.
- 6.11.4.9 For bare overhead lines and bare conductors, earthing and short-circuiting shall be carried out on all sides of the work location, if possible nearest to the work location, on all conductors entering this location; at least one of the earthing and short-circuiting equipment or devices shall be visible from the work location. These rules have the following exceptions:
- 6.11.4.10 For a specific work activity, where there is no break in conductors during work, the installation of a single earthing and short circuiting device at the work location is acceptable; and where it is not possible to see earthing and short-circuiting equipment or device at the limits of the work location, local earthing equipment or device or additional signaling devices or any other equipment identification shall be provided.
- 6.11.4.11 Work shall be commenced only when all required safety measures including proper isolation and earthing have applied. A well-designed Checklist shall be used for this purpose. The Checklist shall be jointly developed by both Parties.
- 6.11.4.12 After work has been completed and inspected, persons no longer required shall be withdrawn. All tools, equipment and devices used during the work

shall be removed. Only then shall the procedure for re-energizing be commenced.

6.11.4.13 All earthing and safety equipment and /or devices at the work location shall be removed. Starting from the work location and progressing outwards, the earthing equipment and /or devices that were applied to electrical installation shall be removed and all locks or other devices, which were used to prevent re-connection shall also be removed. All signs used for the work activity shall be removed. As soon as one of the actions taken to make the electrical installations safe for work has been reversed, this part of the electrical installation shall be regarded as live.

6.11.4.14 From time to time, each Party shall provide the other Party a list of their trained and experienced staff; such staff are the only people authorized to request and supervise the switching actions and the maintenance works on behalf of the requesting Party. The Form given in Appendix D-6 shall be used for requesting switching actions of the line. This Form shall be duly verified and signed by the responsible authority of the Party before delivering to the other Party.

6.11.4.15 Before re-energizing the lines or equipment, the original request Form shall have been produced before the implementing safety officer of the switching substation. It shall be mandatory for the implementing safety officer of the switching substation to verify that the person requesting for re-energizing is the one and the same person requesting for the switching substations to inform and wait for permission from the system operator before actually performing any kind of switching actions.

#### 6.11.5 Testing of HV Line/Equipment

If Tests are required to be conducted on the HV Line/Equipment, the Safety Coordinator shall ensure the following;

- (a) Confirmation from the implementing safety officer that work/testing is not going on and authorization to work/test has not been issued to any one in that HV Line/Equipment within the Points of Isolation specified.
- (b) All Safety Precautions other than that required for current-request have been cancelled.
- (c) The implementing safety officer agrees on the conduct of testing in that part of the System

#### 6.11.6 Cancellation of Safety Precautions

Upon completion of work/testing when the Safety Coordinator decides that requested safety precautions are no longer required, he shall inform the implementing safety officer and request him to cancel the safety precautions which are no longer required.

S. No.	Section	Date of Amendment	Amendments to Grid Code
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## CHAPTER 7

### SCHEDULING AND DISPATCH

#### 7.1 OBJECTIVE

The objective of the Scheduling and Dispatch Code is to specify:

- (a) Duties, responsibilities and actions of the System Operator, Grid Owner, Generators, Distributors and other Users in regard to Scheduling and Dispatch of the Power System;
- (b) Principles and operating criteria guiding the preparation of the Generation Schedule and issuance of Dispatch Instructions;
- (c) Process and requirement for preparation of the Generation schedule;
- (d) Process for Central Dispatch; and
- (e) Procedures to be followed during emergency conditions.

#### 7.2 SCOPE OF APPLICATION

The provisions of the Scheduling and Dispatch Code apply to all Parties, including the following:

- (a) System Operator;
- (b) Grid Owner;
- (c) Generators;
- (d) Distributors; and
- (e) Any other entity with a User System connected to the Grid.

#### 7.3 SCHEDULING AND DISPATCHING RESPONSIBILITIES

##### 7.3.1 Responsibilities of the System Operator

- 7.3.1.1 The System Operator shall have full operational autonomy in responsibility for Scheduling and Dispatching of generation in accordance with procedures defined in this Grid Code.
- 7.3.1.2 The System Operator is responsible for preparing monthly, weekly and daily Generation Schedule on hour to hour basis. Hierarchy-wise, the Generation Schedules shall have the prevalence in the order of daily, weekly, monthly and annual Generation Schedules so that the daily Generation Schedule shall prevail over the rest of the Generation Schedules in the event of any discrepancy.
- 7.3.1.3 The System Operator is responsible for issuing Dispatch Instructions for the Scheduled Generating Units.

- 7.3.1.4 The System Operator is responsible for allocating and monitoring the availability of Generating Units for Ancillary Services and for ensuring such Generating Units are strategically located in the Grid.
- 7.3.1.5 The System Operator is responsible for issuing Dispatch Instructions for Generating Units scheduled for Ancillary services.
- 7.3.1.6 The System Operator is responsible for informing the Grid Owner about relevant operational changes and deviations from the original planned schedule.
- 7.3.1.7 The System Operator shall have operational autonomy in planning and executing Demand Control whenever the need arises.
- 7.3.1.8 The System Operator is responsible for adopting and implementing the Emergency Procedures in case of emergency.

### 7.3.2 Responsibilities of the Grid Owner

- 7.3.2.1 The Grid Owner is responsible for providing the System Operator with monthly, weekly and daily Scheduled Grid Maintenance and Outage Program on hour to hour basis to determine the constraints of the Grid for scheduling and dispatching to meet forecast Demand.
- 7.3.2.2 The Grid Owner and Grid Constructor shall acquire concurrence from the System Operator for any changes in the configuration of elements of the Grid such as CT, PT, relay settings, etc., such that the changes can be incorporated in the SCADA system in a timely manner and that dispatch instructions are appropriate.

### 7.3.3 Responsibilities of Generators

- 7.3.3.1 Generator is responsible for providing the System Operator with a monthly, weekly and daily Capability and Availability Declaration on hour by hour basis.
- 7.3.3.2 Generator is responsible for providing the System Operator Dispatch Parameters and other data such as Prohibited Zones of Cavitations for each of its Scheduled Generating Units.
- 7.3.3.3 Generator is responsible for ensuring that it complies with all dispatch instruction from the System Operator subject to constraints imposed by the characteristics of Scheduled Generating Unit and safety considerations of plant or personnel.
- 7.3.3.4 Generator is responsible for ensuring that Generating Units scheduled for Ancillary Services can provide the necessary support upon instruction from the System Operator.

- 7.3.3.5 Generator is responsible for promptly informing the System Operator of any loss or change, temporary or otherwise, in the operational capability of any Generating Unit scheduled for Active Power or Ancillary Services.
- 7.3.3.6 Generator is responsible for promptly informing the System Operator of any change in the mode of operation of the AVR or governors.
- 7.3.3.7 Generator is responsible for acquiring prior concurrence from System Operator before making any changes in configuration of Generating Plant elements or their settings such as CT/PT ratios that would affect the SCADA system and hence the Dispatch Instructions from System Operator.
- 7.3.3.8 Generator shall not synchronize any of its Generating Units without a Dispatch Instruction except pursuant to Section 6.5.1.18 under sustained declining system frequency.
- 7.3.3.9 Generator shall not de-synchronize any of its Generating Units without a Dispatch Instruction except pursuant to Section 6.5.1.16 under sustained rising system frequency.
- 7.3.3.10 If due to reasons beyond its control, Generator is not able to comply with any of its responsibilities prescribed herein, Generator shall promptly inform the System Operator of such non-compliance and give reasons for non-compliance.

#### 7.3.4 Responsibilities of Distributors and Other Users

- 7.3.4.1 Distributors and Other Users are responsible for providing monthly, weekly and daily Grid Outage Program to System Operator for their maintenance and other related works.
- 7.3.4.2 Distributors and other Users are responsible for implementing all Dispatch Instructions from the System Operator pertaining to Demand Control during an emergency situation.
- 7.3.4.3 Distributors and other Users are responsible for the switching of import/export feeders at border points within their jurisdiction as per instructions of the System Operator.
- 7.3.4.4 Distributors and other Users are responsible for promptly providing information to the Grid Owner and the System Operator regarding shifting of lines that will affect loading of feeders at any substation.
- 7.3.4.5 Distributors and other Users shall provide the Grid Owner and the System Operator information regarding the changes made to supply arrangements of sensitive installations including hospitals and government administrative centers as soon as such changes are made.



## **7.4 OUTAGE INFORMATION REQUIRED FOR SCHEDULING**

### **7.4.1 Generator Maintenance Program:**

- 7.4.1.1 Following the Annual Generation Outage Program, by the 1st day of each month, each Generator shall provide in writing to the System Operator an update of the Final Generation Outage Program for the month ahead and the best estimate forecast for the following month ahead on a week by week basis as per Monthly Generation Outage Form given in Appendix D-3.
- 7.4.1.2 The System Operator shall analyze the Output Usable available and taking into account constraints and Outages of the Grid, Distribution System and other User Systems determine whether the estimates of Output Usable are sufficient to meet the System requirement. Any difference between the Outage Program proposed by the Generator and that proposed by the System Operator may be settled by mutual discussion or shall be referred to the Operation and Reliability Sub Committee.
- 7.4.1.3 By the 15<sup>th</sup> day of every month, the System Operator shall notify each Generator in writing of the final monthly final Generation Outage Program, giving reasons for any amendment made to the Generator's proposal and whether the Output Usable was sufficient to meet the System requirement and if not the MW short falls that would have resulted without the suggested amendments to the Generation Outage Program.
- 7.4.1.4 Following the monthly Generation Outage Program, by 14:00 hours every Wednesday, each Generator shall provide in writing to the System Operator an update of the Final Generation Outage Program for the week ahead and the best estimate forecast for the following week ahead on a day by day basis as per Weekly Generation Outage Form given in Appendix D-4. Information described in Section 6.10.1.1 shall also be presented to the System Operator.
- 7.4.1.5 The System Operator shall analyze the Output Usable available from the information provided under Section 7.4.1.4 above and taking into account constraints and Outages of the Grid, Distribution System and other User Systems determine whether the estimates of Output Usable are sufficient to meet the System requirements. Any difference between the Outage Program proposed by the Generator and that proposed by the System Operator shall be discussed and mutually resolved to the extent possible or shall be referred to the Operation and Reliability Sub Committee.
- 7.4.1.6 By 12:00 hours every Friday, the System Operator shall notify each Generator in writing of weekly Final Generation Outage Program and whether the Output Usable was sufficient to meet the System requirements and if not the MW shortfalls that would have resulted without the suggested amendments to the Generation Outage Program.

- 7.4.1.7 For Scheduled Generator Outage under the final Scheduled Generator Outage Program, the Generator shall request a Scheduled Generator Outage by submitting the Scheduled Generator request form given in Appendix D-5 to the System Operator at least seven Business Days before the date and time of the Scheduled Generator Outage.
- 7.4.1.8 The acceptance or denial of the request for a Scheduled Generator Outage Program shall be conveyed to the Generator by the System Operator not later than 16:00 hours Friday or at least 48 hours before the proposed Scheduled Outage.
- 7.4.1.9 In case of a Maintenance Outage, the Generator shall submit the Forced Generation Outage Request Form given in Appendix D-6 to the System Operator at least 48 hours before the proposed Maintenance Schedule.
- 7.4.1.10 The System Operator shall issue its acceptance or denial of the Generator's Maintenance Outage request not later than 24 hours before the date and time of the proposed Maintenance Outage.
- 7.4.1.11 The System Operator shall advise Generators and other Users at the earliest time of any necessary rescheduling of any outage due to adverse system conditions.

#### 7.4.2 Grid Outage Program

- 7.4.2.1 By the 7<sup>th</sup> day of every month, the System Operator, in consultation with the Grid Owner, shall update the annual Final Grid Outage Program for the month ahead and following month ahead on a week by week basis to produce the monthly Final Grid Outage Program. This is subject to changes recommended in the monthly Final Generation Outage Program issued by the System Operator at the latest by 16:00 hours on the 15<sup>th</sup> day of every month pursuant to Section 7.4.1.3.
- 7.4.2.2 By every Wednesday, the System Operator, in consultation with the Grid Owner, shall update the monthly Final Grid Outage Program for the week ahead and following week ahead on a day by day basis to produce weekly Final Grid Outage Program.
- 7.4.2.3 For Scheduled Grid Outage under the Final Grid Outage Program, the Grid Owner shall request a scheduled Grid Outage by submitting the Transmission Line Shutdown Request Form given in Appendix D-7 to the System Operator at least seven Business Days before the date and time of the Scheduled Outage.
- 7.4.2.4 The System Operator shall give its acceptance or denial of the Grid Owner's request by 16:00 hours on Wednesday but not later than 48 hours before the date and time of the Scheduled Grid Outage.

- 7.4.2.5 In case of a Maintenance Outage of the Grid Equipment or Transmission Links, the Grid owner or other Users shall submit to the System Operator a Grid Maintenance Program with details (Appendix D-7) at least 48 hours before the proposed commencement of such Maintenance Outage.
- 7.4.2.6 The System Operator shall issue its acceptance or denial of the Grid Owner's request for a Maintenance Outage not later than 24 hours before the proposed date and time of such Maintenance Outage.
- 7.4.2.7 The Grid Owner shall publicize all Grid Outages and Maintenance Outages at any particular location through various communication media at least 24 hours prior to the starting time of the actual Outage.
- 7.4.2.8 The Grid Owner shall inform the System Operator and all Users promptly of any changes in the Outage Program that could affect them. The Grid Owner shall inform the System Operator prior to carrying out any maintenance, reinforcement or replacement to equipment at site.

## **7.5 AVAILABILITY DECLARATION INFORMATION REQUIRED FOR SCHEDULING**

### **7.5.1 Monthly Availability Declaration:**

By the third day of every month, Generators shall submit to the System Operator an Availability Declaration Projection for the month ahead and following month ahead on a week by week basis. Such Availability Declaration Projection shall be based upon the annual Generation Schedule. The data shall be furnished, in writing, as per the Monthly Availability Declaration Form given in Appendix D-8.

### **7.5.2 Monthly Generation Schedule:**

By the 15th day of every month, the System Operator shall notify each Generator, in writing, of their approved monthly Projected Availability Declaration for the month ahead and following month ahead.

### **7.5.3 Weekly Availability Declaration:**

By every Wednesday, Generators shall provide the System Operator, in writing, the weekly Availability Declaration Projection for the week ahead and following week ahead on day by day basis as per the Weekly Availability Declaration Form given in Appendix D-9.

#### 7.5.4 Weekly Generation Schedule:

The System Operator shall notify each Generator, in writing, of their approved weekly Projected Availability Declaration not later than 16:00 hours on Friday following submission.

#### 7.5.5 Daily Availability Declaration:

Not later than 12:00 hours every day, each Generator shall provide to the System Operator, in writing, the daily Output Usable for each Generating Unit and the order of dispatch of each Generating Unit for day ahead and following day ahead on hourly basis as per Daily Availability Declaration Form given in Appendix D-10.

#### 7.5.6 Changes to Information

Generators shall promptly notify the System Operator of any changes in the Availability and Capability of any Generating Unit or any unexpected situation that could affect its operation.

### 7.6 GENERATION SCHEDULE PRINCIPLES

#### 7.6.1 Generation Schedule

The System Operator shall take into consideration following factors when preparing the Generation Schedule:

- (a) The registered parameters of Scheduled Generating Units;
- (b) The requirements for voltage control and Reactive Power;
- (c) The need to provide Operating Margin;
- (d) The availability of Ancillary Services;
- (e) The water level in storage type hydro power plants;
- (f) Bilateral contracts such as Power Purchase Agreement between Generators and Users;
- (g) Demand-Generation balance for Active and Reactive Power Balance;
- (h) Constraints of the Generating Units and the Grid; and
- (i) Availability of other sources of electricity such as import facility.

#### 7.6.2 Economic Operation

The Generation Schedule shall be developed with the objective of operating the Power System in an efficient and economic manner while maintaining Power Quality, Stability, Reliability and Security of the Grid.

## 7.7 COMPILATION OF GENERATION SCHEDULE

- 7.7.1 Based on the historical Demand forecast and the Demand forecast projected by the System Planning Department, the System Operator shall develop a cohesive Demand forecast on an hour by hour basis for every day. This Demand forecast shall be compared with the Demand Forecast submitted by Distributors and the higher of the two, after adjustment for system losses, shall be established as the final Demand Forecast.
- 7.7.2 The System Operator shall prepare an hourly Generation Schedule for each day sufficient to match at all times the final Demand Forecast and the Operating Margin. The System Operator shall include the Operating Margin in the Generation Schedule in the following manner:
- (a) Frequency Regulating Reserve shall be allocated to strategically located Generating Plants to achieve required levels of Primary Response and secondary Response to frequency changes in the Grid;
  - (b) Contingency Reserve shall be allocated at strategic locations in the Grid to cover uncertainties in the Generating Plant availability; and
  - (c) A strategic action plan, such as load curtailment, shall be implemented whenever there is insufficient Generation Plant available to provide an adequate Operating Margin.
- 7.7.3 Based on the Generation Price Data of Scheduled Generating Units, the System Operator shall prepare a Merit Order Table of Scheduled Generating Units.
- 7.7.4 The Merit Order Table shall be prepared based on ascending prices with the Generating Unit with the lowest price per kWh at the top of the Merit Order Table.
- 7.7.5 If Availability Declaration is not received by the System Operator within the prescribed time pursuant to Section 7.5.5, then such Generating Unit shall be committed last in the Merit Order Table with no reference to that Generating Unit's Price Data.
- 7.7.6 If two or more Scheduled Generating Units each have the same Generating Unit Price, they should be arranged in Merit Order Table in the order of system loss such that the Scheduled Generating Unit which results in a lesser amount of system loss shall be placed above the other Scheduled Generating Unit.
- 7.7.7 If two or more Scheduled Generating Units having the same Generating Unit Price provide negligible benefits in the amount of system loss, the selection then shall be based on the reserve capability and reactive power capability differences between the Scheduled Generating Units.
- 7.7.8 The System Operator shall commit Scheduled Generating Units in the order of the Merit Order Table, starting at the top of the Merit Order Table for the day ahead Generation Schedule.

7.7.9 By 16:00 hours every day the System Operator shall prepare and issue the day ahead and following day ahead Generation Schedule. This will be treated as standing Dispatch and shall indicate the hourly output of each Generating Unit and also specify the Generating Units providing Ancillary Services.

7.7.10 If the day ahead Generation Schedule is not received by the Generator then the day ahead Generation Schedule issued with previous day schedule shall prevail. If day ahead Generation Schedule is not received for two continuous days then the week ahead Generation Schedule shall prevail for third day.

## **7.8 GENERATION DISPATCH PROCEDURES**

### **7.8.1 Dispatch Criteria**

7.8.1.1 The System Operator when determining and issuing Dispatch Instructions shall consider the following:

- (a) The Generation Schedule;
- (b) Current Demand;
- (c) Current output of the Generators;
- (d) Any changes to Generator data pursuant to Section 7.5.6;
- (e) Constraints of the Grid;
- (f) System losses;
- (g) Merit Order Table;
- (h) Ancillary Services requirements; and
- (i) Power Quality, system reliability and security aspects.

7.8.1.2 The System Operator is authorized to disconnect, interrupt or suspend Generators if in its opinion failure to do so would:

- (a) Endanger safety of personnel and Equipment;
- (b) Disrupt electricity supply in the Grid; or
- (c) Interfere with other Programs of the Grid, such as construction, maintenance, testing, etc.

### **7.8.2 Dispatch Instruction Contents**

7.8.2.1 The System Operator shall determine and issue Dispatch Instructions in a timely manner to Generators, Distributors and/or other Users.

7.8.2.2 The Dispatch Instruction shall contain at a minimum the following:

- (a) the specific Generating Unit or Party to which the instruction applies;
- (b) the specific outcome required;
- (c) the start time for the Dispatch Instruction;
- (d) where ramp rates are involved, the target completion time for the Dispatch Instruction;
- (e) the issue time of the Dispatch Instruction; and
- (f) the identification of the personnel issuing Dispatch Instructions.

7.8.2.3 In addition to the above, Dispatch Instruction may contain any or all of the following:

- (a) increase or decrease active power (MW);
- (b) increase or decrease reactive power (MVAR);
- (c) target time for Scheduled Generating Unit start up and shut down;
- (d) instruction to change the Transformer Tap;
- (e) instruction to maintain fore bay water level in hydropower stations (ROR type or Power Stations in cascade);
- (f) instruction to make or break Isolators, Circuit Breakers, or Ground Switches;
- (g) switching instructions for import export feeders;
- (h) instruction to Black Start;
- (i) instruction to operate Generating Units in off-grid mode;
- (j) instruction to change to frequency control mode;
- (k) instruction to operate in Synchronous Condenser mode;
- (l) instruction to drop load;
- (m) instruction to switch on or off Capacitor Banks; and
- (n) instruction to switch on or off Reactors.

### 7.8.3 Issuing Dispatch Instructions for Generating Units

- 7.8.3.1 Dispatch Instructions shall be issued in written form duly signed by authorized person of each agency. If verbal instructions are issued for reasons of urgency, such instructions shall be followed by written instruction not later than 24 hours after the verbal instructions in accordance with Appendix D This applies to all communications. If communication facilities have broken down, the concerned Party shall immediately notify the other verbally at their nearest office.
- 7.8.3.2 The dispatch instructions shall be recorded in a logbook (electronic or otherwise) in chronological order by both the issuing and receiving Parties.
- 7.8.3.3 Dispatch Instructions shall be issued in clear and imperative sentences such that the receiver understands the instruction correctly and effortlessly. (e.g., “Keep the load at 20 MW until further instruction.”).
- 7.8.3.4 Date (both Nepali and English) and Time (in Hour) of the Instruction shall be clearly written in all Dispatch Instructions.
- 7.8.3.5 The System Operator and Generators shall frequently check and synchronize the clocks of their Control Rooms so that there are no inconsistencies in time stamping of events.

#### 7.8.4 Compliance with Dispatch Instructions

- 7.8.4.1 Generator shall immediately acknowledge and comply with all Dispatch Instructions issued to them by the System Operator.
- 7.8.4.2 Unless otherwise specified, any Dispatch Instruction issued by the System Operator remains valid until superseded by another Dispatch Instruction
- 7.8.4.3 Should there be any unforeseen problem in carrying out any Dispatch Instruction, the Generator shall notify the same to the System Operator immediately
- 7.8.4.4 The Generator may cease to comply with a Dispatch Instruction and may disconnect a Generating Unit when, in the Generator's reasonable opinion, personnel or Equipment safety is at risk.
- 7.8.4.5 Generators shall immediately notify the System Operator of non compliance or any disconnection.

#### 7.8.5 Communication Failure

Provisions shall be made to deal with situations arising out of failure of the communication link between the System Operator and any Generator. In the absence of a specific provision and in the case of a communication link failure, Generators shall operate according to the day-ahead Generation Schedule from the System Operator.

#### 7.8.6 Dispatch Instructions to Distributors and Other Users

Distributor and Other Users shall fully comply with all instructions issued by the System Operator unless, in the reasonable opinion of the Distributor or other User, personnel or Equipment safety is at risk. In such cases the Distributor or other User shall immediately notify the System Operator of the non-compliance and the reasons for such non-compliance

### **7.9 EMERGENCY PROCEDURES**

#### 7.9.1 General Principles

- 7.9.1.1 The System Operator and the Grid Owner through the Operation Sub Committee shall jointly develop a manual specifying the procedures to be followed by all Users during emergency conditions, including Black start procedures. This recovery procedure plan shall, at a minimum, also contain a list of Generators which have Black Start Capability, synchronizing points, priority of essential Demand to be connected and a list of critical personnel,



including their business and residential phone numbers for notification in emergency conditions.

- 7.9.1.2 The Grid Owner, Generators, Distributors and all other Users shall provide the System Operator with the names and phone numbers of their senior management representatives of Grid Owner, System Operator, Generators and Distributors, who are authorized to make binding decisions when called upon during emergencies.
- 7.9.1.3 In the event of an emergency condition, all critical personnel listed in the manual or as directed by the System Operator shall be available at the User's offices for Grid restoration duty.
- 7.9.1.4 In the event of a Total or Partial Blackout of the Grid, the System Operator shall immediately issue instructions to any User for mitigating the disruption of the power supply and its effect on the rest of the Power System in case the blackout is not total.
- 7.9.1.5 During the restoration process following Grid blackout conditions, normal standards of voltage and frequency may not apply.
- 7.9.1.6 During the restoration process following Grid blackout conditions, Scheduling and Dispatch of Generating Units in accordance with the Merit Order may not apply.
- 7.9.1.7 During the restoration process following Grid blackout conditions, Distributors and Users shall connect only that amount of Demand as instructed by the System Operator.
- 7.9.1.8 The System Operator and all Users shall log all operations and operational messages to facilitate subsequent investigation into the Event and to assess the efficiency of the restoration process.
- 7.9.1.9 All communication channels shall only be used for operational communications until such time as the System is restored to a Normal State.

#### 7.9.2 System Recovery From Total Grid Blackout

- 7.9.2.1 The System Operator shall orally inform the NEA Managing Director and the General Managers of the Transmission System Operation, Generation and Distribution and Consumer Services of the occurrence of Grid Total Blackout.
- 7.9.2.2 Because of the complex nature of the Power System and the fact that the system condition prevailing prior to the occurrence of the Grid Blackout largely determines the restoration process to be adopted, it is not practical to set out a pre-determined concise chronological sequence of actions for the restoration of the Grid.

- 7.9.2.3 The overall strategy in the restoration of the Grid after a Total System Blackout shall, in general, include the following:
- (a) Formation of discrete power islands and Generating Unit gradually feeding local Demand in the each power island;
  - (b) Step by step integration of the power islands into larger subsystems; and
  - (c) Eventual restoration of the Grid.
- 7.9.2.4 The procedure for a Black Start shall be that specified by the System Operator at that time and the System Operator shall accordingly instruct Generators with Black Start capability to commence their pre-planned Black Start procedure.
- 7.9.2.5 Upon receipt of the instruction from the System Operator, the relevant Generating Plants shall immediately start up to energize part of the Demand and synchronize with the Grid.
- 7.9.2.6 The System Operator in consultation with Distributors shall prepare Demand blocks in different areas for the purpose of restoration. Demand blocks shall be formed discretely as essential and non essential Demand. During restoration essential Demand shall be connected first and non essential Demand may be connected only when the Power System has returned to a Normal State.
- 7.9.2.7 Generators shall inform the System Operator as Generating Units become available to take Demand such that the System Operator may assess the MW demand which the Generating Unit is likely to pick up on circuit breaker closure.
- 7.9.2.8 Generators to whom start up power supply is made available shall sequence their start up to match their auxiliary power demand with supply available.
- 7.9.2.9 The System Operator may use remote operation of circuit breakers for quick recovery of the Power System.
- 7.9.3 System Recovery From Partial Grid Blackout
- 7.9.3.1 When a part of the Grid is not synchronized with the rest of the Grid, the System Operator with the coordination of the Grid Owner and the Distributor shall ensure that this normal part of the Grid is maintained.
  - 7.9.3.2 If there is no blackout in this part of the Grid, the System Operator shall undertake the resynchronization of this part of the Grid.
  - 7.9.3.3 If there is partial blackout in a part of the Grid, the normal part of the Grid shall be gradually extended to provide the start up power to appropriate Generating Units.

## 7.9.4 Emergency Frequency Management by Demand Control

### 7.9.4.1 Demand Control Initiated by User through Voltage Reduction

7.9.4.1.1 If the frequency deviates below 49.5 Hz and the normal loading level of the Generating Units is reached, the voltage level may be reduced by 5% below normal to try to maintain the System frequency within the permissible range.

7.9.4.1.2 The User shall notify the System Operator as early as possible with details of the proposed location, date, time and the duration of the implementation of the voltage reduction scheme along with the magnitude of the proposed demand reduction.

7.9.4.1.3 The User shall provide the System Operator with the amount of Demand reduction actually achieved by each Customer group in the VLC scheme within half an hour of the implementation of Demand Control.

### 7.9.4.2 Automatic Under Frequency Demand Disconnection

7.9.4.2.1 To limit the effects of a major loss of generation, the System Operator shall determine the level of Demand Control required through Automatic Load Dropping (ALD) through the use of under frequency relays.

7.9.4.2.2 If the frequency falls below 49 Hz, ALD should operate according to the following priority:

- (a) Group A for frequency level <49.0 Hz
- (b) Group B for frequency level <48.0 Hz

7.9.4.2.3 In order to ensure that subsequent fall in frequency will be contained by the operation of the ALD, additional Manual Demand Dropping shall be implemented so that loads dropped automatically can be reconnected.

7.9.4.2.4 Users shall not reconnect the disconnected Demand without clearance from the System Operator.

7.9.4.2.5 Subject to available generation, the first Demand to be disconnected shall be the first to be reconnected to the Grid.

7.9.4.2.6 Users shall notify the System Operator of the actual Demand that was disconnected by ALD and the actual Demand that was restored within half an hour from the load dropping or restoration operation respectively

7.9.4.2.7 Users shall inform the System Operator the effectiveness of ALD scheme in their supply areas.

#### 7.9.4.3 Emergency Manual Load Disconnection

- 7.9.4.3.1 The System Operator in consultation with Distributors shall establish a priority scheme for emergency Manual Load Dropping, equitably allocated throughout the Distribution System.
- 7.9.4.3.2 The Distributor shall disconnect its Customers immediately upon the receipt of instructions from the System Operator.
- 7.9.4.3.3 The Distributor or User shall not reconnect the disconnected Demand without clearance from the System Operator.
- 7.9.4.3.4 If the Manual Load Dropping is not sufficient to arrest the decline in the System frequency, the System Operator may disconnect the total Demand of the Distributor or User at the Connection Point in order to preserve the integrity of the Grid.
- 7.9.4.3.5 The Distributor or User shall provide the System Operator with the amount of Manual Load Dropped and subsequently reconnected upon recovery of the System frequency within half an hour of the operations.

#### 7.9.5 Unforeseen Circumstances:

- 7.9.5.1 In the event of circumstances which have not been foreseen in the Grid Code, the System Operator shall, to the extent reasonably possible, consult promptly all affected Grid Users to reach an agreement as to the best course of action.
- 7.9.5.2 If an agreement is reached, the System Operator shall operate accordingly and at the same time shall submit a report on the agreement to the GCMC for review and recommendation to the ERC for amendment of the Grid Code.
- 7.9.5.3 If an agreement is not reached and the Security of the System is at stake, then the System Operator shall be the sole judge as to the best course of action and shall issue appropriate instructions to all Users, who shall comply with these instructions to the extent that such instructions are not detrimental, based on the technical characteristics of the User's System as registered under the Grid Code or in the Connection Agreement, to the Equipment and safety of their personnel. The System Operator shall be responsible to the GCMC for any unjustified actions or measures it has taken.

S. No.	Section	Date of Amendment	Amendments to Grid Code
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## **CHAPTER 8**

### **SYSTEM TEST**

#### **8.1 OBJECTIVE**

The objectives of this System Test Code are as follows:

- (a) To ensure, as far as possible, that System Tests when conducted either by a User or by the Grid Owner protect the security of their personnel and/or the general public, preserve the integrity of Plant and Equipment and cause minimum detriment to the Grid Owner and Users; and
- (b) To establish procedures to be adopted for conducting and reporting System Tests.

#### **8.2 SCOPE OF APPLICATION**

The provisions of the System Test Code apply to all Parties, including the following:

- (a) Grid Owner;
- (b) System Operator;
- (c) Grid Constructor;
- (d) Generators;
- (e) Distributors; and
- (f) Any other entity with a System connected to the Grid.

#### **8.3 SYSTEM TEST PROCEDURE**

8.3.1 If any User or the Grid Owner, wishing to undertake a System Test, they shall submit a Test Request in writing to the System Operator at least three (3) months in advance of the proposed test date. In case where the System Test needs to be carried out as soon as possible, the System Operator may waive the three month advance notice requirement and after consultation with the Grid Owner and any affected Users, the System Operator shall set the proposed test date.

8.3.2 The Test Request shall contain the following information:

- (a) Details of the purpose and nature of the proposed System Test;
- (b) Proposed date for the System Test;
- (c) Extent and condition of Equipment involved; and
- (d) Proposed test procedures specifying the switching sequence and the timing of the switching sequence.

8.3.3 The System Operator shall assess the impact on the Grid and the acceptability of the proposed test and may require additional information before accepting the proposed test.

8.3.4 Upon acceptance of the Test Request, the System Operator shall notify the System Test requesting Party, the Grid Owner, if it is not the System Test requesting Party, and any other affected Users. The notification shall contain the following information:

- (a) Details of the nature and purpose of the proposed System Test;
- (b) Extent of Equipment involved;
- (c) System Test requesting Party;
- (d) Listing of all affected Users;
- (e) Proposed date of the System Test; and
- (f) An invitation to all affected Users to nominate representatives to the Test Committee.

8.3.5 The System Operator shall establish the Test Committee and shall convene the first meeting of the Test Committee. The agenda for this meeting shall cover the following:

- (a) Appointment of System Test Coordinator who will also chair the Test Committee;
- (b) Details of the purpose and nature of the proposed System Test and other matters included in the Test Request provided by the System Test Requesting Party;
- (c) Establishment and finalization of the System Test Program which shall include the System Test procedures, plan for carrying out the System Test and details of monitoring the System during the test;
- (d) Test Safety Coordination;
- (e) Possibility of taking advantage of the shut down period during conduct of System Test to carry out simultaneously other Maintenance Programs;
- (f) Evaluation of economic, operational and risk implications on the Grid, and the System of other Users;
- (g) Allocation of costs of the System Test between Parties; and
- (h) Details of any further information required from Users.

8.3.6 The Test Committee shall determine all matters relating to the test including the desirability of carrying out the test at all. When the System Test Program has been agreed by the Test Committee, the Test Coordinator shall issue the System Test Program to all affected Users at least 15 days prior to the proposed date for the Test.

8.3.7 The Test Coordinator shall be notified immediately of any proposed changes or amendment to the System Test Program and, in conjunction with the Test Committee, shall assess the acceptability of any proposed changes. If the changes are acceptable, the Test Coordinator shall issue a revised System Test Program to all affected Users.

8.3.8 At the appointed time, the System Test shall proceed according to the latest version of the System Test Program.

8.3.9 Within 60 days of the conclusion of the Test, the System Test Requesting Party shall prepare a report on the outcome of the Test and issue it to the members of the Test Committee. The report shall include the following:

- (a) Description of the Equipment involved in the Test;
- (b) Description of the System Test carried out; and
- (c) Results, conclusions and recommendations for any further tests or actions.

## **8.4 TESTING OF GENERATING UNIT**

### **8.4.1 General Test Requirements**

- 8.4.1.1 The System Operator may issue instructions to Generators requiring tests to be conducted on any Generating Unit, at any time. However, Generators shall not be required to conduct such tests more than twice a year, except when the System Operator can justify the necessity for additional tests.
- 8.4.1.2 The following tests shall be performed, in accordance with agreed procedures and standards, to confirm compliance of Generating Units:
  - (a) Declared Availability Capacity;
  - (b) Capability to provide Ancillary Services as per agreement;
  - (c) Capability to operate within registered generation parameters; and
  - (d) Capability to meet applicable requirements of the Grid Code.
- 8.4.1.3 Tests shall be conducted only in the presence of representatives of the System Operator, Generators, Grid Owner and /or User.
- 8.4.1.4 All tests shall be recorded.
- 8.4.1.5 Generator shall demonstrate reliability and accuracy of test instruments made available by the Generator for use in the Tests.
- 8.4.1.6 Generator shall be given at least 48 hours to conduct the test requested.
- 8.4.1.7 If a Generating Unit fails, the following procedures shall be followed:
  - (a) The Generator shall give the System Operator a written report with reasons for the failure within three days from the day the test was carried out;
  - (b) After rectifications, the Generator shall inform the System Operator of its ability to demonstrate compliance of the Generating Unit with its Registered Equipment Data. Within 48 hours of such declarations, the Generator shall conduct a retest and confirm to the System Operator that the Generating Unit met the requirements;
  - (c) If a dispute arises regarding the test failure, the System Operator and the Generator shall seek to resolve the issue amicably between themselves; and



- (d) If the dispute cannot be resolved between themselves, the Parties shall follow the Dispute Resolution process specified in Chapter 2.

#### 8.4.2 Tests to be performed

##### 8.4.2.1 Declared Availability Capacity Testing

This test shall demonstrate that the Generating Unit can be scheduled and dispatched in accordance with the Registered Equipment Data. The Generating Unit will pass the test if it is able to meet the Registered Equipment Data for two continuous hours.

##### 8.4.2.2 Schedule and Dispatch Instruction Testing

This test shall demonstrate that the Generating Unit meets the relevant Generation Scheduling and Dispatch parameters specified in the Registered Equipment Data. The results of the test, measured on the high voltage side of the Generator transformer) shall be recorded on a chart recorder. The Generating Unit will pass the test if its level of achievement is within +/- 2.5% of the value declared.

##### 8.4.2.3 Reactive Power Testing

This test shall demonstrate that the Generating Unit can meet the registered value of Reactive Power Capability. The test shall be carried out for duration of one hour at the Generating Unit stator terminals and the results recorded on a chart recorder. The proposed Grid voltage at the entry point shall be maintained by the Generator by adjustment of reactive power on the remaining units and if not available by appropriate transformer tap adjustments at the substation. The Generating Unit will pass the test if its level of achievement is within +/- 5% of its declared value. Grid Owner shall also monitor the input of such Ancillary Services derived from the Grid and due account shall also be taken of any condition that may affect the test.

##### 8.4.2.4 Primary Response Testing

This test shall demonstrate that the Generating Unit possesses the capability to provide Primary Frequency Response in accordance with Registered equipment Data. The test results, to be recorded on chart recorder, shall be measured on the high voltage side of the Generator transformer as well as the Grid frequency. The Generating Unit will pass the test if its level of response lies within +/- 5% of the required level of response within five (5) seconds.

##### 8.4.2.5 Fast Start Capability Testing

This test shall demonstrate that the Generating Unit possesses the capability to Start-Up, synchronize with the Grid within 15 minutes and be loaded up to its declared capability. The Generating Unit will pass the test if it meets the Fast Start Capability requirements.

#### 8.4.2.6 Black Start Capability Testing

This test shall demonstrate that the Generating Unit with Black Start capability can implement a Black Start procedure in accordance with its declared capability. The Generator shall give at least seven days notice to the Generator for a Black Start test. The Generator shall not be required to carry out Black Start test in respect of any particular Generating Unit more than once every two fiscal years. The Generating Unit will pass the test if the Generating Unit starts on its own, synchronizes with the Grid and carries load without the need for external power supply.

#### 8.4.2.7 Isolation Mode Operation

This test shall demonstrate that the Generating Plant is capable of operating in Isolation mode in which the Generating Plant is isolated from the rest of the Grid and is capable of generating and maintaining a stable supply of electricity to the customers within the isolated area.

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## **CHAPTER 9**

### **GRID METERING**

#### **9.1 OBJECTIVE**

The objective of the Grid Metering Code is to specify:

- (a) Metering requirements for Metering the energy and demand in Generating Plants, Grid, and other Users at each Connection Point; and
- (b) Procedures for meter reading.

#### **9.2 SCOPE OF APPLICATION**

The provisions of the Grid Metering Code apply to all Parties, including the following:

- (a) Grid Owner;
- (b) System Operator;
- (c) Grid Constructor;
- (d) Generators;
- (e) Distributors; and
- (f) Any other entity with a User System connected to the Grid.

#### **9.3 METERING REQUIREMENT**

9.3.1 The Generator shall install metering to provide information for both real time and recording purpose at each Generating Unit. The metering system shall also account for station auxiliaries, and local distribution. The metering shall record the following:

- (a) Bus voltage;
- (b) Frequency;
- (c) MW;
- (d) MWhr;
- (e) MVAR;
- (f) Current; and
- (g) Any other facilities as agreed in the Connection Agreement.

9.3.2 Metering shall be provided on the Grid to provide information for both real time and recording purpose in relation to each transmission feeder, power transformer, distribution feeder and High Voltage Consumers. The metering system shall also account for substation auxiliaries and compensation devices. The metering shall record the following:

- (a) Bus voltage;
- (b) Frequency;
- (c) MW with maximum Demand;
- (d) MWHR;
- (e) MVAR;
- (f) MVARH;
- (g) Power factor;
- (h) Current; and
- (i) Any other facilities as agreed in the Connection Agreement.

9.3.3 Bi-directional Meters shall be installed at the Connection Point between the Grid and the Generator and between the Grid and the Distributor to measure the following:

- (a) Active energy for export and import; and
- (b) Reactive energy for export and import.

#### 9.3.4 Energy Meters

Main Meters and Check Meters shall be installed at all Connection Points between the Grid and IPP's and for other Connection Points the meters shall be installed as stipulated in the Connection Agreement.

#### 9.3.5 Metering Point

- 9.3.5.1 The Metering Point shall be located at the Connection Point; if this is not possible, a procedure shall be established to adjust the energy loss between the Metering Point and the Connection Point. The location of the Metering Point and the procedure for adjustment of loss, if necessary, shall be specified in the Connection Agreement.
- 9.3.5.2 Each power transformer in the Grid substation shall have separate Metering on the high voltage side and the low voltage side.
- 9.3.5.3 The energy consumed by auxiliary machines at generating stations shall be measured at the primary side of the unit auxiliary transformer. Energy supplied to the office and staff quarters shall be measured separately and shall not be considered as auxiliary consumption. Monthly readings on auxiliary consumption shall be furnished to the System Operator.
- 9.3.5.4 The auxiliary consumption of Grid substations shall be measured on the primary side of the auxiliary station service transformer. Energy supplied to the office and staff quarters shall be measured separately and shall not be considered as auxiliary consumption. Monthly readings on auxiliary consumption shall be furnished to the System Operator.

## 9.4 METERING RESPONSIBILITY AND OWNERSHIP

- 9.4.1 The Metering Equipment comprises of instrument transformers, meters, and all associated cables, wires and associated devices.
- 9.4.2 The Metering Equipment at Generating Plants shall be owned by the respective Generators and the Generators shall be responsible for supply, installation, testing, putting into service, and maintenance to ensure that the Metering Equipment complies with the Metering Code.
- 9.4.3 The Metering Equipment at Grid substations without Connection Point shall be owned by the Grid Owner. The Grid Constructor shall be responsible for supply, installation, testing, and putting into service to ensure that the Metering Equipment complies with the Metering code. The Grid Owner shall be responsible for maintenance to ensure the Metering Equipment complies with the Metering Code.
- 9.4.4 The supply, installation, testing, putting into service, and maintenance of the Metering Equipment at Connection Points shall be in accordance with the Connection Agreement.
- 9.4.5 The Main Meter shall be owned by the Party supplying electricity and the supply, installation, testing, putting into service and maintenance shall be the responsibility of said Party.
- 9.4.6 The Check Meter shall be owned by the Party receiving electricity and the supply, installation, testing, putting into service and maintenance shall be the responsibility of said Party.
- 9.4.7 Metering Equipment Security
- 9.4.7.1 The Metering Equipment (for Main and Check Meters) at Connection Point shall be protected against external interference except where sealing is impractical. The point of sealing shall be:
- (a) CT secondary boxes;
  - (b) PT secondary boxes;
  - (c) Meter box;
  - (d) Meter test block;
  - (e) Meter terminal cover;
  - (f) Meter cover Panel doors where CT and PT secondary circuits are terminated; and
  - (g) Local communication port
- 9.4.7.2 Secondary CT and PT windings shall be armored cable of single length.
- 9.4.7.3 The metering cubicle shall be completely and securely locked and sealed, provided all necessary registers and local communication ports are visible and accessible.

- 9.4.7.4 Appropriate security shall also be provided against unauthorized access and against corruption of data in transmission.
- 9.4.7.5 Security password for programming meters shall be possessed only by the Grid Owner and programming and reprogramming of meters shall be carried out only in the presence of both Parties.
- 9.4.7.6 The Grid Owner and the User shall jointly seal the Metering Equipment. The seal shall be replaced following any test or inspection, downloading or site reprogramming.
- 9.4.7.7 Each Party shall control the issue of its own seals and sealing pliers and shall keep an accurate register of all such pliers and the authorized persons to whom they are issued.
- 9.4.7.8 No seal shall be broken or removed except in the presence or with the prior consent of the Party affixing the seal. Where verbal consent is obtained, it must be immediately confirmed in writing. Under normal condition, at least one-week notice shall be given to the relevant Party for its consent to break the seal.
- 9.4.7.9 The Grid Owner of the substation where the Metering Equipment is located shall be responsible to keep the metering seals in tact.

## **9.5 METERING EQUIPMENT STANDARDS**

### **9.5.1 Voltage Transformer**

- 9.5.1.1 The minimum standard of accuracy of the voltage transformer shall conform to the latest relevant IEC Standard and be as follows:
  - (a) For Generators, including IPP's, with total installed capacity exceeding 5MW, the accuracy shall be 0.2;
  - (b) For Distributors and HV Consumers with power transfer greater than 5MW, the accuracy shall be 0.2;
  - (c) For Generators, including IPP's, with total installed capacity equal to or less than 5 MW, the accuracy shall be 0.5; and
  - (d) For Distributors and HV Consumers with power transfer equal to or less than 5MW, the accuracy shall be 0.5.
- 9.5.1.2 The neutrals of the voltage transformer shall be solidly grounded and the secondary shall be suitable for a 3-phase, 4-wire Y-connection.
- 9.5.1.3 The rated secondary voltage of the voltage transformer shall be 110 volts
- 9.5.1.4 The secondary burden of voltage transformer shall be maintained between 25% and 100% of rated values.

- 9.5.1.5 The Check Meter shall be supplied from a secondary core separate from the one feeding supply to the main Meter.

#### 9.5.2 Current Transformer

- 9.5.2.1 The minimum standard of accuracy of the current transformer shall conform to the latest relevant IEC Standard and be as follows:

- (a) For Generators, including IPP's, with total installed capacity exceeding 5MW, the accuracy shall be 0.2;
- (b) For Distributors and HV Consumers with power transfer greater than 5MW, the accuracy shall be 0.2;
- (c) For Generators, including IPP's, with total installed capacity equal to or less than 5MW, the accuracy shall be 0.5; and
- (d) For Distributors and HV Consumers with power transfer equal to or less than 5MW, the accuracy shall be 0.5.

- 9.5.2.2 The rated secondary current of the current transformer shall be one (1) ampere.

- 9.5.2.3 The secondary burden of the current transformer shall be maintained between 25% and 100% of rated values.

- 9.5.2.4 The Check Meter shall be supplied from a secondary core separate from the one feeding supply to the Main Meter.

#### 9.5.3 Main and Check Meters

- 9.5.3.1 Meters shall be of three-element, 3-phase, 4-wire, Wye-connection, bi-directional digital type, having facility for local and remote communication. The transmission medium may be of any type but shall be free of data loss during transmission.

- 9.5.3.2 The minimum standard of accuracy of Meters shall comply with the latest IEC standards and be as follows:

- (a) For Generators, including IPP's, with total installed capacity exceeding 5MW, the accuracy shall be 0.1;
- (b) For Distributors and HV Consumers with power transfer greater than 5MW, the accuracy shall be 0.1;
- (c) For Generators, including IPP's, with total installed capacity equal to or less than 5MW, the accuracy shall be 0.2; and
- (d) For Distributors and HV Consumers with power transfer equal to or less than 5MW, the accuracy shall be 0.2.

- 9.5.3.3 The burden of meters shall be maintained between 25% and 100% of rated values.



- 9.5.3.4 The meter shall display KW and cumulative Demand, KWh, KVA, KVAh and KVARh with the features of adjustable time-of-use, maintenance records, recordable load profile, pulse output, and down loading facilities in local and remote mode. The load profile data up to at least six channels shall be recorded for at least 65 days with half an hour interval.
- 9.5.3.5 A cumulative record of the parameters measured shall be available on the meter. The loss of auxiliary supply to the meter shall not erase these records. Separate record shall be provided for each measured quantity and direction. The meter shall have super capacitor for memory storage in addition to internal battery
- 9.5.3.6 All metering systems shall be capable of electronic data transfer through dedicated telephones or the Grid Owner's communication channels.

#### 9.5.4 Metering Equipment Inspection and Testing

##### 9.5.4.1 Regular Testing

- (a) All new or replacement Metering Equipment shall be tested and certified by an independent, internationally recognized laboratory. The cost of the test shall be borne by the owner of the Metering Equipment. The tests shall be carried out as per the latest relevant IEC standard.
- (b) Prior to operation, Metering Equipment shall be re-tested at Grid Owner's laboratory against the Grid Owner's sub-standard test meter.
- (c) The sub-standard test meter shall be recalibrated and recertified at least every five (5) years by an independent, internationally recognized laboratory. The cost of the test shall be borne by the Grid Owner.
- (d) Instrument transformers shall be tested and recalibrated at least once every five (5) years.
- (e) Meters shall be tested and recalibrated at least once every two (2) years.
- (f) At least one month's prior written notice of a routine test and 7 days prior written notice in the case of every site test of new, replacement or modified metering shall be given to the relevant Party, except where such test is carried out as a result of an emergency or Equipment failure in respect of metering which is already in operation. The notice shall state the date and time of the test.
- (g) The tests shall be conducted in the presence of representatives of the interested Party, unless the interested Party agrees otherwise.
- (h) A copy of all test report shall be given to the interested Part even if the concerned interested Party fails to attend the test.
- (i) The testing and recalibration of Check Meters shall follow the above procedures.
- (j) Normally, the cost and expenses of such testing shall be borne by the owner of the Metering Equipment.

##### 9.5.4.2 Ad-hoc Testing

- (a) Any Party has the right to ask for testing of Metering Equipment, which is in operation by notifying the owner of such Metering Equipment if it feels the Metering Equipment is not performing well within its prescribed limits of accuracy.
- (b) Representatives of both Parties shall inspect and test the Equipment within three (3) days from the date of receipt of notice and a report of the Test shall be produced by the Metering Equipment owner.
- (c) A copy of all test report shall be given to the Party requesting the Test even if the Party fails to attend the test.
- (d) If the Metering Equipment fails the test, the cost associated with such inspections and tests shall be borne by the Metering Equipment owner.
- (e) If the Metering Equipment passes all inspections and tests, the cost associated with such inspections and tests shall be borne by the Party requesting the Test.

#### 9.5.5 Meter Register

Each Party shall maintain a register on Metering Equipment. This register shall include information such as serial number, accuracy class, technical details of the meter and the Metering Equipment, dates, locations, result of tests, maintenance program, inspections, any permanent or temporary replacement of meters and Metering Equipment, the dates on which any seal was applied or broken and the persons carrying out and attending any such tests, readings, inspections or sealing.

#### 9.5.6 Defective Equipment

- (a) If, at any time, Metering Equipment is destroyed, damaged or found defective, it shall be removed immediately.
- (b) The relevant Party shall ensure that the defective Metering Equipment is replaced and service and operation restored as per the Metering Code within one month from the date of removal of the Equipment.
- (c) Prior to operation, the repaired re-calibrated Metering Equipment or new replacement Metering Equipment shall be tested in accordance with the Metering Code.
- (d) Where the Metering includes both Main and Check Meters and the Main Meter has been removed for any reason, then the Check Meter shall be regarded as the Main Meter until the replacement or return to site of the Main Meter.

### 9.6 METER READING

#### 9.6.1 Meter Readings

9.6.1.1 All metering installations shall record time, based on NST.

9.6.1.2 Normally, the Main Meter shall be read but Check Meter shall be used for verification purpose.

- 9.6.1.3 Meter readings at Connection Points shall be witnessed by authorized representatives of concerned parties. If either one of the representative is absent, the representative of the Party, who is present, shall provide the Meter readings to the absent Party within three days from the date of Meter reading and such readings shall be validated by the Grid Operator.
- 9.6.1.4 A Metering Equipment reading protocol shall be prepared. Meter reading shall be carried out as per the meter reading form. Each meter reading form shall be given a reference number, defining the date of meter reading, and station.
- 9.6.1.5 Each Grid Owner's regional office, Generator and Distributor shall read the meters for the current month at 1200 hours NST on the first day of the following month.
- 9.6.1.6 By the 7th of every month, the Grid Owner, Generators, and Distributors shall send electronically or by fax to the System Operator, hourly data on actual input and output of each metering point for the previous month along with adjustments for dispatch instruction issued by the System Operator. The Meter readings shall be recorded in accordance with Monthly Meter Reading Form given in Appendix D.

#### 9.6.2 Metering Discrepancies and Retroactive Adjustments

- 9.6.2.1 The Party responsible for the Meter at the Connection Point shall inform the System Operator, as soon as practicable, if any of the meter seals are broken, the meter fails to function or if the measurement accuracy of the Metering Equipment is not as per the Metering Code. The System Operator shall inform the relevant authorities of these matters.
- 9.6.2.2 The Party responsible for the Meter shall repair or replace any defective Metering Equipment in accordance with the Metering Code section 9.5.6. If the Main Metering is found to be defective, from that point in time and until the Main Metering Equipment is restored, the Check Meter shall be considered as the Main Meter for all purposes.
- 9.6.2.3 If the Check Meter is also found with broken seals, or inoperative or inaccurate, the measurement shall be determined by utilizing the meters at the Grid Owner's nearest substation, where the measurement shall be adjusted for line losses and any other energy usage between the Connection Point and the substation.
- 9.6.2.4 If at any time, supply from voltage transformer to any meter is not available, the energy measurement from the time the failure is deemed to have occurred until the voltage transformer circuit is restored to the meter shall be calculated as per procedures agreed in the Connection Agreement.
- 9.6.2.5 In case of transmitted metered data, impulses representing electrical quantities may be lost between the relevant meter and the Load Dispatch

Center. Any difference noted at the time the meter is inspected and read at site shall be settled as provisioned in the Connection Agreement.

- 9.6.2.6 If any User disagrees with the metering data, or the readjustment values, or the Parties cannot come to an agreement in respect of a fault on the Metering Equipment upon testing or inspection, the disagreement may be referred to the Grid Code Management Committee.

## **9.7 METERING EQUIPMENT MAINTENANCE**

### **9.7.1 Maintenance**

- 9.7.1.1 The Metering Equipment and the Main and the Check Meters shall be maintained by the respective owners unless otherwise provisioned in the Connection Agreement.
- 9.7.1.2 Each Party shall grant access to any other Party, its employees, agents and contractors and persons duly authorized by them full right to enter upon any part of such Party's property to the extent necessary for the purposes of this metering.
- 9.7.1.3 The right of access provided shall include the right to bring in such vehicles, plant, machinery, test kits, loading kits, sub-standard Meters and maintenance materials as shall be necessary for the purpose of this metering.
- 9.7.1.4 The Party given access shall ensure that damage to the property over which access has been given is avoided and shall make good any damage caused in exercising such right as soon as practicable. The Party shall cause as little disturbance as possible to any other Party or other occupier of such property.

S. No.	Section	Date of Amendment	Amendments to Grid Code
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## CHAPTER 10

### EXEMPTIONS AND TRANSITORY PROVISIONS

#### 10.1 OBJECTIVE

The objectives of this Chapter are:

- (a) to identify those provisions of the Grid Code which certain Parties cannot immediately comply with and either specify the time frame within which certain Parties are required to take necessary steps to comply with the provisions of the Grid Code or to provide such Parties with an exemption from compliance with those specific provisions; and
- (b) to identify provisions of the Grid Code that need to be improved or added in the near term and the process for making such improvements or additions.

#### 10.2 EXEMPTIONS

##### 10.2.1 Planning Code

The System Planning Department shall assess the vulnerability of the Grid to voltage collapse under heavily loaded conditions in all its Grid Planning within one year of Grid Code approval.

##### 10.2.2 Grid Connection

- 10.2.2.1 Under the Grid Code, the Grid Owner is responsible for operation and maintenance of the Grid. The Grid Owner will continue to operate and maintain all low voltage equipment at Grid substations owned by the Grid Owner

##### 10.2.3 Grid Metering

- 10.2.3.1 Check meters shall not be required at User Systems owned by NEA until real business transactions take place between NEA business entities.
- 10.2.3.2 Existing Metering Equipment, irrespective of its ownership, shall not be required to meet the equipment standards of Chapter 9, Metering Code and this exemption shall continue until mutually agreed otherwise. However, the Grid Owner shall be required to follow the equipment standards of Chapter 9, with prepaire schedule programme. Metering Code for replacement of its existing Metering Equipment.

##### 10.2.4 Requirement for Generators

###### 10.2.4.1 General

Existing Generating Plants shall not be required to sign a Connection Agreement specified in Chapter 5, Connection Code.

10.2.4.2 Some of the technical requirements specified in Chapter 5, Connection Code are not economically feasible or operationally required for all Generating Plants. Exemptions to specific technical requirements are described below:

10.2.4.2.1 Generating Plants with plant capacity not exceeding 10 MW shall not be required to install SCADA system for LDC.

10.2.4.2.2 Run of river Generating Plants shall not be required to install automatic generation control (AGC) from LDC. This requirement shall not be necessary for storage plants with capacity less than 50 MW.

10.2.4.2.3 Generating Plants with unit capacity not exceeding 10 MW shall not be required to install fast start facility.

10.2.5 Requirement for Distributors

Distributors shall not be required to sign a connection agreement for existing distribution points.

### **10.3 TRANSITORY PROVISIONS**

10.3.1 Performance Standards

10.3.1.1 The Electricity Regulation (2050) has set the permissible voltage variation in the Grid as +/- 10% of nominal voltage, while the international standard is +/-5%. Commencing from the fiscal year 2062/63, the System Planning Department in all its annual short term grid operational planning studies shall identify where such reinforcements are required to maintain Grid voltage at par with the international norm. Generally, huge investments are required for Grid reinforcement and without such investments it is not possible to achieve this level of performance. The aim of future Grid developments should be a gradual improvement in Grid voltage for which the NEA Management shall allocate necessary budget in this sector.

10.3.1.2 The performance standard of the Grid as measured by Voltage Unbalance has not yet been adopted. The Grid Owner shall make necessary arrangements so that it will be able to measure this value by the end of the fiscal year 2062/63 and thenceforth provide an indicator by which to gauge the quality of power supply in the Grid.

10.3.1.3 Grid Owner shall determine the values of station auxiliaries at each of its Grid substation and submit them along with supporting details to the GCMC, who shall evaluate the calculations and prescribe the maximum values of station auxiliaries consumption for each of its Grid substations.

- 10.3.1.4 Within the first six (6) months of the affectivity of the Grid Code, the Grid Owner shall devise methods to measure the performance for personnel safety. The Grid Owner shall submit the report to the GCMC, who shall then prescribe targets to be achieved by the Grid Owner

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## CHAPTER 11

### REPORTS

#### 11.1 OBJECTIVE

The objectives of this Chapter are as follows:

- (a) To specify the types of report required under various provisions of the Grid Code; and
- (b) To specify the agencies responsible for producing these reports.

#### 11.2 SCOPE OF APPLICATION

The provisions of this Chapter apply to all Parties, including the following:

- (a) System Operator;
- (b) Grid Owner;
- (c) Generators;
- (d) Distributors; and
- (e) Any other entity with a System connected to the Grid.

#### 11.3 GRID CODE MANAGEMENT COMMITTEE REPORTS

##### 11.3.1 Trimester and Annual Report

- 11.3.1.1 The GCMC shall submit the trimester report on Grid Operation to the ERC and all Grid Users within forty-five (45) days of the end of the trimester period.
- 11.3.1.2 The GCMC shall submit an annual report for the previous year to the ERC and all Grid Users by the month of every Kartik (mid November).

##### 11.3.2 Significant Event Reports

Within seven (7) days following the receipt of the System Operator's report on a Significant Event, the chairperson of the GCMC shall validate the report and make recommendations to the ERC. If a violation of the Grid Code is determined to be the cause of the Significant Event, punitive actions and/or corrective actions shall be recommended in the report.

### 11.3.3 Special Reports

Special reports shall be prepared by the System Operator at the discretion of the GCMC or on the request of the Grid Owner or any Government or regulating agencies or any User. Special Reports prepared for Users shall be at the expense of the Users.

## 11.4 REPORTS ON PLANNING STUDIES

The System Planning Department shall prepare following reports in accordance with Section 3.6 of the Grid Code:

- a) Consolidated Grid Demand Forecast;
- b) Least Cost Generation Expansion Plan;
- c) Short term Grid expansion plan;
- d) Transmission Development Plan; and
- e) Power System Master Plan.

## 11.5 REPORTS ON GRID PERFORMANCE APPRAISAL

11.5.1 The System Operator and the Grid Owner shall jointly prepare and submit a monthly report on Grid Performance for the previous month to the GCMC. The report shall be prepared within thirty (30) days from the end of the month to which the report applies and shall contain the following information along with supporting details:

- a) Actual value of Transmission Availability achieved pursuant to Section 4.4.1.1;
- b) Actual value of Transmission Reliability pursuant to Section 4.4.2.1; and
- c) Record of safety performance, including details of accidents pursuant to Section 4.6.

11.5.2 The Grid Owner shall prepare and submit a monthly report on Transmission Loss to the GCMC in accordance with Section 4.5 of the Grid Code. The report shall be prepared within thirty (30) days from the end of the month to which the report applies and shall contain the actual value of energy loss in the Grid along with details on each in feed, out feed and station auxiliaries for each Grid substation.

## 11.6 REPORTS ON CONNECTION REQUIREMENT

The System Planning Department shall be responsible for preparing the report on Grid Impact Studies within two (2) months from the receipt of User's acceptable application for Connection in accordance with Section 5.4.3.1 of the Grid Code. This report shall be submitted to the Grid Owner, who shall pass it on to the User for necessary actions.

## 11.7 REPORTS ON GRID MANAGEMENT

- 11.7.1 The System Operator and the Grid Owner shall jointly prepare and submit a monthly report on Grid Operation to the GCMC. The report shall contain details as specified in Section 11.7.4 below on monthly basis. The report shall be prepared within thirty (30) days from the end of the month to which the report applies and shall also highlight the occurrence of any problems encountered and the measures adopted to address them. It shall also include their recommendations to improve the operation of the Power System.
- 11.7.2 The System Operator and the Grid Owner shall jointly prepare and submit the trimester report on Grid operation to the GCMC. The report shall be prepared within thirty (30) days from the end of the trimester period and shall contain all details required for the monthly Grid operation report and the annual Grid operation report, consolidated on a trimester basis.
- 11.7.3 The System Operator and the Grid Owner shall jointly prepare and submit an annual report on Power System Operation to the GCMC. This report shall be prepared by the end of the last Business Day of the month of every Aswin (mid October).
- 11.7.4 The annual Power System Operation report shall include the following:
- (a) Total available generation and actual generation;
  - (b) Total energy import and export;
  - (c) Total energy received at and supplied from Grid substations;
  - (d) Energy loss in the Grid;
  - (e) Availability of Grid;
  - (f) Reliability of Grid;
  - (g) Total unavailable power/energy due to planned and forced outages;
  - (h) Annual frequency variation index;
  - (i) Annual voltage variation index;
  - (j) Annual load curve and load duration curve;
  - (k) Typical load curve and load duration curve for the day of maximum Demand and the day of minimum Demand in the year;
  - (l) Typical load curve and load duration curve for the hottest and the coldest day in the year at one of the load centers in the Terai region;
  - (m) Typical load curve and load duration curve for the hottest and the coldest day in the year in Kathmandu;
  - (n) Violations of Grid Code;
  - (o) Significant Events; and
  - (p) Any other details required by the GCMC.

## 11.8 REPORT ON SCHEDULING & DISPATCHING

11.8.1 The System Operator, Grid Owner, Generator, Distributor, and other Users, as the case may apply, shall prepare reports for Events occurring in their sites within thirty (30) days of the Event. Typical examples of reportable Events are:

- (a) Serious equipment problem such as transformer, circuit breaker, or bus bar;
- (b) Exceptionally high/low system voltage;
- (c) Grid constraints;
- (d) Instances of persistent/significant violation of Grid Code;
- (e) Loss of Generating Unit;
- (f) Partial or Total Grid Blackout;
- (g) Protection failure;
- (h) Fire incidents affecting human or facilities;
- (i) Accidents affecting human or facilities; and
- (j) Any other important details.

### 11.8.2 Generator Operating Records

11.8.2.1 Generators shall provide the following information to the System Operator on daily basis:

- (i) Active and reactive power generation, power factor and transmission line voltage for each clock hour in accordance with the Forms given in Appendix D.
- (ii) Changes in operating status of Units, disconnecting switches, circuit breakers, etc. in accordance with the Form given in Appendix D;
- (iii) Any event (trip pings, alarms, etc.) that affect or could have affected power generation and delivery in accordance with the Form given in Appendix -14; and
- (iv) Any unusual condition that requires attention.

The completed and duly signed Form shall be faxed/ emailed to the LDC by 14:00 clock hour the next Day.

The reporting of items (ii), (iii) and (iv) above shall be done promptly after such event has taken place, first verbally, followed by written reports and supported, wherever possible, by printouts of Event recorders.

11.8.2.2 In addition to daily reports, Generators shall also provide the System Operator with monthly generation reports in accordance with the Forms given in Appendix D within seven (7) days from the end of the month for which the report is being prepared.

11.8.2.3 Generator shall submit Generator and HV feeder Outage Report to the System Operator in accordance with Forms given in Appendix D for each month within seven (7) days from the end of the month for which the report is being prepared.

- 11.8.2.4 Generator shall submit to the Grid Owner through their area offices record of monthly energy delivered to the Grid and energy received from the Grid for each High Voltage feeder within 7 days from the end of the month for which the report is being prepared in accordance with Forms given in Appendix D.

### 11.8.3 Significant Event Reports

- 11.8.3.1 After every major Grid Event like cascade tripping, Power System black-outs and Grid disturbance, the System Operator shall investigate or instigate an investigation into the cause of the Event, submit an Event report to the GCMC, Grid Owner, Concerned Generator and Distribution within three days of the Event. If this is not possible, the System Operator shall submit a preliminary report within this period and shall submit a detailed investigation report within fifteen (15) days from the date of the Significant Event.
- 11.8.3.2 The following minimum information shall be included in the written report of the team investigating the Significant Event:
- (a) Time, date and location of the Significant Event;
  - (b) Equipment directly involved and not merely affected by the Event;
  - (c) Description of the Significant Event;
  - (d) Demand in MW and Generation in MW interrupted;
  - (e) All relevant data, copies of all records from recording instruments including disturbance recorders, event loggers, etc;
  - (f) Sequence of tripping;
  - (g) Details of relay flags;
  - (h) Duration of the interruption;
  - (i) Cause of the Event; and
  - (j) Recommendations to prevent recurrence of such Event in future.

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**APPENDIX-A  
STANDARD PLANNING DATA**

**A.1 GENERATING PLANT DATA**

A.1.1 The Generator shall provide the Grid Owner following general information about the power station:

- (a) Location map and site map showing major components of the power station;
- (b) Approximate construction period;
- (c) Total installed capacity in MW along with number and size of generating units; and
- (d) Transmission voltage and point of connection with Grid.

A.1.2 The following data on each generating unit shall be provided by the Generator

- (a) Maximum and minimum operating head;
- (b) Type and capacity of turbine;
- (c) Generator:
  - (i) Type;
  - (ii) Rating(MW and MVA);
  - (iii) Rated terminal voltage(kV);
  - (iv) Rated Power Factor;
  - (v) Reactive Power Capability (MVA<sub>r</sub>) in the rang 0.95 of leading and 0.85 of lagging;
  - (vi) Short Circuit Ratio;
  - (vii) Direct axis transient reactance (% on rated MVA);
  - (viii) Direct axis sub- transient reactance (% on rated MVA);
  - (ix) Auxiliary Power Requirement (MW)
- (d) Generator Transformer
  - (i) Type;
  - (ii) Rated Capacity (MVA);
  - (iii) Voltage Ratio HV/LV;
  - (iv) Tap change Range (+%to -%);
  - (v) Percentage Impedance (positives sequence at full load).

A.1.3 If the Distribution has any Embedded Generating Plant, the Generator through the Distributor shall provided the Grid Owner all information mentioned in Articles A.1.1 and A.1.2 above.



## A.2 GRID DATA

A.2.1 The Grid Owner shall be responsible for collecting following general data from its various offices:

- (a) Name of line (Indicating Power Stations and sub-stations to be connected);
- (b) Voltage of line (kV);
- (c) No. of circuits;
- (d) Route length (km);
- (e) Conductor sizes;
- (f) Line parameters (PU values);
  - (i) Positive sequence resistance/km and reactance/km;
  - (ii) Zero sequence resistance/km and reactance/km;
  - (iii) Positive sequence shunt susceptance /km(B/2); and
  - (iv) Zero sequence shunt susceptance /km(B/2).

## A.3. USER SYSTEM DATA

A.3.1 The User shall furnish following details of the User System at the Connection Point to the Grid Owner:

- (a) Substation layout showing arrangement of Equipment;
- (b) Electrical circuits;
- (c) Grounding arrangements;
- (d) Phasing arrangements; and
- (e) Switching arrangements.

A.3.2 If the substation in the User System is connected to the Grid through overhead lines and/or underground cables, the User shall submit to the Grid Owner following details on these lines:

- (a) Name of line (Indicating Power Stations and sub-stations to be connected);
- (b) Voltage of line (kV);
- (c) No. of circuits;
- (d) Route length (km);
- (e) Conductor sizes;
- (f) Line parameters (PU values);
  - (i) Positive sequence resistance/km and reactance/km;
  - (ii) Zero sequence resistance/km and reactance/km;
  - (v) Positive sequence shunt susceptance /km(B/2); and
  - (vi) Zero sequence shunt susceptance /km(B/2).

A.3.3 If the User System is connected through a transformer, following details of the transformer shall be provided to the Grid Owner:

- (a) Rated MVA;
- (b) Rated primary and secondary voltage (kV);
- (c) Winding arrangement;
- (d) Tap changer type, number of steps, and size;
- (e) Positive sequence resistance and reactance at max., min. and nominal tap position;
- (f) Zero sequence reactance for three-legged core-type transformer; and
- (g) BIL value (kV).

A.3.4 The User shall provide the Grid Owner with following details on switchgear, circuit breakers and disconnect switches installed at the Connection Point or the substation at the User System:

- (a) Rated voltage (kV);
- (b) Rated continuous maximum current;
- (c) Rated symmetrical RMS short-circuited current (kA); and
- (d) BIL value (kV).

A.3.5 If the User System is equipped with capacitors, reactors, static var compensators), following details of these equipment shall be supplied to the Grid Owner:

- (a) Rated capacity (MVAR);
- (b) Rated voltage (kV);
- (c) Type (shunt capacitor, shunt reactor, etc.); and
- (d) Operation and control details such as fixed or variable; manual or automatic control.

A.3.6 For User System with loads above one MW, the following information shall be provide by the User to the Grid Owner:

- (a) Type of load (furnace load, rolling mills, traction loads, pumping loads or other industrial loads);
- (b) Rated voltage and phase;
- (c) Number and size of large motors and type of drives and control arrangements;
- (d) Sensitivity of load to voltage and frequency;
- (e) Maximum harmonic content of load;
- (f) Average and maximum phase unbalance of load; and
- (g) Short circuit level at Connection Point due to load and also Embedded Generators, if any.

## APPENDIX B

### DETAILED PLANNING DATA

#### B.1 GENERATING PLANT DATA

The Generator shall provide following information on its Generating Plant to the Grid Owner.

##### B.1.1 General Data with following details:

- (a) Name of Power Station;
- (b) Number and capacity of Generating Units(MVA);
- (c) Single line diagram of Power Station and switchyard;
- (d) Neutral Grounding of Generating Units; and
- (e) Earthing arrangements with earth resistance values.

##### B.1.2 Protection and Metering with following details:

- (a) Full description including settings for all relays and protection systems for the entire power station;
- (b) Full description including settings for all relays installed on all outgoing feeders from Power Station switchyard;
- (c) Full description of inter- tripping of circuit breakers at the point or points of Connection with the Transmission System;
- (d) Estimated fault clearance time for electrical faults on the User's System; and
- (e) Full description of operational and commercial metering schemes.

##### B.1.3 Generating Unit Data with following details:

###### B.1.3.1 Parameters of Generator and Turbine:

- (a) Rated terminal voltage (kV);
- (b) Rated MVA and MW;
- (c) Inertia constant (MW sec/ MVA)H;
- (d) Minimum stable loading (MW);
- (e) Reactive power capability curve;
- (f) Additional capacity (MW) obtainable from Generating Units in excess of Net Declared Capability;
- (g) Derated capacity (MW) on a monthly basis, if applicable;
- (h) Direct axis synchronous reactance. ( % on MVA )  $X_d$  ;
- (i) Direct axis transient reactance ( % on MVA )  $X'_d$  ;
- (j) Direct axis sub- transient reactance (% on MVA )  $X''_d$  ;
- (k) Quadrature axis synchronous reactance ( % on MVA )  $X_q$  ;
- (l) Quadrature axis transient reactance ( % on MVA )  $X'_q$  ;
- (m) Quadrature axis sub- transient reactance ( % on MVA )  $X''_q$  ;

- (n) Direct axis transient open circuit time constant ( sec)  $T'_{do}$ ;
- (o) Direct axis sub- transient open circuit time constant (Sec)  $T''_{do}$ ;
- (p) Quadrature axis transient open circuit time constant ( Sec)  $T'_{qo}$ ;
- (q) Quadrature axis transient open circuit time constant ( Sec )  $T''_{qo}$ ;
- (r) Stator Resistance ( Ohm)  $R_a$ ;
- (s) Stator leakage reactance (Ohm)  $X_q$ ;
- (t) Stator time constant (Sec);
- (u) Short circuit and Open Circuit saturation characteristics curves of the generator for various terminal voltages;
- (v) Type of Turbine;
- (w) Operating Head ( Mtr.);
- (x) Discharge with Full Gate Opening ( cumecs); and
- (y) Speed rise on total Load throw off ( %).

#### B.1.3.2 Parameters of Excitation Control System:

- (a) Type of excitation;
- (b) Maximum field voltage;
- (c) Minimum field voltage;
- (d) Rated field voltage;
- (e) Details of excitation loop in block diagrams showing transfer functions of individual elements using I.E.E.E. symbols;
- (f) DC gain of excitation loop;
- (g) Maximum rate of change of field voltage (rising);
- (h) Maximum rate of change of field voltage (falling);
- (i) Dynamic characteristics of over- excitation limiter; and
- (j) Dynamic characteristics of under- excitation limiter.

#### B.1.3.3 Parameters of Governor:

- (a) Governor average gain ( MW/Hz);
- (b) Speeder motor setting range;
- (c) Time constant of steam or fuel or water governor valve;
- (d) Governor valve opening limits;
- (e) Governor valve rate limits;
- (f) Time constant of turbine; and
- (g) Governor block diagram showing transfer functions of individual elements using I.E.E.E symbols.

#### B.1.3.4 Operational Parameter:

- (a) Minimum notice required to synchronise a Generating Unit from de- synchronisation;
- (b) Minimum time between synchronising different Generating Units in a Power Station;
- (c) Minimum block load requirements on synchronising.

**B.1.4 Switchyard with following details:****B.1.4.1 Step-up transformer with following details:**

- (d) Rated MVA;
- (e) Rated voltage (kV);
- (f) Voltage ratio;
- (g) Vector Group;
- (h) Positive sequence reactance for maximum , minimum, normal Tap.(%on MVA);
- (i) Positive sequence resistance for maximum, minimum, normal Tap.(%on MVA);
- (j) Zero sequence reactance.(% on MVA);
- (k) Tap changer range ( + % to - %) and steps;
- (l) Type of Tap changer. ( OFF/ON Load).

**B.1.4.2 Circuit Breakers and Isolators with following details:**

- (a) Rated voltage (kV);
- (b) Type of circuit breaker ( MOCB/SF6);
- (c) Rated short circuit breaking current (kA) 3 phase;
- (d) Rated short circuit breaking current ( kA) 1 phase;
- (e) Rated short circuit making current (kA) 3 phase;
- (f) Rated short circuit making current (kA) 1- phase; and
- (g) Provisions of auto reclosing with details.

**B.1.4.3 Communication System with following details:**

- (a) Details of equipment installed at points of Connections.

**B.2 USER SYSTEM DATA****B.2.1 General**

B.2.1.1 Single line diagram of Distribution System (showing distribution lines from points of Connection with the Transmission System, 132/33/11 kV sub- stations, 11/0.4 kV sub- stations, consumer bus if fed directly from the Transmission System).

**B.2.2 Loads**

Connected load with details on numbers of consumers category wise, details of loads of one (1)1 MW and above;  
Information on diversity of load and coincidence factor;  
Daily demand profile; and  
Cumulative demand profile of Distribution System.

**APPENDIX – C****SCHEDULE OF REPORTS & DATA  
(Subject to be Discussed)**

<b>Responsible Party: Grid Code Management Committee</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
2.3.4.2	TSO	GCMC annual budget	By end of Falgun
2.5.1	NEA	Report on dispute resolutions and revisions	At least once every year
2.6.7	All	Report on compliance monitoring	As and when required
2.7.1.2	NEA	Report on actions	As and when required
2.8.6	All	Approved changes to Grid Code	At least once every six months
11.3.1.1	All	Trimester report on Grid operation	Within 45 days from end of trimester
11.3.1.2	All	Annual report in Power System operation	By end of Kartik
11.3.2.1	NEA	Validated report on Significant Event	Within 7 days of receipt of report
<b>Responsible Party: System Operator</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.5.3.6	Users	Information on planned development in Grid	Promptly
5.4.3.1	Grid	Report on Grid Impact studies	Within 60 days from receipt of application
6.11.1.2	User/ Grid	3-year rolling annual Grid Outage Program (draft)	By end of Chaitra
6.11.1.4	Users	3-year rolling annual Grid Outage Program (final)	By 15th of Baisakh
6.11.2.3	Gen.	3-year rolling annual Gen. Outage Program (draft)	By end of Chaitra
6.11.2.5	Gen.	3-year rolling annual Gen Outage Program (final)	By end of Baisakh

<b>Responsible Party: System Operator (Contd.)</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
6.11.3.2	All	3-year rolling annual Generation Schedule (final)	By end of Baisakh
6.11.4.1	All	3-year rolling annual Grid Operating Program (final)	By 15 <sup>th</sup> of Jestha
7.4.1.2	Gen.	Monthly Generation Outage Program (draft)	By 10 <sup>th</sup> of every month
7.4.1.3	Gen	Monthly Generation Outage Program (final)	By 15 <sup>th</sup> of every month
7.4.1.5	Gen	Weekly Generation Outage Program (draft)	By every Thursday
7.4.1.6	Gen	Weekly Generation Outage Program (final)	By 12:00 hrs every Friday
7.4.1.8	Gen	Response to request for Scheduled Gen. Outage	At least 48 hrs. before shutdown
7.4.1.10	Gen	Response to request for Gen. Maintenance Outage	At least 24 hrs. before shutdown
7.4.1.11	All	Rescheduling of any Outage	At the earliest
7.4.2.1	-	Monthly Grid Outage Program (final)	By 7 <sup>th</sup> of every month
7.4.2.2	-	Weekly Grid Outage Program (final)	Every Wednesday
7.4.2.4	Grid	Response to Scheduled Grid Outage	No later than 48 hrs. before Outage
7.4.2.6	Grid	Response to Grid Maintenance Outage	No later than 24 hrs. before Outage
7.5.2	Gen.	Approved monthly Availability Projection	By 15 <sup>th</sup> of every month
7.5.4	Gen.	Approved weekly Availability Projection	No later than 16:00 hrs. every Friday
7.7.9	Gen.	Day ahead Generation Schedule	No later than 16:00 hrs. every day
7.8.3	Gen.	Confirmation of Verbal Instruction (Appendix D-10)	No later than 24 hours after verbal instruction
11.3.3	NEA	Special report on request	As per requirement

<b>Responsible Party: System Operator (Contd.)</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
11.5.1	GCMC	Monthly report on Grid performance appraisal	Within 30 days from end of month
11.7.1	GCMC	Monthly report on Grid operation	Within 30 days from end of month
11.7.2	GCMC	Trimester report on Grid operation	Within 30 days from end of trimester
11.7.3	GCMC	Annual report on Power System Operation	By end of Aswin
11.8.1	TSO/ GCMC	Event report	Within 30 days of Event
11.8.5.1	All	Significant Event report	Within 3 days from date of Event
<b>Responsible Party: Grid Owner</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.4.2.1.6	SPD/ SO	All planning data received from Users	Within 7 days of receipt of data
3.4.2.2.1	SPD	Data of loadings on peak days	By end of Aswin
3.4.2.2.4	SPD	Changes in planning data in Appendices A & B	By end of Aswin
4.5.2.2	GCMC	Auxiliary consumption of Grid substations	By end of fiscal year
5.3.6.2	User	Log containing test results and maintenance records of Equipment	As and when requested by Party
5.4.1.7	User	Data and information about the Grid	Within reasonable time
5.4.2.1	User	Processing of Connection Application	Within 90 days of receipt of application
5.4.6.2	Gen/ User	Details required for energizing Connection Points	At least 60 days prior to energizing
5.8.1.1	User	Fixed Asset Boundary Document	Minimum two weeks prior to Completion Date



<b>Responsible Party: Grid Owner (Contd.)</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
5.9.1.3	User	Connection Point Electrical Diagrams	As per Agreement
5.10.1.5	User	Registered Equipment Data	As per Agreement
5.11.2.2	User	Equipment Identifications	As per Agreement
7.4.2.1	-	Monthly Grid Outage Program (final)	By 7 <sup>th</sup> of every month
7.4.2.2	-	Weekly Grid Outage Program (final)	Every Wednesday
7.4.2.3	SO	Request for Scheduled Grid Outage (Appendix D-7)	At least 7 days before Outage
7.4.2.5	SO	Request for Grid Maintenance Outage (Appendix D -7)	At least 48 hours before Outage
7.4.2.7	Public	Public notice of all Grid Outage	At least 24 hours before outage
7.4.2.8	SO/ Users	Any change in Outage Program	Promptly
8.3.1	SO	Test request for System test	At least 3 months before proposed Test
11.5.1	GCMC	Monthly report on Grid performance	Within 30 days from end of month
11.5.2	GCMC	Monthly report on transmission loss	Within 30 days from end of month
11.6.1	User	Grid Impact Studies	Within 3 months from receipt of application
11.7.1	GCMC	Monthly report of Grid operation	Within 30 days from end of month
11.7.2	GCMC	Trimester report on Grid Operation	Within 1 month from end of trimester
11.7.3	GCMC	Annual report on Power System operation	By end of Aswin
11.8.1	TSO	Event report	Within 30 days of Event

<b>Responsible Party: Generator</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.4.2.2.3	SPD	Details of loadings	By end of Aswin
3.5.2.2	SPD	Commissioning date of projects	By end of Kartik
5.4.1.2	Owner	Standard Planning Data	With Connection Application
5.4.1.3	Owner	Additional planning data	As and when requested
5.4.4.5	Owner	Detailed Planning Data	Within 30 days from Agreement
5.4.6.1	Owner	Details for energizing Connection Points	At least 60 days prior to energizing
5.9.1.2	Owner	Connection Point Electrical Diagrams	As per Agreement
5.10.1.5	Owner	Registered Equipment Data	As per Agreement
5.11.2.6	Owner	Equipment identifications	As per Agreement
6.10.2.1	SO	3-year rolling annual Generator Outage Program (Appendix D-1)	By end of Falgun
6.10.3.1	SO	3-year rolling annual Availability and Capacity Declaration (Appendix D-2)	By end of Flagun
7.4.1.1	SO	Monthly Gen. Outage Program (Appendix D-3)	By 1st day of each month
7.4.1.4	SO	Weekly Generation Outage Program (Appendix D-4)	By 14:00 hrs. every Wednesday
7.4.1.7	SO	Request for Scheduled Gen. Outage (Appendix D-5)	No later than 7 days prior to Outage
7.4.1.9	SO	Request for Generation Maintenance Outage (Appendix D-6)	At least 48 hours prior to Outage
7.5.1	SO	Monthly Availability Projection (Appendix D-8)	By 3 <sup>rd</sup> day of every month
7.5.3	SO	Weekly Availability Projection (Appendix D-9)	Every Wednesday
7.5.5	SO	Daily Output Useable (Appendix D- )	No later than 12:00 hours every day

<b>Responsible Party: Generator (Contd.)</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
7.5.6	SO	Changes in Availability of Generating Unit	Promptly
11.8.1	TSO/ GCMC	Event report	Promptly
11.8.4.1	SO	Operational information (Appendix D-12 to D-14)	No later than 12:00 hours every day
11.8.4.2	SO	Monthly Generation report (Appendix D-15 to D-16)	Within 7 days from end of month
11.8.4.3	SO	Monthly Generation and HV feeder Outage report (Appendix D-17 to D-20)	Within 7 days from end of month
11.8.4.4	Grid	Record of energy delivered and received (Appendix D-21)	Within 7 days from end of month
<b>Responsible Party: Distributors/Users/HV Consumers</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.4.2.1.1	Grid	Details of Demand and energy consumption on monthly basis for past year	By 15 <sup>th</sup> of Bhadra
3.4.2.1.2	Grid	Annual energy and Demand forecast for HV consumers	By 15 <sup>th</sup> of Bhadra
3.4.2.1.3	Grid	Annual Demand and energy forecast for existing HV Consumers, if load is expected to increase by 1 MW.	By 15 <sup>th</sup> of Bhadra
3.4.2.1.4	Grid	Details of area specific loads	By 15 <sup>th</sup> of Bhadra
3.4.2.2.4	SPD	Changes in Planning Data in Appendices A & B	By end of Aswin
5.4.1.2	Grid	Log containing test results and maintenance record of Equipment	As and when requested by Party
5.4.1.4	Grid	Detailed Planning Data as per Appendix B	Within 30 days from Agreement

<b>Responsible Party: Distributors/Users/HV Consumers (Contd.)</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
5.4.1.5	Grid	Additional planning data for HV Consumers	With Connection Application
5.4.6.1	Grid	Details for energizing Connection Points	At least 60 days prior to energizing
5.9.1.2	Grid	Connection Point Electrical Diagrams	As per Agreement
5.10.1.5	Grid	Registered Equipment Data	As per Agreement
5.11.2.6	Grid	Equipment identifications	As per Agreement
6.11.1.1	SO	3-year rolling annual User Outage Program	By end of Falgun
8.3.1	SO	Test request for System Test	At least 3 months before proposed Test date
11.8.1	TSO/ GCMC	Event report	Within 30 days of Event
<b>Responsible Party: System Planning Department</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.5.1.2	NEA	Demand forecast (draft)	By end of Aswin
3.5.1.3	NEA	Demand forecast (final)	By end of Kartik
3.5.2.6	NEA	Least Cost Generation Plan (draft)	By end of Poush
3.5.2.7	NEA	Least Cost Generation Plan (final)	By end of Magh
3.5.3.5	NEA	Short term Grid Operation Plan (draft)	By end of Magh
3.5.3.5	NEA	Short term Grid Operation Plan (final)	By end of Falgun
3.5.4.2	NEA	Transmission Development Plan (draft)	By end of Falgun
3.5.4.3	NEA	Transmission Development Plan (final)	By end of Chaitra
3.5.5.2	NEA	Power System Master Plan	By end of Jestha
5.4.3.1	Grid	Grid Impact Studies	Within 2 months from receipt of application

<b>Responsible Party: Power Trading Department</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.5.2.4	SPD	Details of import export power	By end of Kartik
3.5.2.5	SPD	Details of signed PPA's	By end of Kartik
5.4.1.1	Grid	Application for Connection	Within seven days
<b>Responsible Party: Engineering Services</b>			
<b>Section</b>	<b>Party</b>	<b>Description of Report/Data</b>	<b>Schedule</b>
3.5.2.3	SPD	Details of candidate power projects	By end of Kartik

- Note:
- (a) TSO means Transmission & System Operation
  - (b) NEA means NEA Management
  - (c) All means all relevant Parties
  - (d) Grid means Grid Owner
  - (e) Gen. means Generator
  - (f) SPD means System Planning Department
  - (g) SO means System Operator
  - (h) GCMC means Grid Code Management Committee

**ANNUAL OUTAGE PROGRAM**

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY:**  
**FOR : F/Y ..... BS ..... AD.**

Month (Nepali)	Srawan	Bhadra	Aswin	Kartik	Marg	Paush	Magh	Falgun	Chaitra	Baisakh	Jestha	Ashad
Month (English)												
Week												
No. of days												
Outage in Hrs.												
Generating Unit												
No.1												
No.2												
No.3												
Power Transformer												
No.1												
No.2												
Unit Circuit Breaker												
No.1												
No.2												
No.3												
Line Circuit Breaker												
No.1												
No.2												
Other Equipment												
No.1												
No.2												

Note: If the month starts on a day other than Sunday, the days before the first Sunday of the month shall be included in first week of the month.

If the month ends on a day other than Saturday and number of weeks in the month happen to be more than four, the days after the last Saturday shall be included in fourth week of the month.

Notes if any:

Comments if any:

Submitted by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

Acknowledged by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

## ANNUAL AVAILABILITY DECLARATION

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY:**  
**FOR : F/Y ..... BS ..... AD.**

S.No.	Month (Nepali) Month (English)	Srawan	Bhadra	Aswin	Kartik	Marg	Paush	Magh	Falgun	Chaitra	Baisakh	Jestha	Ashad
1	<b>Power Availability:</b>												
	Average Discharge Available CMPS												
	Average MW Available in Month												
	Max.MW Available in Peak Hr.												
	Min. MW Available in Peak Hr.												
2	<b>Energy Availability:</b>												
	Av. MWh/day available in the Month												
	Peaking facility MWh/day												
	Total declared MWh in the Month												
	Design MWh for the Month												

Notes if Any:

Comments if any:

Submitted by:  
Signature:  
Name:  
Designation:  
Seal:

Acknowledged by:  
Signature:  
Name:  
Designation:  
Seal:

**MONTHLY GENERATION OUTAGE PROGRAM**

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY:**  
**FOR : F/Y ..... BS ..... AD.**

**MONTH:**

Week No. as per Month	Residual* Previous Week	W1	W2	W3	W4	Partial** Last Week
<b>Week No. as per Nepali Calander</b>						
Nepali Date (From-to)						
English Date (From-to)						
Generator Unit No. 1, Outage Hrs. Outage MW.						
Generator Unit No.2, Outage Hrs. Outage MW.						
Generator Unit No.3, Outage Hrs. Outage MW.						
Transformer No. 1 Outage Hrs. Outage MW.						
Transformer No. 2 Outage Hrs. Outage MW.						
Line Ckt.Breaker No.1, Outage Hrs Outage MW.						
Other Equipment Outage Hrs. Outage MW.						

\* If the month starts on a day other than Sunday then the days before the first Sunday of the month are termed as Residual previous week.

\*\* If the month ends on a day other than Saturday then the days after the last Saturday of the month are termed as partial last week

Notes if any:

Comments if any

Submitted by:

Acknowledged by:

Signature:

Signature:

Name:

Name:

Designation:

Designation:

Seal:

Seal:



**WEEKLY GENERATION OUTAGE PROGRAM**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : YEAR .....MONTH .....WEEK.**

Day	Sunday			Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			
	From To	Hrs.	MW Deferred	From To	Hrs.	MW Deferred	From To	Hrs.	MW Deferred	From To	Hrs.	MW Deferred	From To	Hrs.	MW Deferred	From To	Hrs.	MW Deferred	From To	Hrs.	MW Deferred	
Date (Nepali)																						
Date (English)																						
Outage Time																						
Unit No.1																						
Unit No.2																						
Unit No.3																						
Transformer-1																						
Transformer-2																						
Line CB-1																						
Line CB-2																						
Other Equip.																						

Notes if any:

Comments if any

Submitted by:

Acknowledged by:

Signature:

Signature:

Name:

Name:

Designation:

Designation:

Seal:

Seal:

**SCHEDULED OUTAGE REQUEST FORM**

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY :**  
**FOR : ..... YEAR.....MONTH.....DATE.**

Location	Description works	Start Date and Time	Finish Date and Time	Duration of Shutdown Requested

Note : Request form should be submitted at least seven Business Days prior to planned scheduled outage.

Submitted by:  
Name :  
Designation :  
Date of submission :  
Signature :  
Company Seal :

Approved by :  
Name :  
Designation :  
Date of submission :  
Signature :  
Office Seal :

**FORCED/ MAINTENANCE OUTAGE REQUEST FORM**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.....DATE.**

Start Date	Start Time	Location and Description of the works	Finish Date	Finish Time	Duration of Shutdown

Reason for Outage :

Note : Request form shall be submitted at least 48 hours prior to proposed time for maintenance outages.

Submitted by :

Name :  
Designation :  
Date of submission :  
Signature :

Company Seal :

Approved by:

Name :  
Designation :  
Date of submission :  
Signature :

Office Seal :

**TRANSMISSION LINE SHUTDOWN IMPLEMENTATION FORM****NAME OF GENERATING PLANT/ OR GRID OFFICE :****NAME OF THE GENERATING COMPANY:****FOR : .....YEAR.....MONTH.....DATE.****A. Shutdown Request (Shutdown may be for User, Grid Owner or both) :**

Shutdown Requested by	
Date of Shutdown	
Earliest start time	Latest completion time
Location of work	
Description of work	
Type of outage (scheduled or form)	
In-charge Supervisor	Safety Officer
Name of the person approving the shutdown and date of approval	Signature

**B. Shutdown Placement**

Step	Time	Description of Operation	(Insert User name)		NEA	
			Lock No.	User SO	Lock No.	ISO
<b>Disconnection at end-1 -----</b>						
1		.....shall open Circuit Breaker				
<b>Disconnection at end-2 -----</b>						
2		.....shall open Circuit Breaker				
3		..... Shall open isolator				
<b>Disconnection at end-1 -----</b>						
4		..... Shall open isolator				
<b>Grounding</b>						
5		User Shall close ground switch at end-1				
6		NEA Shall close ground switch at end-2				

After step six the Implementing Safety Officer (ISO) shall inform User's Safety Officer(USO) that shutdown has been effective and he can authorize his personnel to work on the line. No personnel other than the personnel under the supervision of the supervisor in-charge are allowed to work on the line. The USO will hold the key for all isolators throughout the shutdown and is the only allowed to work on the line. The USO will hold the key for all isolators throughout the shutdown and is the only person that can release the shutdown.

**C. Shutdown Release**

Step	Time	Description of Operation	.....		NEA	
			Lock No.	User SO	Lock No.	ISO
1		The User SO shall remove the grounding switch at end-1 and NEA personnel shall open the grounding switch at end-2.				
2		Verify CB is open at end-2				
3		ISO shall remove the lock on isolator at end-2 and NEA personnel shall close isolator at end-2				
4		Verify CB is open at end-1				
5		The User SO shall remove the lock on isolator at end-1 and operator shall close isolator at end-1				
6		User SO shall report the LDC that shutdown is complete and system is ready for operation.				

System is in normal operation after completion of shut down and reconnection.

User Job Incharge

NEA Job Incharge

**MONTHLY AVAILABILITY DECLARATION ON WEEKLY BASIS**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.**

S. No.	Week* as per month	Residual *** Prev. Week	W1	W2	W3	W4	Partial last week ****
1	Week No. as per Nepalese Calander						
	Nepali Date ( From----to)						
	English Date(From-to)						
	<b>Power Availability</b>						
	Average Discharge Available in CMPS						
2	Average MW Available in the Week						
	Max. MW available during Peak Hours**						
	Min. MW available during Peak Hours						
	<b>Energy Availability</b>						
	Average MWh/day available in the week						
Peaking MWh available/ day							
Total declared MWh in the Week							
Design Capacity averaged over week							

\* Week means 00:00 hrs on Sunday to 24:00 hrs on Saturday

\*\* Peak hour means the duration between 18:00 hrs to 21:00 hrs

\*\*\* If the month starts on a day other than Sunday then the days before the first Sunday of the month are termed as Residual previous week.

\*\*\*\* If the month ends on a day other than Saturday then the days after the last Saturday of the month are termed as partial last week

Notes if any:

Notes if any:

Submitted by:

Signature:

Name:

Designation:

Seal:

Acknowledged by:

Signature:

Name:

Designation:

Seal:

**MONTHLY AVAILABILITY DECLARATION ON HOUR TO HOUR BASIS**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.**

Date Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32		
	MW																																	
0.00																																		
1.00																																		
2.00																																		
3.00																																		
4.00																																		
5.00																																		
6.00																																		
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19.00																																		
20.00																																		
21.00																																		
22.00																																		
23.00																																		
24.00																																		
<b>Total :</b>																																		

Notes if any:

Comments if any

Submitted by:  
Signature:  
Name:  
Designation:  
Seal:

Acknowledged by:  
Signature:  
Name:  
Designation:  
Seal:

**WEEKLY AVAILABILITY DECLARATION**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.....WEEK.**

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Date (Nepali)							
Date (English)							
Hour	MW	MW	MW	MW	MW	MW	MW
0.00							
1.00							
2.00							
3.00							
4.00							
5.00							
6.00							
7.00							
8.00							
9.00							
10.00							
11.00							
12.00							
13.00							
14.00							
15.00							
16.00							
17.00							
18.00							
19.00							
20.00							
21.00							
22.00							
23.00							
24.00							
<b>Total :</b>							

Notes if any:

Comments if any

Submitted by:

Signature:

Name:

Designation:

Seal:

Acknowledged by:

Signature:

Name:

Designation:

Seal:

**DAILY AVAILABILITY DECLARATION**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.....DATE (NEPALI)**

**.....YEAR.....MONTH.....DATE (ENGLISH)**

Unit Hour	Unit 1 MW	Unit 2 MW	Unit 3 MW	Unit 4 MW	Unit 5 MW	Unit 6 MW	Total MW	Remarks for shutdown
0.00								
1.00								
2.00								
3.00								
4.00								
5.00								
6.00								
7.00								
8.00								
9.00								
10.00								
11.00								
12.00								
13.00								
14.00								
15.00								
16.00								
17.00								
17.30								
18.00								
18.30								
19.00								
19.30								
20.00								
20.30								
21.00								
22.00								
23.00								
24.00								
<b>Total :</b>								

Notes if any:

Comments if any

Submitted by:

Signature:

Name:

Designation:

Seal:

Acknowledged by:

Signature:

Name:

Designation:

Seal:



**VERBAL DISPATCH INSTRUCTION CONFIRMATION**

**FROM: LDC, NEA**

**TO:**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

We here by confirm our verbal dispatch instruction as per following details,  
issued to you by telephone at----- (insert time) hrs. on ----- (insert date).

Time (Hrs)		Verbal Instruction	Verbal Instruction given by
From	To		

Operation Engineer

**DAILY GENERATION REPORT FORM**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.....DATE**

Energy Meter Reading Previous .....

Energy Meter Reading Present .....

Multiplying Factor

Total Generation of the Day MWh

Cumulative Energy for the Month MWh

Time Hours	Unit No. 1 MW	Unit No. 2 MW	Unit No. 3 MW	Total MW	Reactive MVAR	Calculated MVA	PF	Remarks
13.00								
14.00								
15.00								
16.00								
17.00								
18.00								
19.00								
20.00								
21.00								
22.00								
23.00								
24.00								
1.00								
2.00								
3.00								
4.00								
5.00								
6.00								
7.00								
8.00								
9.00								
10.00								
11.00								
12.00								
Average								

Regards,

\_\_\_\_\_  
Operation Engineer

**DAILY GENERATION LOG SHEET**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : .....YEAR.....MONTH.....DATE**

Time	Freq.	UNIT # 1			UNIT # 2			UNIT # any additional no.			Total Generation		Tran-Line Voltage kV	Step-up Transformer (AMP)
		Generati on (MW)	Reactive Power		Generati on (MW)	Reactive Power		Generati on (MW)	Reactive Power		Active (MW)	Reactive (MVAR)		
			P.F.	(MVAR)		P.F.	(MVAR)		P.F.	(MVAR)				
1.00														
2.00														
3.00														
4.00														
5.00														
6.00														
7.00														
8.00														
9.00														
10.00														
11.00														
12.00														
13.00														
14.00														
15.00														
16.00														
17.00														
18.00														
19.00														
20.00														
21.00														
22.00														
23.00														
24.00														
Total :														

Note : (a) + MVAR means export and (b) - MVAR means import

Submitted by :  
Signature :  
Name:  
Designation:  
Seal:

**FAULT REGISTRATION FORM**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : ..... YEAR .....MONTH.**

<b>Power Plant :</b>	<b>Date of Fault : Nepali : .....</b>	<b>Time :</b>
	<b>English : .....</b>	
<b>Affected Parts of the Power Plant :</b>		
<b>Description of the Fault :</b>		
<b>Cause :</b>		
<b>Tripped Breaker :</b>		
<b>Alarms &amp; Indications on Protection Relay :</b>		
<b>Outage Time :</b>		
<b>Loss of Generation :</b>		

(.....)  
**Operation Engineer**

**MONTHLY GENERATOR PERFORMANCE REPORT FORM**

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY:**  
**FOR : ..... YEAR .....MONTH.**

S. No.	Particulars	Unit No. 1	Unit No. 2	Unit No. 3	Transformer No.1	Transformer No.2
1	Present Reading at ----- Hrs On -----					
2	Previous Reading at ----- Hrs On-----					
3	Difference					
4	Multiplying Factor					
5	Energy (MWh)					
6	Cumulative From beginning of the Year					
7	Total Energy Supplied to Interconnection Point					
8	Total Hours In Month					
9	Actual Running Hours in Month					
10	Percentage Running Hours					
11	Average Power Production (MW)					
12	Maximum Demand					
13	Plant Load Factor					
14	Number of Trippings on Plant Side					
15	Type of Tripping					
16	Number of Trippings on System or Trasmision Line Side					
17	Types of Tripping on System					

Notes if any:

Comments if any

Submitted by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

Acknowledged by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

**MONTHLY GENERATION REPORT FORM**

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY:**  
**FOR : ..... YEAR .....MONTH.**

Date	Total Generation MWh	Delivery to Interconnection Point (MWh)	Local Distribution (MWh)	Deemed Generation of NEA outages and reduced outputs (MWh)	Deemed Generation of Plant Outages and Reduced Outputs (MWh)	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
<b>Total</b>						

Notes if any:

Comments if any

Submitted by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

Acknowledged by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

**MONTHLY OUTAGE AND REDUCED OUTPUT REPORT**

**NAME OF GENERATING PLANT :**  
**NAME OF THE GENERATING COMPANY:**  
**FOR : ..... YEAR .....MONTH.**

Date	NEA outages and reduced outputs			Description of event			Plant Outages and reduced Outputs		
	From Hrs	To Hrs	Prorated hours	Load before event (MW)	Load during event (MW)	Deemed gen. Loss (MWh)	Load before event (MW)	Load during event (MW)	Deemed gen. Loss (MWh)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									

Notes if any:

Comments if any

Submitted by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

Acknowledged by:  
 Signature:  
 Name:  
 Designation:  
 Seal:

**MAINTENANCE OUTAGE REPORT FORM**

**NAME OF GENERATING PLANT :**

**NAME OF THE GENERATING COMPANY:**

**FOR : ..... YEAR .....MONTH.....DATE.**

Type of outage (maintenance or forced) :
Actual start date and time of outage :
Actual finish date and time of outage :
Length of outage :
MW output before outage :
MW output during outage :

**Description of work :**

Submitted by:  
Signature:  
Name :  
Designation  
Date:  
Seal:



**LOADING STATUS AND SCHEDULED OUTAGES**

**NAME OF SUBSTATION:**  
**NAME OF AREA GRID OFFICE:**  
**FOR :** ..... YEAR .....MONTH.

S.No.	Substation	Voltage level and feeders name	Maximum Load						Frequency of		Duration of		Total planned outages		Remarks	
			First week		Second week		Third week		Fourth week		Shut down (a)	Load shedding (A)	Shut down (b)	Load shedding (B)		Frequency (a+A)
			Amp	Date and time	Amp	Date and time	Amp	Date and time	Amp	Date and time						

**FORCED OUTAGES OF TRANSMISSION LINES AND SYSTEM FAILURES**

NAME OF SUBSTATION: .....  
 NAME OF AREA GRID OFFICE: .....  
 FOR : ..... YEAR .....MONTH.

S.No.	Substation	Voltage level and feeders name	Tripping				Total Forced outages			System Failure		Remarks
			Terminal related		Line related		Frequency (a+b)	Time(A+B)	Frequency	Time		
relays operated		relays operated		relays operated		relays operated						
Main protection E/F+O/C		Main protection E/F+O/C		Main protection E/F+O/C		Main protection E/F+O/C						
Duration (a)		Duration (a)		Duration (a)		Duration (a)						
Frequency (a)		Frequency (a)		Frequency (a)		Frequency (a)						
Outage		Outage		Outage		Outage						
Duration (b)		Duration (b)		Duration (b)		Duration (b)						
Frequency (b)		Frequency (b)		Frequency (b)		Frequency (b)						
Duration (B)		Duration (B)		Duration (B)		Duration (B)						
Frequency (B)		Frequency (B)		Frequency (B)		Frequency (B)						

**METER READING FORM**

**NAME OF SUBSTATION:**  
**NAME OF AREA GRID OFFICE:**  
**FOR : ..... YEAR .....MONTH.**

METER READING DESCRIPTION	Feeder-1				Feeder-2				Feeder-3						
	MAIN METER		CHECK METER		% DIFFERENCE		MAIN METER		CHECK METER		% DIFFERENCE		CHECK METER		
	Make & S. No.	FROM GRID	TO GRID	FROM GRID	TO GRID	FROM GRID	TO GRID	FROM GRID	TO GRID	FROM GRID	TO GRID	FROM GRID	TO GRID	FROM GRID	TO GRID
THIS MONTH READING															
DIFFERENCE															
METER MULTIPLIER															
KILOWATT - HOURS															

COMPANY REPRESENTATIVE :

NEA REPRESENTATIVE :

Signature  
 Name :  
 Designation :  
 English Date :  
 Nepali Date :  
 Time :  
 Office Seal :

Signature  
 Name :  
 Designation :  
 English Date :  
 Nepali Date :  
 Time :  
 Office Seal :

**APPENDIX – E**  
**Grid Owner Name...**  
**APPLICATION FORM**  
**FOR**  
**GRID CONNECTION**

Ref. No. ....

Date:.....

To,

Grid Owner  
Name;.....  
Address: .....

Through,

.....  
.....  
.....

Dear Sir/Madam,

We understand that a memorandum of understanding/connection agreement is required with the .....(Grid Owner Name) in order to connect our facilities to the Grid. Please find enclosed herewith our application along with the necessary details for the proposed Connection. An attested copy of our business license is also attached.

Name of Applicant .....

Signature of Authorized Representative .....

Name of Firm .....

**APPLICATION FORM  
FOR  
GRID CONNECTION**

**APPLICANT/GRID USER:**

Name: .....

.....

Address:.....

.....

Telephone: .....

Email: .....

Fax: .....

Contact Person:.....

Type of Grid User (tick one):

Generator	Distributor	HV Consumer	
Others	Existing Grid User	Yes	No

---

**NEA/GRID OWNER:**

Address:.....

.....

Telephone: .....

Email: .....

Fax: .....

Contact Person: .....

## GUIDELINES FOR APPLICATION PROCESSING

### 1. Definition of Terms

- 1.1 All terms in this application shall have the meanings given to them in the Grid Code (Section 1.7).

### 2. Processing of Applications

- 2.1 Prospective Grid Users shall submit their applications to the Grid Owner for Connections prior to signing any Power Purchase Agreement and in case of other Generators, Distributors and High Voltage Consumers such applications shall be submitted during their design phase and well ahead of the procurement of the User's facilities such that the applicant as well as the Grid Owner becomes fully aware of its responsibilities and the technical requirements regarding the Grid Connection. No Connection to the Grid shall be permitted without a memorandum of understanding or a connection agreement between the two Parties in accordance with the Nepal Grid Code.
- 2.2 All applications, aimed at Power Purchase Agreement, shall be submitted to the Power trader/Distributor. Applications of Generators and Distributors shall be submitted directly to the Grid Owner's head office. Applications of High Voltage Consumers shall be submitted to the Grid Owner's regional office through the related local Distributor's office.
- 2.3 The Power Trader or the Grid Owner's regional office, as the case may be, shall forward the application to the Grid Owner within seven (7) days of receipt of the application. The Grid Owner shall forward this application to the System Planning Department for necessary studies within seven (7) days of receipt of the application.
- 2.4 Until the Connection Agreement is signed, the Grid Owner and the applicant shall communicate with each other directly.
- 2.5 In the event the application is deemed incomplete or unsatisfactory by the Grid Owner, the same shall be communicated in writing to the applicant within fifteen (15) days of receipt and the applicant shall submit such information to the Grid Owner not later than thirty (30) days of such notice. The application shall be deemed null and void if complete information is not provided to the Grid Owner within this thirty (30) day period.
- 2.6 If Grid Impact Study be required, the System Planning Department shall complete such studies and forward the results to the Grid Owner within two (2) months of receipt of applicant's acceptable application.
- 2.7 if additional time be required for the Grid Impact Studies because of complexity of the Connection, the System Planning Department shall prepare a preliminary report within the prescribed time with detail report to be

presented within the extended time period approved by the Grid Owner. The Grid Owner shall inform the applicant of such time extension.

- 2.8 Based on the application and the results of the Grid Impact Studies, the Grid Owner shall make an offer for Connection to the applicant within ninety (90) days of receipt of acceptable application. The Grid Owner's offer for Connection shall include proposed amendments to the application, results of the Grid Impact Studies and, if the Grid Impact Studies reveal that the applicant's facilities degrade the Grid, related counter measures the applicant needs to undertake to make the applicant's proposal acceptable.
- 2.9 The Grid Owner's offer for Connection shall also provide a preliminary schedule for undertaking necessary reinforcements in the Grid to accommodate the applicant's facilities in the Grid.
- 2.10 If the applicant does not reply to the offer for Connection within thirty (30) days from the date the Grid Owner makes the offer for Connection, the offer shall be deemed null and void.
- 2.11 If the applicant accepts the Grid Owner's offer for Connection within the prescribed time or any mutually agreed extension thereof, the Grid Owner and the applicant shall sign a Memorandum of Understanding or Connection Agreement or Amended Connection Agreement as the case may be within thirty (30) days from the date the applicant accepts the Grid Owner's offer for Connection.
- 2.12 If the applicant fails to sign the Memorandum of Understanding or the Connection Agreement or the Amended Connection Agreement as the case may be, within the prescribed time frame, the offer shall be deemed null and void.

### **3. Schedules**

- 3.1 All applicants seeking a new Connection to the Grid or an amendment to the existing Connection Agreement shall fill in and submit the following schedules together with the application.

- \* Schedule 1: Description of Grid User's Facilities
- \* Schedule 2: Facility Location Map
- \* Schedule 3: Planning Data
- \* Schedule 4: User System Data
- \* Schedule 5: Detailed Planning Data
- \* Schedule 6: Detailed User System Data
- \* Schedule 7: User's Single Line Diagram
- \* Schedule 8: Connection Point Diagram
- \* Schedule 9: Equipment Specifications
- \* Schedule 10: Protection Scheme
- \* Schedule 11: SCADA and Communication Scheme
- \* Schedule 12: Metering Scheme
- \* Schedule 13: Construction Schedule

**SCHEDULE 1: DESCRIPTION OF GRID USER'S FACILITIES**

(The applicant shall herein briefly describe the project being undertaken, its salient features, current proposed capacity of the plant and any expansion plan, financing scheme for constructing the project, etc.)

Draft

\_\_\_\_\_  
**(Signature of authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**



**SCHEDULE 2: FACILITY LOCATION MAP**

(The locations of the User System, the proposed Connection Point and the approximate alignment of the transmission/sub-transmission line between the User System and the Connection Point shall be shown herein on a geographical map.)

Draft

\_\_\_\_\_  
**(Signature of authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**

**SCHEDULE 3: PLANNING DATA**

(The applicant shall herein provide information in accordance with Section 5.4 and Appendix-A.1 of the Nepal Grid Code as applicable).

Draft

\_\_\_\_\_  
(Signature of authorized Representative)

\_\_\_\_\_  
(Seal of Company)

\_\_\_\_\_  
(Name of Authorized Representative)

**SCHEDULE 4: USER SYSTEM DATA**

(The applicant shall herein provide information in accordance with Appendix A.3 of the Nepal Grid Code as applicable).

Draft

\_\_\_\_\_  
**(Signature of authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**

**SCHEDULE 5: DETAILED PLANNING DATA**

(The applicant shall provide information in accordance with Appendix B.1 of the Nepal Grid Code as and when requested by the Grid Owner)

Draft

\_\_\_\_\_  
(Signature of authorized Representative)

\_\_\_\_\_  
(Seal of Company)

\_\_\_\_\_  
(Name of Authorized Representative)

**SCHEDULE 6: DETAILED USER SYSTEM DATA**

(The applicant shall provide information in accordance with Appendix B.2 of the Nepal Grid Code as and when requested by the Grid Owner)

Draft

\_\_\_\_\_  
(Signature of Authorized Representative)

\_\_\_\_\_  
(Seal of Company)

\_\_\_\_\_  
(Name of Authorized Representative)

**SCHEDULE 7: USER'S SINGLE LINE DIAGRAM**

(The applicant shall herein provide a single line diagram showing circuit connections of all major equipment and related devices in the User System in accordance with Article 5.9 of the Nepal Grid Code.).

Draft

\_\_\_\_\_  
**(Signature of Authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**

**SCHEDULE 8: CONNECTION POINT DIAGRAM**

(The applicant shall herein provide a composite single line diagram for the entire Connection Point showing circuit connections of all major equipment and related devices on Grid User's side as well as the Grid Owner's side of the Connection Point in accordance with Article 5.9 of the NEA Grid Code.

Draft

\_\_\_\_\_  
**(Signature of Authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**

**SCHEDULE 9: EQUIPMENT SPECIFICATIONS**

(The applicant shall herein provide specifications of major equipment not included in Schedules 1-4 in accordance with Chapters 5 and of the NEA Grid Code).

Draft

\_\_\_\_\_  
**(Signature of Authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**



**SCHEDULE 10: PROTECTION SCHEMES**

(The applicant shall herein provide details of the principal protection schemes in the User's system as well as at the Connection Point in accordance with Chapter 5 and 6 of the NEA Grid Code).

Draft

\_\_\_\_\_  
(Signature of Authorized Representative)

\_\_\_\_\_  
(Seal of Company)

\_\_\_\_\_  
(Name of Authorized Representative)

**SCHEDULE 11: SCADA & COMMUNICATION SCHEME**

(The applicant shall herein provide details of SCADA and communication arrangement in the User's system and at the Connection Point in accordance with Chapters 5 and 6 of the NEA Grid Code).

Draft

\_\_\_\_\_  
(Signature of Authorized Representative)

\_\_\_\_\_  
(Seal of Company)

\_\_\_\_\_  
(Name of Authorized Representative)

**SCHEDULE 12: METERING SCHEMES**

(The applicant shall herein provide details of the metering arrangements in the User's system and at the Connection Point in accordance with Chapter 9 of the NEA Grid Code).

Draft

\_\_\_\_\_  
(Signature of Authorized Representative)

\_\_\_\_\_  
(Seal of Company)

\_\_\_\_\_  
(Name of Authorized Representative)

**SCHEDULE 13: CONSTRUCTION SCHEDULE**

(The applicant shall herein provide the construction schedule of the User's facilities in the User's system and at the Connection Point indicating testing, commissioning and Connection dates in accordance with Chapter 5 of the NEA Grid Code).

Draft

\_\_\_\_\_  
**(Signature of authorized Representative)**

\_\_\_\_\_  
**(Seal of Company)**

\_\_\_\_\_  
**(Name of Authorized Representative)**

Draft