MINISTRY OF ENERGY AND NATURAL RESOURCES

ELECTRICITY REGULATORY AUTHORITY

GRID CODE REGULATION 2024

Preamble

In exercise of power conferred by Section 89 of the Electricity Act of Bhutan 2001, the Electricity Regulatory Authority hereby issues this Grid Code Regulation 2024 of Bhutan.

CHAPTER 1

PRELIMINARY

Title

1. This Regulation is called the Grid Code Regulation 2024.

Commencement

2. This Regulation comes into force from **29th January 2024**.

Scope

3. This Regulation applies to all entities within the country connected to the Transmission System, including the following:
   (1) System Operator;
   (2) Transmission Licensee;
   (3) Generation Licensee; and
   (4) Users.

Purpose

4. The purpose of the Regulation is to establish the rules, standards and procedures governing the operation, maintenance and development of the Transmission System for safe, secure, reliable and efficient operation of the Power System.

Repeal

5. This Regulation repeals the Bhutan Electricity Authority Grid Code Regulation 2008.

CHAPTER 2

ROLES AND RESPONSIBILITIES

Introduction

6. This chapter describes the responsibilities of the Licensees and Users, the roles of the Authority and power of the Ministry for the purpose of regulation of the Power System operation.

Roles and Responsibilities of the Ministry

7. In the matters related to Grid Code Regulation, the Ministry shall:
   (1) determine general policies, targets, strategies of the electricity industry operation;
   (2) approve power system expansion plans;
   (3) provide policy on protection against and solutions to energy shortage; and
   (4) provide policy on customer service standards and Licensee standards.

8. The National Transmission Grid Master Plan issued by the Ministry shall form the basis for planning and development of the Transmission System.

Roles and Responsibilities of the Electricity Regulatory Authority

9. In matters relating to the Grid Code Regulation, the Electricity Regulatory Authority shall:
   (1) Develop regulations, standards, codes, principles and procedures related to the following:
      a) performance standards, including minimum technical and safety requirements for operation and maintenance of generation, transmission and distribution facilities;
      b) terms and conditions for provision of access to the Transmission System and Distribution networks; and
      c) system operation including dispatch of generation;
      d) issue, modify and revoke licenses for generation, transmission, system operation, export, import, distribution and sale of electricity;
      e) monitor the performance of Licensees and their compliance with provisions of the Act, regulations, standards, codes and licenses;
      f) impose fines, sanctions or penalties for any breach of provisions of the Act, regulations, standards, codes and licenses; and
      g) settle disputes and grievances between Licensees and between Licensees and customers.

10. In the performance of above mandates, the Authority shall:
   (1) ensure the reliability, quality, security and efficiency of electricity supply;
   (2) encourage competition in electricity generation, transmission and supply;
   (3) ensure non-discriminatory access to the transmission and distribution;

(4) ensure a fair balance of the interest of the public, customers and participants in the electricity sector;
(5) facilitate the development of the generation, transmission and distribution of electricity throughout the country; and
(6) ensure the protection of the natural resources, the environment and other public interests affected by the development of electricity supply.

Responsibilities of System Operator

11. The System Operator shall:
    (1) co-ordinate the power supply system to obtain instantaneous balance between generation and consumption of electricity;
    (2) be responsible for dispatching generation installations;
    (3) co-ordinate the transmission outages;
    (4) monitor the import and export of electricity;
    (5) prepare forecasts of generation requirements;
    (6) coordinate for the dispatch of generation installations; and
    (7) perform such other functions as may be prescribed by the Authority in the license or by regulations.

12. The System Operator shall not, in the performance of its functions, show undue preferences or discrimination against any Person.

13. The System Operator shall be responsible in providing all the information and data relating to the management of the transmission grid to the Authority and the Ministry.

14. The System Operator shall be responsible for optimum scheduling and dispatch of electricity within the country and for export or import.

15. The System Operator shall coordinate and be responsible for restoration of Power System during partial or total black out.

Responsibilities of Transmission Licensee

16. The Transmission Licensee shall provide access to all existing and potential Users of the Transmission System on the payment of fees and other charges for services as may be approved by the Authority.

17. The Transmission Licensee shall undertake the operation of the Transmission System as per the license terms and conditions and the relevant regulations issued by the Authority.

18. The Transmission Licensee shall implement the expansion plans approved by the Ministry and the Authority in co-ordination with the following agencies:
    (1) The System Operator;
    (2) Generation Licensees;
    (3) Distribution Licensees; and

(4) Other Users.

19. The Transmission Licensee shall be responsible in providing all the information and data regarding the management of the Transmission System to the System Operator, Authority and the Ministry.

Responsibilities of Distribution Licensee

20. The area of the Licensee's distribution of electricity shall be defined on the license.

21. A Distribution Licensee shall provide access to all existing and potential Users of the Distribution network on payment of charges, and on the terms and conditions for network services as may be approved by the Authority.

Responsibilities of Transmission System Users

22. All Users connected to the Transmission System, including the Generation Licensees, Distribution Licensees, are responsible for:
    (1) planning, constructing, maintaining and upgrading of all necessary equipment in their respective system, including the installations of protective devices for connection to the Transmission System according to approved standards and regulations;
    (2) providing the System Operator with all requested data on the technical and economical characteristics relating to the design, construction and operation of facilities to be connected to the Transmission System;
    (3) employing adequate key personnel with required professional competencies; and
    (4) complying with the necessary operating liaison procedures and operation of communication equipment according to specifications issued by the System Operator.

23. The Distribution Licensee and other Users of the Transmission System shall provide realistic demand forecasting and other information to the System Operator for effective management of Power System.

24. All the Licensees and Users connected to the Transmission System shall comply with the decisions of the System Operator in connection with the execution of his functions under this Regulation.

CHAPTER 3

PLANNING CODE

Introduction

25. The Planning Code specifies the policy, criteria, procedures and information requirements for the purpose of planning the modification of an existing Connection Site between a User's system and the Transmission System or expansion of the Transmission System for connection of new generating station and new electrical facilities of Distribution Licensee or other Users.

Objective

26. The objectives of the Planning Code for the purpose of planning the modification of an existing Connection Site between a User's system and the Transmission System or expansion of the Transmission System for connection of new generating station or Load are to:

    (1) specify the responsibilities of the System Operator, Transmission Licensee, and other Users;
    (2) identify necessary technical studies and planning procedures; and
    (3) standardize the planning data required from Licensees and Users.

Scope

27. The Planning Code shall be complied by all Licensees and Users connected to and intending to connect to the Transmission System including the System Operator and Transmission Licensee.

Planning Policy

28. The Transmission Licensee shall carry out the planning for modification of an existing Connection Site between a User's system and the Transmission System or expansion of the Transmission System to connect the new generating station or Load in co-ordination with the System Operator, concerned Licensees and Users.

29. Under this Planning Code, Transmission Licensee shall comply and refer the following:
    (1) National Transmission Grid Master Plan developed by the Ministry;
    (2) transmission planning criteria and guidelines of the Ministry; and
    (3) relevant power data, hydrological statistics and other reports issued by relevant agencies and the Ministry;
    (4) regulations, standards issued by the Authority; and
    (5) directives issued by the System Operator.

30. The Transmission Licensee shall provide to the Authority the investment plan for system expansion or up gradation works for technical and investment approval of proposed Transmission System expansion or up gradation works. The plan shall include implementation schedule and technical and investment details of the transmission lines and substation including the associated equipment such as transformers, capacitors, reactors, protection systems and other switchgears.

31. The Transmission System planning and development for Cross-Border power trade shall be carried out as per the directives, plans and guidance of the Ministry.

Planning Data Standards

32. Under this Planning Code, standards for data collection shall be prepared by the Transmission Licensee considering the following:
    (1) principles and criteria for requirement of various information and data from Licensees and Users;
    (2) procedure for collection of data and information;
    (3) types of information required such as technical, financial and operational data of the electrical facilities of Licensees and Users.

33. All Licensees and Users shall provide required planning data to the Transmission Licensee of their system and Connection Site intending for connecting to the Transmission System.

34. The System Operator may establish further specifications and requirements of data.

35. The Licensees and Users shall identify data and information that may be required to be kept confidential.

Planning Criteria

36. The System Operator shall develop and issue guideline on the Planning Criteria of the Transmission System in accordance with the security philosophy of the National Transmission Grid Master Plan of the Ministry and in accordance to guidelines issued by the Authority.

37. The Transmission System shall to the extent possible securely withstand against the following outages without necessitating Load shedding or rescheduling of generation during steady state operation:
    (1) outage of a 66 kV S/C line; or
    (2) outage of a 132 kV S/C line; or
    (3) outage of a 220 kV S/C line; or
    (4) outage of a 400 kV S/C line; or
    (5) outage of single interconnecting transformer.

38. The contingencies mentioned above in section 37 shall be considered assuming a planned outage of another 66 kV S/C or 132 kV S/C or 220 kV S/C line in another corridor, not emanating from the same substation. The Transmission System shall be capable of withstanding the loss of most severe single system in feed without loss of stability.

39. Any one of the Events defined above in sections 37 and 38 shall not cause:
    (1) loss of supply;
    (2) prolonged operation of the system frequency beyond the required bandwidth;
    (3) unacceptably high or low voltage;
    (4) system instability; and
    (5) unacceptable overloading of Transmission System elements.

40. Minimum of two transformers shall be provided in a substation of 66 kV and above.

41. The planning study shall consider all Generating Units operating within their capability curves and voltage profile being maintained within required limits.

Planning Studies

42. The System Operator shall prepare short-term Load forecasts for the overall system with identification of different likely scenarios of energy-Load balances, power export potentials and energy deficit projection.

43. The System Operator shall review all expansions plans of Transmission System based on the forecasted generation capacity and the Load growth.

44. The System Operator and Transmission Licensee shall perform following Grid Planning Studies to identify necessary corrective measures for safety, reliability, security and stability of the Transmission System:
    (1) assessment of impact on the Transmission System or to any User's system on account of forecasted Load growth, proposed addition or change of equipment or facilities in the Transmission System or in the User's system;
    (2) assessment of behavior of the Transmission System during normal and outage-contingency conditions as well as during the transient conditions due to switching operation or other disturbances;
    (3) Load flow studies to evaluate behavior of the Transmission System for the existing scenario as well as for the projected scenarios with the planned transmission facilities and newly connected generating plants under maximum and minimum forecasted Load condition;
    (4) short circuit studies to evaluate the effect on the Transmission System due to the connection of new generating plants, transmission lines and other facilities that may result to increased fault duties on the Transmission System;
    (5) transient stability studies, where necessary, to verify the impact of the connection of new generating plants, transmission lines, substations and modified configurations of the Transmission System segment or that of User's system on the ability of the Power

System to seek a stable operating point following the transient disturbances after single-outage contingency and multiple-outage contingency forecasted-Load conditions;

(6) steady-state stability analysis to evaluate the vulnerability of the Transmission System to steady-state stability problems - generally occurring from heavily loaded system, leading to major disturbances from minor ones as result of steady-state oscillation, which would require power system stabilizers tuning;

(7) voltage-stability analysis to assess the vulnerability of the Transmission System to the voltage-collapse under heavily-loaded conditions;

(8) Reactive Power compensation studies.

CHAPTER 4

CONNECTION CODE

Introduction

45. The Connection Code specifies the connection conditions as a minimum technical requirement for the purpose of connecting to the Transmission System. Any new connection to the Transmission System shall not adversely affect the operation of the Power System.

Objective

46. The objective of Connection Code is to establish standard connection procedures and conditions for connecting to the Transmission System without affecting the Power System operation by the new connection or existing modification.

Scope

47. The Connection Code shall be applicable to the Transmission Licensee and all the Users including the potential Users seeking new connection to the Transmission System as well as to the Users seeking modifications to their existing system.

Procedure for Connection

48. Any potential Users seeking to establish new connections or Users seeking the modification of their existing system shall submit the application with detail report in standard format to the Transmission Licensee containing the following:
    (1) purpose of the proposed connection and modification with proposed capacity, connection point and equipment details; and
    (2) implementation schedule of the proposed connection or modification.

49. Transmission Licensee shall establish the procedures for processing of applications for modification of existing connection or new connection to the Transmission System.

50. Transmission Licensee shall provide to the applicant detail requirements for new connection or modification of connection within reasonable time but not later than 45 days from the submission of application.

51. Connection of a User's facilities to the Transmission System shall have Connection Agreement executed between the Users and the Transmission Licensee.

Standards for Connection

52. The designing, manufacturing, testing, certification and installations of equipment or apparatus to be included in or to be connected to the Transmission System shall comply with the applicable standards and codes of Bhutan. In absence of such standards, Good Utility Practices shall be adopted.
53. All equipment and facilities installed at the Connection Point shall not pose a threat to the safety of personnel or cause damage to equipment or to the Power System.

Connection Conditions

54. A Site Responsibility Schedule shall be prepared for every Connection Site between the Transmission Licensee and the Users and incorporate in the Connection Agreement.

55. The details of site ownership and boundary demarcations of the Connection Site shall be clearly specified in the Site Responsibility Schedule. The boundary between the generating station and the Transmission System shall be the gantry of the substation, switchyard, pot-head yard or other terminal equipment as agreed between the two parties. The boundary between the Transmission System and Distribution System shall be the outgoing-terminal pole-structure or other terminal equipment as agreed between the two parties. The boundary between the Transmission System and other Users' system shall be the isolator of the Transmission Licensee.

56. Licensees and Users shall develop the operational and safety rules applicable to User's system including the equipment, apparatus, services and supplies at the Connection Site. Operational and safety responsibilities at the Connection Site shall also be clearly specified in the Site Responsibility Schedule. Transmission Licensee and Users shall appoint competent personnel to ensure operational safety at the Connection Site. The schedule of telecommunications and measurement facilities including list of personnel of two parties for communication at the Connection Site shall be furnished. Operating and safety rules shall be made available to relevant personnel at the Connection Site.

57. Transmission Licensee and the Users shall incorporate the protection coordination and metering philosophies in the Site Responsibility Schedule. Protection systems are required to be provided by all Users connected to the Transmission System. The effective coordination of the protection systems shall be ensured by concerned parties.

58. The Licensees and Users shall maintain a log containing the test results and maintenance records relating to all equipment and facilities at the Connection Site.

59. Site Common Drawing will be prepared by the Transmission Licensee and the Users at the Connection Site containing equipment site layout, electrical layout, protection and control details and common services drawings. Respective Single Line Diagram of the Connection Site containing connected equipment, associated external circuits, equipment rating, nomenclature, numbering, labelling and layout shall also be developed by the concerned parties. All the Site-Common Drawings and Single Line Diagrams of the Connection Site shall be incorporated in the Site Responsibility Schedule. Where any equipment or circuit connections at the Connection Site are replaced or modified, the Single Line Diagram and Site-Common Drawings shall be accordingly updated and furnished to other party.

60. The Transmission Licensee and Users shall develop standard procedures to access the Connection Site for the purpose of installation, operation, meter and other measurement recording, inspection, monitoring, maintenance and for other operational activities.

61. The Site Responsibility Schedule shall be made available to the System Operator, Transmission Licensee and to the respective Users.

62. The System Operator shall be responsible to determine the availability of transmission capacity for Users to connect to the Transmission System and approve the connecting equipment.

63. Transmission Licensee, Generation Licensees and Users shall ensure that generating plant and electrical system connected to the Transmission System are designed, constructed, installed and operated as per standard in a manner that the variations of instantaneous value of system frequency and voltage does not impact the normal operation of the grid.

64. The Distribution Licensee and other Users connected to the Transmission System shall provide their own reactive compensation, where required in accordance to the instructions of the System Operator.

65. The Licensees and Users connected to the Transmission System shall be responsible for:
    (1) implementing necessary modifications or up gradations of their equipment and circuit connection;
    (2) carrying out relay-setting for suitable protection coordination;
    (3) assisting in contingency operations such as through Load shedding, islanding, black-start recovery, providing start-up power and other system restoration activities;
    (4) maintaining metering and communication system in good condition;
    (5) coordinating outage plan as per the plan of the Transmission Licensee and instruction of the System Operator; and
    (6) implementing promptly all instructions of the System Operator.

66. The interconnection between a User's system and the Transmission System at the Connection Site shall be controlled by the circuit breaker capable of interrupting within the short-circuit current range approved by the Transmission Licensee or System Operator.

67. Hydropower-generation units with Francis Turbines shall be capable of continuous stable operation at any Load between 50% and 100% MCR; while Pelton Turbines and Kaplan Turbine shall be capable of continuous stable operations at the Load between 30% and 100% MCR and 70% and 100% MCR respectively at normal operating head.

68. The Generating Units shall be capable to generate or absorb Reactive Power within their respective capability limit without compromising the active generation.

69. The System Operator shall have the access to the facilities of Licensees, Users and Customers, including the metering equipment to enable perform its functions after providing reasonable prior notice.

70. The System Operator shall determine the unit-wise Commercial Operation Date of new power plant connecting to the grid. The power injected into the grid prior to the declaration of COD shall be treated as Infirm Power.

71. For the purpose of connection of new generating station, the determination of respective Commercial Operation Date and the treatment of Infirm Power shall be carried out as per the power purchase agreement. In the absence of such agreement on the determination of Commercial Operation Date and treatment of Infirm Power, the Authority shall determine the Commercial Operation Date and the treatment of Infirm Power through separate guidelines or directives.

72. The System Operator may institute additional connection conditions where required.

73. All international connections and the execution of agreements shall be implemented as per the policy guidelines or directives of the Ministry.

74. Transmission Licensee shall submit to the Authority by 31st March of every year a schedule of transmission assets containing the Transmission System as of 31st December of the previous year.

CHAPTER 5

OPERATION CODE

Introduction

75. The secure, safe, reliable and efficient operation of the Power System requires appropriate real-time balancing of the Load and generation, which involves complex operation and coordination. The Operation Code specifies the policy, criteria and procedures for maintaining operational reliability and efficiency of the Power System.

Objective

76. The objective of the Operation Code is to:
    (1) specify the operating criteria, policies and states of the Power System;
    (2) define the operational responsibilities of the System Operator, Transmission Licensee, other Licensees and Users;
    (3) specify the principles and procedures for realistic demand estimation and forecasting;
    (4) standardize the coordination procedure for outage planning;
    (5) specify the roles and responsibilities for the Black-Start recovery;
    (6) establish a procedure for operational liaison; and
    (7) identify periodic reporting data and Event information.

Scope

77. The Operating Code shall be complied by Transmission Licensee, Generation Licensees, Distribution Licensees and all other Users of the Power System.

Operating Policy

78. The real-time operation of the Transmission System shall be managed by the System Operator from the National Load Dispatch Centre. The Transmission Licensee and all other Licensees and Users shall cooperate with each other and with the System Operator, adopting the Good Utility Practice at all times for effective operation of the Power System.

79. The control rooms of the System Operator, generating stations, transmission substations, distribution control centres and other significant control centres of the Users of the Power System shall be manned round the clock by competent personnel, except those control centers that are remotely operated.

Operating States of Power System

80. The rated frequency of the power system shall be 50.0 Hz.

81. The Transmission System shall be considered to be in the Normal State when:
    (1) power system frequency is within the limit of 49.9 Hz. to 50.05 Hz;
    (2) voltages at all connection points are within limits of 0.95 times and 1.05 times of the nominal values;

(3) transmission line loadings and sub-station equipment are below 90% of their continuous ratings; and
(4) sufficient operating margin is available.

82. Transmission System shall be considered to be in the Alert State during one or more of the following conditions:
(1) power system frequency is beyond the normal operating limit but within 49.5 Hz to 51 Hz;
(2) voltages at connection points are outside the normal limit but within the bandwidth of 0.9 times and 1.1 times of the nominal values;
(3) critical loading or imminent overloading of transmission line or substation equipment; or
(4) adverse weather condition.

83. Transmission System shall be considered to be in the Emergency State during one or more of the following conditions with occurrence of multiple-outage contingency but without resulting to total system blackout:
(1) frequency is below 49 Hz with deficit of adequate generation;
(2) transmission System voltage are outside the limit of 0.9 times and 1.1 times of nominal values; and
(3) loading level of any transmission line or sub- station equipment is above 110% of its continuous rating.

84. Transmission System shall be considered to be in the Extreme State when the corrective measures undertaken by the System Operator in the Emergency State failed to maintain system security, resulting to cascading outages, islanding, and system voltage collapse.

85. Transmission System shall be considered to be in the Restorative State when Generating Units, transmission lines, sub-station equipment and Loads are being energized and synchronized to restore the Transmission System to its Normal State.

Operating Criteria of Power System

86. Transmission System shall be operated to remain in the Normal State and achieve the power quality standards as specified by the System Operator.

87. The Transmission System shall continue operating in Normal State without compromising the security and reliability on single-outage contingency that is, even after loss of a single Generating Units, transmission line or transformer.

88. The frequency of the Power System during the Normal State shall be regulated through Frequency Regulating Reserve, while during other conditions, it shall be regulated with timely use of Contingency Reserve and demand control system.

89. Availability of adequate Frequency Regulating Reserve and Contingency Reserve shall be ensured for the purpose of stabilization of the Transmission System.

90. The restoration to the Normal State shall be efficiently carried out after occurrence of multiple-outage contingency.

91. Following the Transmission System leading to operate in several self-operating Island Grids, the System Operator shall, within fastest possible time, restore the Transmission System to a Normal State through resynchronization.

System Security Aspects

92. All facilities of Licensees and Users shall be operated in synchronism with Transmission System.

93. No part or element of the Power System shall be deliberately isolated, except:
    (1) under an emergency;
    (2) under conditions in which such isolation would prevent a total Transmission System collapse and enable early restoration of power supply;
    (3) when serious damage to a costly equipment is imminent and such isolation would prevent it; and
    (4) when such isolation is specifically instructed by the System Operator.

94. The System Operator in consultation with the Transmission Licensee shall prepare the list of important elements on which the above stipulations of section 93 shall be applicable. The removal of those important element of the Transmission System under an emergency situation shall be communicated to the System Operator at the earliest possible time after the Event. The System Operator shall restore the Power System into complete synchronism as soon as the conditions permit. The Operating Procedure for restoration of the Power System shall be formulated by the System Operator.

95. Manual or automatic tripping of any of the important elements of the Transmission System shall be precisely communicated by concerned Licensees or the Users to the System Operator as soon as possible but within ten minutes of the occurrence of Event. The cause and reason to the extent determined and the likely time of restoration shall also be intimated to the System Operator. The outage shall be restored as soon as possible within the reasonable time.

96. Without prior consent of the System Operator, no generator shall suddenly reduce their generation output by more than 5 (five) MW or no Large Consumer shall cause a sudden increase of Load by more than 5 (five) MW, except to prevent damage to their equipment or for deviation settlement management and under other emergency conditions.

97. Protections and relay settings of the Transmission System shall be coordinated periodically as per the plan agreed in the Power System coordination committee meeting.

98. Transmission Licensee and Users shall provide all attempts to ensure that the Power System frequency always remains within the normal frequency bandwidth of 49.9 to 50.05 Hz.

99. Each Licensee and the Users shall provide an adequate and reliable communication facilities to ensure effective exchange of data as well as efficient intimation of information to the System Operator and other parties. Wherever possible, redundancy and alternate path shall be maintained for communication along the important routes of the Transmission System.

100. Each Licensee and Users shall send data including the outputs of Disturbance Recorder and sequential Event Recorder to the System Operator for purpose of analysis of Transmission System Event. The Event reporting format and procedure, including other requirements shall be developed by the System Operator for compliances of the Licensees and Users. No Licensee shall refuse providing any data or information required by the System Operator, Authority or the Ministry for the purpose of discharging their functions under the provisions of Grid Code Regulation 2024 and the Act.

Operational Responsibilities of Licensees and Users

101. The System Operator shall coordinate and ensure to maintain the power quality in the Transmission System during normal conditions.

102. The System Operator shall:
    (1) ensure Load-generation balance during emergency conditions and take prompt corrective actions to restore the system to normal conditions;
    (2) perform all necessary system studies to determine the safe operating limits that shall protect the Transmission System against any instability problem, including those due to multiple-outage contingencies;
    (3) control voltage variations of the Transmission System through a combination of instructions to generators and other Licensees.

103. The System Operator in consultation with all Licensees and Users shall develop a detailed operating procedure of the Power System Operation in conformity to the Grid Code Regulation.

104. The System Operator, after approval of the Authority, may instruct the Transmission Licensee to disconnect the User's installations from the Transmission System, where the Users has:
    (1) failed to comply with substantial requirements of the Grid Code Regulation; and
    (2) repeatedly failed to comply with instruction of the System Operator.

105. The System Operator may remotely control and operate certain strategic and critical substation nodes of Transmission System and generating switchyards in the time of emergencies such as during the floods and other calamities only upon specific request of the concerned Licensees without compromising any operational safety aspects as well as operational efficiency of the Power System.

106. The Generation Licensees shall ensure to efficiently maintain and operate its Generating Units for maximum possible availability of the units and deliver the declared capabilities.

107. The Generation Licensees shall provide all required operational data to the Transmission Licensee and System Operator.

108. Generating Units synchronized to the Transmission System, irrespective of type and size, shall have their governors in normal operation at all times. Generating Unit of over ten (10) MW that is required to be operated in absence of its governor shall immediately inform the System Operator on the reason and duration and shall correct it as soon as possible. All hydro governors shall have a Governor Droop band of 3 to 10 percent. No dead bands and time delays shall be deliberately introduced without the approval of the System Operator.

109. All Generating Units, operating at 100% of their Maximum Continuous Rating (MCR), shall instantaneously pick-up extra Load within the technical limits prescribed by the manufacturer when frequency falls due to a system contingency. Generating Unit of over ten (10) MW unable to comply with the requirement shall be permitted to operate in synchronism with the Transmission System only after obtaining permission of the System Operator. However, the corresponding short-fall in Spinning Reserve of one Generating Unit shall be allowed to be compensated by other generating units. The recommended rate for changing the governor setting, that is, supplementary control for increasing or decreasing the generation output for all Generating Units, irrespective of their type and size, would be one (1) percent per minute or as prescribed by manufacturer. However, if frequency falls below 49.9 Hz, all partially Loaded Generating Units shall pick up additional Load at a faster rate, according to their capability.

110. All Generating Units shall normally have their Automatic Voltage Regulation (AVR)s in operation with appropriate settings. For operation of Generating Unit of over ten (10) MW size without its AVR in service, the approval of the System Operator shall be obtained after immediate intimation of the reason and duration.

111. All Generating Units shall generate or absorb Reactive Power within their capability curve as per system condition and as per instruction from the System Operator.

112. Generating Units having Black Start facility shall always ensure to maintain them in operating condition.

113. The Transmission Licensee shall develop and ensure implementation of safe and efficient operating procedures of Transmission System, including the coordination and operation of system protection schemes to prevent from voltage collapse and cascading.

114. Distribution Licensee and Users shall install and maintain voltage control equipment including the Reactive Power compensation sources in their respective system at the Connection Point to maintain the required voltage level and Reactive Power as determined by System Operator.

115. Distribution Licensees and Users shall install automatic under-frequency Load shedding facilities in their respective systems as per the instruction of the System Operator to prevent frequency decline, system collapse, grid disintegration, cascading tripping of Generation Units and to address other operational problems of the Power System. The under-frequency Load-shedding and islanding schemes shall be kept functional, unless temporarily kept out of service with prior consent of the System Operator.

Demand Estimation for Operational Purposes

116. The Distribution Licensees and Users shall prepare most realistic Load forecast for day-ahead, month-ahead, year-ahead and three-year ahead periods. Energy sales in each tariff class and customer category shall be projected for the forecasted period adopting the most practical and advanced estimation method. The Load projection shall take into account of EIC consumers as well. The respective demand estimates shall be updated periodically as required by the System Operator. The Load forecast at each Connection Point shall be calculated taking into account the Distribution System losses.

117. Based on the data furnished by the Distribution Licensees and Users, the System Operator shall prepare fortnight and day-ahead as required.

118. For the purpose of day-ahead generation scheduling and dispatch, the System Operator shall prepare demand estimation based on the Time Block specified in this Regulation on the data furnished by Licensees and Users. The Distribution Licensee and Users shall update respective Load forecast periodically or as may be required by the System Operator based on the operational need. The System Operator shall maintain a data base of total demand of the country on an hourly basis.

119. The Distribution Licensee shall provide the Load shedding schemes to the System Operator, consisting the following:
    (1) Load in discrete block with estimated demand of each discrete block;
    (2) Load-shedding sequence.

Operating Margins and Demand Control

120. Operating Margin comprises of Contingency Reserve and Operating Reserves required for satisfactory operation of the Power System to cover uncertainties in variation in demand forecasts, loss of external connections, loss of generation, constraint in the Transmission System and or any other factor.

121. The System Operator may decide the required Contingency Reserves on the basis of historical trends in reduction of generation and increase in demand during real-time operation.

122. As per the instruction of the System Operator, the Distribution Licensee or the Users shall accordingly reduce their demand in the Event of insufficient generation capacity or in the Event of equipment failures or system constraints resulting to significant generation-Load imbalances associated with frequency problems, voltage collapse or thermal overloading in the Transmission System.

123. Each Licensee shall make arrangements to enable manual demand disconnection on the instruction of the System Operator under normal and in the contingent conditions.

Reactive Power and Voltage Control

124. The System Operator, Licensees and Users shall co-ordinate to maintain the system voltage within the system criteria. Transmission Licensee and each Users connected to the Transmission System shall arrange to provide its own local requirements of Reactive Power.

125. The Generation Licensees shall have sufficient Reactive Power reserve capacity within generator capability curve to maintain the system voltage during emergency conditions.

126. In the Event of loss of a component of the Power System, affecting the system voltage, the System Operator shall define the revised Load profile within the technical capability of the available generation and reactive reserve capacity to ensure that the voltage is maintained within acceptable levels.

127. The Generation Licensees shall operate within the technical capability of respective generating stations to provide the required reactive generation within generator capability curve and reserve capacity as per the instruction of the System Operator. To control the level of system voltage, after examining the security and reliability criteria, the System Operator may issue instructions to:
    (1) generators to generate or absorb Reactive Power as per their capability curves; and
    (2) Licensees and Users to switch ON or OFF of lines and transformers.

128. Reactive power compensation should be provided locally close to the Reactive Power consumption as far as possible. The Licensees and Users shall provide local Reactive Power compensation to minimize or avoid the consumption of Reactive Power from the Transmission System, particularly during the low-voltage conditions.

129. In normal circumstance, the Distribution Licensee shall ensure to minimize the Reactive Power consumptions at an interconnection point when the voltage is below 95% of rated value and prevent generating Reactive Power when the voltage is above 105% at that point. The System Operator shall periodically review the Reactive Power consumption and generation at the interconnection points and advise for installation of Reactors or Capacitors.

130. Switching ON and OFF of all bus and line reactors and shunt capacitors in the Transmission System and tap changing of all the inter-connecting transformers shall only be carried out in accordance to instructions of the System Operator.

131. The Reactive Power charges for the Power System within the country, if any, shall be allocated as determined by Authority from time to time.

Outage Planning

132. All Licensees and Users shall provide the System Operator their proposed outage plans for the next financial year by 1st December of each year. The outage plans shall consist of reasonable proposals resulting from regular or special maintenance program or due to other prudent system improvement activities.

133. The System Operator shall review and prepare final annual outage plans based on the proposal submitted by Licensees and Users within 15th of December of each year and share with Licensees and Users by 31st December of each year. The review and finalization of outage plan shall be associated with relevant system studies and where necessary, the outage plans of Users shall be rescheduled to ensure adequate generation-Load balancing.

134. The approved annual outage plan shall be periodically reviewed by the System Operator on a monthly and quarterly basis in coordination with concerned Licensees and Users and modify wherever required.

135. The System Operator may conduct relevant studies in case of occurrence of emergency in the System due to loss of generation and significant fault in the Transmission System resulting to disturbance and system isolation.

136. The System Operator is authorized to defer the planned outage in case of the following:
    (1) major Transmission System disturbance leading to total black out in country;
    (2) system isolation;
    (3) black out in a distribution system; and
    (4) any other Event in the system that may have an adverse impact on the system security by the proposed outage.

137. Transmission Licensees shall ensure that all the scheduled and unscheduled outages of Transmission System are carried out efficiently and effectively to restore the isolated component at the earliest possible time.

138. The Transmission Licensee shall perform reliability analysis of the Transmission System on account of scheduled and non-scheduled outages for security and reliability of the System.

139. The outage plans of generating stations and Transmission System associated with export of power to neighboring countries shall be finalized in consultation with the concerned System Operator of the neighboring country.

Recovery Procedures

140. Detailed plans and procedures for restoration of the Transmission System under partial or total blackout shall be developed by the System Operator in consultation with all Licensees and Users and be updated annually after review. These procedures shall be complied by all the Users to ensure consistent, reliable and rapid restoration.

141. Detailed plans and procedures for restoration after partial or total blackout of each Distribution System connected to the Transmission System shall be finalized by the concerned Licensee in coordination with the System Operator. The procedure shall be reviewed and revised annually.

142. The System Operator shall develop the following list that needs to be restored on priority:
    (1) list of generating stations with Black Start facility and redial charging capability;
    (2) transmission system elements associated with export of power to neighboring countries; and
    (3) synchronizing points and essential Loads.

143. The System Operator is authorized during the restoration process, following the black out, to operate with reduced security standards in terms of voltage and frequency as necessary to achieve the fastest possible recovery of the Transmission System.

144. All communication channels shall be used for operational communication purpose, during the restoration process, until the full recovery of Transmission System into Normal State.

Operational Liaison

145. The operational liaising is a mandatory built-in hierarchical function of the System Operator and Licensees to facilitate quick transfer of information for effective operation of the Power System.

146. Before carrying out any operation on the Transmission System, the System Operator shall inform concerned Licensees to carry out necessary operational measures, whose system could experience an operational effect.

147. Immediately after occurrence of an Event on Transmission System, the System Operator shall inform concerned Licensee with details available at that point of time, whose system may have experienced an operational effect.

148. Before any operation is carried out on the Licensee's system, the System Operator shall be informed with details on the proposed operation to study the operational effect that may occur on the Transmission System.

149. Immediately after the occurrence of Event on a Licensee's system, the concerned Licensee shall inform the System Operator of the Event with the details to assess the consequential operational effect that may have experienced in the Transmission System.

150. Details of any occurrence of Event on the other User's system having an operational effect on the Transmission System shall be reported by the concerned Users to the System Operator.

Safety Co-ordination

151. The Transmission Licensee and concerned Users shall develop necessary operational safety procedures for carrying out isolation and earthing work in their respective system. The procedures shall include:
    (1) the nomination and qualifications of a safety coordinators;
    (2) communication protocols for all testing, operation and maintenance works; and
    (3) isolation and earthing process, including test-confirmation and removals of isolating or earthing works.

Event Reporting

152. Any Event on the other User's system having an operational effect on Transmission System shall be reported by Licensees or Users to the System Operator.

153. The reporting incidents that require reporting are as follows:
    (1) tripping of inter-connecting transformer (ICT), transmission line or capacitor bank;
    (2) tripping of Generating Units;
    (3) major protection failure;
    (4) exceptional deviation of voltage and frequency;
    (5) serious equipment problems and faults such as in circuit breaker, transformers, bus-bar etc.;
    (6) overloading of equipment or transmission lines;
    (7) activation of alarm or indication of abnormal operating condition;
    (8) temporary changes in the capabilities of the Generating Units or apparatus; and loss of Load.

154. All reportable incidents shall be reported verbally by the concerned Licensees or Users to the affected parties and the System Operator immediately. The written information of the reportable Events shall be submitted by the concerned Licensees or Users to the System Operator in the specified format within reasonable time with copy to the affected parties. A written report shall include the following details of the Event:
    (1) time and date of Event;
    (2) location;
    (3) plant and equipment directly involved;
    (4) description and cause of Event;
    (5) antecedent conditions;
    (6) demand and generation interrupted and duration of interruption;
    (7) all relevant system data including records from Disturbance Recorders, Event Recorders and other recording instruments;
    (8) sequence of tripping with the time;
    (9) details of relay flags;
    (10) remedial measures and recommendation for future improvement; and
    (11) other relevant information.

Periodic Reports

155. A quarterly report shall be issued by the System Operator to all Licensees, Users, Authority and the Ministry, containing the performance of the Transmission System for the previous quarter. The report shall include the following:
    (1) performance of generating stations;
    (2) peak demand, energy availability and analysis of forecasted demand with actual demand;
    (3) cross-border export and import of electricity;
    (4) frequency profile, containing maximum and minimum frequency recorded and the frequency duration in different frequency bands;
    (5) voltage profile of important and critical substations;
    (6) major generation and transmission outages with measures to reduce the outages;
    (7) transmission constraints and future remedial plans; and
    (8) instances of persistent or significant non-compliance with the grid code regulation and action undertaken.

156. The System Operator shall also prepare an annual report covering the operational performance of the Transmission System and of overall Power System. Other detail information as required by the Ministry and the Authority for the purpose of development of Power System Master Plan, formulation of other policy and regulatory decisions or for the purpose of smooth operation of the Transmission System shall be submitted by the System Operator, and Licensees and Users.

Communication

157. Licensees and Users shall appoint a focal person or office to be responsible for all communications with the System Operator.

158. Instructions given by the System Operator that shall have commercial implications for Licensees and Users shall always be given in writing unless the instructions have an emergency character.

159. Appropriate communication media shall be used between the System Operator and Licensees or Users. Any instructions of the System Operator shall be subsequently confirmed through electronic message or in writing within reasonable time but not later than 24 hours.

160. The System Operator, Licensees and Users shall accept the recording of all instructions and communications through whatever communication mode they received as evidence.

161. All data, information and notices to be provided to the System Operator under this Grid Code Regulation shall be delivered in writing or through formally established communication mode.

CHAPTER 6

SCHEDULING AND DISPATCH CODE

Introduction

162. The Scheduling and Dispatch Code specifies the coordination protocols for generation dispatch and energy drawal in the Power System to achieve real-time balancing of generation and Load. As the national Power System operates in synchronism with the regional grid, the scheduling and dispatch also contains coordination procedures with the regional Power System.

Objective

163. Following are the objectives of the Scheduling and Dispatch Code:
   (1) defining responsibilities of the System Operator, Generation Licensees, Distribution Licensees, Transmission Licensee and Users in the Power System in scheduling and dispatch; and
   (2) standardizing scheduling and dispatch procedure including the Cross-Border coordination.

Scope

164. The Scheduling and Dispatch Code shall apply to the System Operator, Transmission Licensee, Generation Licensees, Distribution Licensee and other Users of the Power System.

165. The procedure for scheduling and dispatch of generation for export and import of energy in the country shall be implemented in accordance with relevant Cross-Border agreement executed by the authorized agencies of the Royal Government of Bhutan.

Demarcation of Responsibilities

166. The entire Power System shall be operated as a single national system with following responsibilities of the System Operator:
   (1) centralized scheduling and dispatch of generation;
   (2) scheduling the drawals of transmission and Distribution Licensee; and
   (3) scheduling and dispatch of import and export.

167. The generating stations shall be responsible for power generation in accordance with the daily schedules approved by the System Operator. The generating stations shall be operated and maintained to achieve the best possible long-term economic availability.

168. Generating stations are normally expected to generate power according to the approved daily schedules. Any unforeseen situation at the generation stations resulting to deviation from the approved schedules shall be informed to the System Operator immediately. The System Operator after examining the Transmission System conditions shall revise and reschedule the dispatch after coordinating with other generating stations, Distribution Licensees, Users and importing agencies across the international border.

169. The System Operator shall reschedule the generation dispatch of concerned generating stations when the frequency is higher than 50.05Hz and spilling of reservoir water is not envisaged. Similarly, in the Event of frequency falling below 49.9Hz, the System Operator may consider revision in scheduling and dispatch of the generating stations after examining the respective hydrological inflow position.

170. Notwithstanding above, the System Operator may direct, for immediate compliance, the Distribution Licensee for demand management and generating stations to increase or decrease their generation in case of contingencies such as overloading of lines and transformers, abnormal voltages or due to other system security threats.

171. For the purpose of generation scheduling and dispatch, the generating stations shall declare realistic plant capabilities. While the generation stations shall endeavor to forecast the day-ahead generation based on the latest and most efficient meteorological and hydrological forecasting technology, as a minimum, the declaration of day-ahead plant capability in terms of energy of the generating stations shall be based on the hydrological inflow data and past historical generation records.

172. The System Operator shall periodically review the hourly logbooks maintained by the concerned Licensees and Users to verify the deviation of actual dispatch from the proposed schedules and prepare a report on deviations. This should enable the System Operator, concerned Licensees and Users to increasingly refine the future forecasting schedules.

173. All Licensees and Users entering into an agreement for sale of power shall acquire prior approval of the System Operator on the metering and supply arrangements. The energy meters shall be installed in all interconnections, identified points and in substations for recording of energy and Reactive Powers. The type of meters to be installed, metering schemes, metering capability, testing and calibration requirements shall be as agreed by System Operator.

174. The Transmission Licensee shall be responsible for the computation of energy transferred at every Connection point. All computations carried out by the Transmission Licensee shall be furnished to Distribution Licensee, Generation Licensee and Users for verification and reconfirmation within the 20th day of every following month. Any mistake or omission detected shall be immediately rectified by the Transmission Licensee and subsequently submit to System Operator.

Scheduling and Dispatch Procedure

175. All the generating stations synchronized with the Transmission System shall be duly listed for scheduling generation dispatch with the System Operator. The capacities of generating stations and any contracted generating shares shall also be listed.

176. By 0800 hours of each day, all the EIC connected to the Distribution System or directly to the Transmission System shall provide their day-ahead schedule for next day Time Block specified to the respective Licensees responsible for supplying or selling them the power.

177. By 0700 hours of each day, all generating stations shall submit their inflows and calculate their respective energy generation capability and maximum Ex-Bus deliverable power for the next day Time Block. The Ex-Bus power available shall be calculated excluding the auxiliary consumptions, colony Loads and other generation constraining factors such as maintenance that might restrict generation in any period during the next day. The total energy capability and anticipated power capability on Time Block that can be delivered to the Transmission System, on an Ex-Bus basis shall be accordingly calculated after deduction of all local and auxiliary demands.

178. By 0800 hours of each day, all generating stations including embedded generators directly connected to the Distribution and Transmission System shall submit the station-wise Ex-Bus energy generation forecast for 2400 hours of the following day to the System Operator.

179. By 0800 hours of each day, all the Distribution Licensees after deducting supply to be met from their own generation sources, if any shall submit their forecasted demand schedule including the forecast schedule submitted by EIC for next day in Time Block to the System Operator.

180. The System Operator shall compile available Ex-Bus energy generation forecast and demand estimate of the entire Power System in the Time Block of the following day and submit to the Trader.

181. By 10:30 hours of each day, the Trader shall inform the regional counterpart agencies on the expected Cross Border energy transfer at the identified regional border point, calculated after taking into account the national transmission loss.

182. By 1330 hours, the Trader shall receive from the regional counterpart agencies of any modification required in the Cross Border transfer arising from any anticipated transmission constraints and shall communicate to the System Operator for any reschedule of energy.

183. The System Operator after finalization of export or import shall issue Time Block of the following day on:
   (1) generation schedule to each generating stations, excluding embedded generation and off-grid generators;
   (2) Net-Drawal Schedule for Distribution Licensees and EIC, including the necessary power allocation required if any.

184. The Distribution Licensees and other concerned Licensees shall accordingly intimate the EIC of the finalized generation schedule and Net Drawal Schedule.

185. The System Operator shall ensure that the daily Dispatch Schedules of the generating stations are operationally reasonable and efficient. The Generating Licensees shall be responsible to furnish the typical ramping up and down capabilities of their machines to the System Operator.

186. The System Operator shall revise the schedules in the following circumstances and accordingly inform the regional counterpart agencies affecting the Cross Border power transfers:
   (1) in case of Forced Outage of the Generating Unit or due to sudden change in the hydrological inflow, where the revised schedules shall be based on the revised capability declared by the concerned generating stations; and
   (2) in the Event of evacuation constraints of power due to outage, failure or other limitations in the Transmission System and sudden demand change in the distribution system or any exigencies.

187. The revised schedules for the remaining period of the day shall be intimated to System Operator at least one and half hour before coming it into effect.

188. In case of any disturbances in the Transmission System within the country, the scheduled generation of all generating stations and scheduled drawal of the Distribution Licensees and Users shall be deemed to have been revised equal to their actual generation and drawal for the affected period. Statement on occurrence of Transmission System disturbance and its duration shall be issued by the System Operator.

189. The System Operator, any point of time, may revised the schedules on its own initiative for purpose of safe, secure and reliable operation of the Power System.

190. The actual generation and Load demand of the previous day shall be issued by the System Operator daily, taking into account all ex-ante changes in Dispatch Schedule of generation and energy Drawal Schedule. The Transmission and Distribution Licensee shall issue the individual actual Load demand to EIC daily. The historical schedules and dispatch shall be referred for continuously refinement of demand estimation.

191. The scheduling submitted by the generating stations and Distribution Licensee, the final schedules issued by the System Operator; and the actual schedules implemented shall be made available for a period of five (5) days to all concerned parties for verification. The System Operator shall review and rectify where necessary.

192. All the planned shutdown of the Licensee's system and EIC system shall be intimated to the System Operator and to other affected parties connected either to Transmission System or Distribution System at least one day ahead of the shutdown. In the Event of emergency shutdown, concerned licenses and EIC shall immediately inform of the likely restoration time to the System Operator and the affected parties.

193. The System operator shall properly document all the information received within the provisions of the Grid Code Regulation, including the forecasted generation schedules of each generating stations, the Drawal Schedules of Transmission and Distribution Licensee and EIC and all revised schedules with corresponding reasons.

Schedule Deviation Charges

194. The concerned Licensees shall submit actual block-wise generation and energy-drawals of the previous week to the System Operator by every Monday.

195. The System Operator shall prepare and issue the statement of charges for the respective deviation of schedules to all concerned Licensees.

196. The Deviation Charges shall be payable to or receivable from the Pool Account managed by the System Operator.

197. The Authority shall develop separate regulation to determine the charges for Deviation for allocation to the concerned Licensees and Users resulting on account of corresponding deviation submitted to the System Operator.

198. The concerned Licensees and EIC subjected to payment of the deviation charges shall complete the payment within 7 (seven) days of the issuance of statement of charges for deviation by the System Operator, failing which late payment surcharge shall be applicable as approved by the Authority.

CHAPTER 7

MISCELLANEOUS

Confidentiality

199. The System Operator, Licensees and Users shall maintain confidentiality of all information received under the provisions of this Grid Code Regulation and prevent from disclosing to third parties without the prior written consent of concerned Licensees and Users or upon approval of the Authority, except to the Ministry upon request.

Dispute

200. Any disputes arising between the Licensees and between Licensees and Customers from the enforcement of the provision of this Regulation shall be dealt in accordance to the Dispute Resolution Procedures of the Authority.

Non-Compliance

201. The System Operator, Licensees and Users shall comply with the provisions of this Grid Code Regulation. Any non-compliances shall lead to imposition of fines, penalties and sanctions by the Authority.

Cyber-Security

202. All Licensees, Users and EIC connected to the grid must have cyber security measures for the protection and resilience of critical information infrastructure.

Amendment

203. The Authority may amend this Grid Code Regulation as and when required.

Definitions

204. For the purpose of this Regulation, any word or expression used to which a meaning has been assigned in the Electricity Act of Bhutan, 2001, shall have that meaning, unless explicitly indicated in this Regulation. The following words and expressions shall have the meaning ascribed to them:

(1) **"Act"** means the Electricity Act of Bhutan, 2001;

(2) **"Alert State"** means the condition of the Transmission System as defined in Section 82;

(3) **"Automatic Voltage Regulator"** means a continuously acting automatic excitation control system to control the voltage of a Generating Unit measured at the generator terminals;

(4) **"Authority"** means the Electricity Regulatory Authority established pursuant to Part 2, Section 7 of the Electricity Act of Bhutan 2001;

(5) **"Black Start"** means the procedure necessary to restore the Transmission System from partial or a total blackout;

(6) **"Buyer"** means a person purchasing electricity from any point of the Power System;

(7) **"Commercial Operation Date"** is the date of commencement of commercial operation of Generating Unit or generating station, immediately after its successful completion commissioning tests;

(8) **"Connection Agreement"** means an agreement executed between the Transmission Licensee and other Licensees or Users setting out the terms and conditions relating to a connection to and use of the Transmission System;

(9) **"Connection Site"** means site where the electrical system or facilities or equipment of the Licensees and Users connects to Transmission System;

(10) **"Connection Point"** means electrical point located at the Connection Site, where Licensees or User's electrical system including the generation stations, equipment and other apparatus connects to the Transmission System;

(11) **"Contingency Reserve"** means generating capacity that is intended to take care of the loss of the largest synchronized Generating Unit;

(12) **"Cross Border"** means international cross border or boundary;

(13) **"Customer"** means a person purchasing electricity from the electrical facilities of the Licensees connected to the Power System;

(14) **"Demand"** means the demand of Active Power and Reactive Power of electricity unless otherwise stated;

(15) **"Deviation Charge"** is a charge resulted as a consequence of deviation of actual generation or actual energy drawal from the scheduled ones;

(16) **"Dispatch Schedule"** means the electrical power and energy output of a generating station as Ex-Power Plant delivery that is scheduled to be supplied into the Transmission System;

(17) **"Distribution Licensee"** means a Licensee who has obtained a License to distribute electricity in pursuant to Section 22 of the Act;

(18) **"Distribution"** means the conveyance of electricity through a distribution system, which distributes electricity at voltage below 66kV or as deemed by the Authority to be a part of the distribution network;

(19) **"Disturbance Recorder"** means a device provided to record the behavior of the pre-selected digital and analogue values of the parameters of the Power System during an Event;

(20) **"Drawal Schedule"** means the electrical power that a Distribution Licensee is scheduled to receive from the generating stations as Ex-Power Plant delivery;

(21) **"EIC"** means Energy Intensive Consumer (HV an MV industries) with contract demand more than or equal to 2MW;

(22) **"Emergency State"** means the condition of the Transmission System as defined in Section 82;

(23) **"Event Recorder"** means a device provided to record the sequence of operation in terms of the time of the relays and equipment at a location during an Event;

(24) **"Event"** means an unscheduled or unplanned occurrence of incident in the Transmission System including the disturbances, equipment outage, faults in the Power system;

(25) **"Ex-Power Plant" or "Ex-bus"** means the net electrical power and energy output of a generating station, after deducting auxiliary consumption and transformation losses;

(26) **"Extreme State"** means the condition of the Transmission System as defined in Section 84;

(27) **"Forced Outage"** means an outage of a Generating Unit or a transmission facility due to unplanned fault or other unplanned reasons;

(28) **"Frequency Regulating Reserve"** means a Generating Unit's capability of assisting in frequency control through governor action;

(29) **"Generating Unit"** means an electrical generating unit coupled to a turbine in a power station with associated apparatus which relates exclusively to the operation of that unit;

(30) **"Generation Licensee"** means Licensee who has obtained a License for generation of electricity pursuant to Section 22 of the Act;

(31) **"Good Utility Practices"** means any general practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period which could have been expected to accomplish the desired results at a reasonable cost consistent with good business practices, reliably, safely and with expedition;

(32) **"Governor Droop"** means, in relation the operation of the governor of a Generating Unit, the percentage drop in system frequency which would cause the Generating Unit under free governor action to change its output from zero to full Load;

(33) **"Grid Planning Studies"** means studies on the performance of a Transmission System, including but not limited to Load flow studies, short circuit studies, transient stability studies, steady state stability analysis, voltage stability analysis and Reactive Power compensation studies;

(34) **"High Voltage"** means voltage of 66 kV and above;

(35) **"Infirm Power"** means the electricity injected into the grid during the testing and commissioning of new Generating Unit or station that is concluded by the successful completion of Load rejection test occurring prior to the date of commercial operation;

(36) **"Island Grid"** means a portion of the Transmission System that is electrically isolated from the rest of the Transmission System;

(37) **"Large Consumer"** means Consumer directly connected to the Transmission System;

(38) **"Licensee"** means any person issued with a License pursuant to Section 22 of the Act;

(39) **"Load"** means the electrical power and energy consumed by the electrical system of Distribution Licensee, other Users or Large Consumers;

(40) **"Maximum Continuous Rating" or "MCR"** means the normal rated full Load power output capacity of a Generating Unit which can be sustained on a continuous basis at specified conditions;

(41) **"Ministry"** means the Ministry assigned with responsibility of the electricity sector;

(42) **"National Transmission Grid Master Plan"** means a long-term plan prepared for the development of the Power System;

(43) **"Net Drawal Schedule"** means the Drawal Schedule of a beneficiary after deducting the apportioned and estimated transmission losses;

(44) **"Normal State"** means the condition of the Transmission System as defined in Section 81;

(45) "**Person**" means any individual, firm, company, association, partnership or body of persons, whether incorporated or not as defined in the Act;

(46) **"Pool Account"** means the Account to be maintained and operated by the System Operator for any payable and receivables from the Licensees and EICs for settlement of deviation charges;

(47) **"Power System"** means the total system relating to power supply including associated generation, transmission and distribution networks and the User's electrical system;

(48) **"Reactive Power"** means the square root of the difference between the square of the kilovolt-amperes and the square of the kilowatts, expressed in VAR;

(49) **"Restorative State"** means the condition of the Transmission System as defined in Section 85;

(50) **"Single Line Diagram"** is schematic representation of the HV apparatus and the connections to all external circuits at a Connection Point incorporating its numbering, nomenclature and labelling;

(51) **"Site Common Drawings"** means drawings prepared for each Connection Point, containing electrical layout drawings, other physical layout drawings, common protection and control drawings and common service drawings;

(52) **"Site Responsibility Schedule"** means a schedule specifying the ownership and responsibility for all the equipment at a Connection Site, including the operational, safety and other coronation procedures;

(53) **"Spinning Reserve"** means partly loaded generating capacity with some reserve margin that is synchronized in Power System and having capability to provide increased generation instantaneously in response to a frequency drop or at short notice upon dispatch instruction of the System Operator;

(54) **"System Operator"** is Licensee designated by the Authority under Section 39 of the Act;

(55) **"Time Block"** is time duration block starting at 00.00 hours at an interval specified by the Authority for recording the energy meter values, presently defined at fifteen (15) minutes time duration block and is subject to revision from time to time;

(56) **"Trader"** means designated entity involved in purchase or sale of electricity;

(57) **"Transmission Licensee"** is Licensee who has obtained license for transmission of electricity in pursuant to Section 22 of the Act;

(58) **"Transmission System"** means an electrical system operating at a nominal voltage of 66 kV and above;

(59) **"Users"** includes all the electrical customers including EIC that are connected to the Transmission and Distribution System.

Abbreviation

204. The following abbreviations shall have the meaning ascribed to them:

(1) "AC" means Alternating Current;

(2) "AVR" means Automatic Voltage Regulator;

(3) "BST" means Bhutan Standard Time;

(4) "D/C" means Double Circuit;

(5) "HV" means High Voltage;

(6) "ICT" means Inter-Connecting Transformer;

(7) "IST" means Indian Standard Time;

(8) "kV" means kilovolt;

(9) "LV" means Low Voltage;

(10) "MCR" means Maximum Continuous Rating;

(11) "S/C" means Single Circuit;

(12) "SRS" means Site Responsibility Schedule;

(13) "MW" means megawatt;

(14) "MWh" means megawatt-hour;

(15) "MVAR" means megavolt-ampere reactive; and

(16) "VAR" means volt-ampere reactive.

Schedule 1: Metering Philosophy

1. The energy meters of uniform technical specification shall be provided so as to permit accounting of the energy transactions at actual drawal or injection from one Licensee or Users to another.
2. The main meter and check meter shall be provided on all the outgoing feeders from the bus-bars of the generating switchyard to measure and record the energy delivered to the Grid. The main meter and check meter shall be connected to same core of CTs & VTs.
3. The main energy meter shall be owned by the Licensee or Users in whose premises the meter is located and the check meters shall be owned by the other Licensee.
4. The main energy meters having been in continuous service throughout the month shall be used for purpose of energy billing. Where the main meter has been removed from service for repairs or have not registered energy supply for any duration of time, the recording of the corresponding check meter shall be considered as basis for billing. The respective owners of the meters shall be responsible for maintenance of their meters.
5. The main meters and check meters shall normally be installed of a same accuracy level. In the Event any meter is removed from calibration or testing, the concerned Licensee or the Users shall substitute the meters in presence of all the concerned parties.
6. Pending the results of such testing, the billing shall continue based on the energy recorded by the main meter(s).
7. All the energy meters installed on feeders of 66kV and above shall be of a minimum accuracy class of 0.2 and accuracy class 0.5 for 33kV and below. In future, as and when the meters are replaced, efforts shall be made to install higher accuracy class energy meters.
8. All the main and check meters shall be jointly tested and calibrated once in five years as per prevailing standards. However, these meters shall be tested and calibrated if there are inconsistent or abnormal reading. The cost of testing and calibration of the energy meters shall be borne by the respective owner of the energy meters.
9. The concerned representatives shall record the energy meter reading(s) at 1230 hours (BST) on the 1st of every calendar month. Recording of energy meter readings shall be carried out jointly by the concerned Licensees or Users.
10. The current transformers and voltage transformers connected to the energy meters shall have a minimum measurement accuracy of class 0.5.
11. The meter shall be totally sealed and tamper-proof, with no possibility of any adjustments at site, except for a restricted clock operation.

The amended version approved in the Hundred and Eighteenth Commission Meeting held on 29th January 2024.