**“Grid Control and Power Exchange Code for Electricity”**

**(Only the Articles related with CNC-RfG requirements)**

**SECTION I**

**GENERAL PROVISIONS**

**CHAPTER 9**

**TECHNO-ECONOMIC DECLARATIONS**

**~~Article 43~~**

**This article is included in Power Exchange Code (LAGIE)**

**Obligation to submit declarations**

Production license holders for Units registered with the Generation Unit Register must submit Techno-Economic Declarations separately for each Generation Unit.

**~~Article 44~~**

**This article is included in Power Exchange Code (LAGIE)**

**Contents of Techno-Economic Declarations**

1. Techno-Economic Declarations include the information given in the following tables. Details are given in the DAS Manual. The technical information in the Declaration must agree with the Registered Statistics for the Unit and correspond to the real operation technical information for such Unit. The economic information in the Declaration must be cost-oriented, namely they must reflect the expenses actually incurred by the production license holder as these are allocated in each case and computed in accordance with the definition of each economic figure in the Declaration in accordance with this Code.

**A. Technical parameters**

**A1. Unit operation technical information**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Description** |  |  |  | **Numerical** | **Measuring** |  |
|  |  |  | **value** | **unit** |  |
|  |  |  |  |  |
|  |  |  |  |
| Unit Net Capacity (NCAP) as defined in ~~Article 217~~ |  | MW |  |
|  |  |  |  |
| Maximum Continuous Generation Capability (Unit Net |  | MW |  |
| Capacity after taking into account the internal service |  |  |
| and the Unit Auxiliary Loads) |  |  |  |  |  |
|  |  |  |  |
| Maximum Continuous Generation Capability under ISO |  | MW |  |
| conditions (Unit Net Capacity after taking into account |  |  |
| the Unit internal service and auxiliary loads) |  |  |  |  |
|  |  |  |  |
| Technical Minimum Generation (Unit Net Capacity |  | MW |  |
| after taking into account the Unit internal service and |  |  |
| auxiliary loads) |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Minimum Up time |  |  |  |  | hours |  |
|  |  |  |  |  |  |  |
| Minimum down time |  |  |  |  | hours |  |
|  |  |  |  |  |
| Maximum generation capability (capacity) |  |  | MW |  |
|  |  |  |  |  |  |  |
| Price for Maximum | generation | capability | (in case of |  | €/ MWh |  |
| ancillary service) |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Maximum operation | time at | maximum | generation |  | time |  |
| capability |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |
| **Time off load before going into longer standby conditions** |  |  |
|  |  |  |  |  |  |  |
| Hot to warm |  |  |  |  | time |  |
|  |  |  |  |  |  |  |
| Warm to cold |  |  |  |  | time |  |
|  |  |  |  |  |  |  |
| **Time to synchronize** |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Hot |  |  |  |  | time |  |
|  |  |  |  |  |  |  |
| Warm |  |  |  |  | time |  |
|  |  |  |  |  |  |  |
| Cold |  |  |  |  | time |  |
|  |  |  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Minimum time in addition to time to synchronize in case |  | time |  |
| of revocation from total non-availability state |  |  |
|  |  |  |
|  |  |  |  |
| **Operation from synchronization to technical minimum generation** |  |  |
|  |  |  |
| Soak time |  |  |

|  |  |  |
| --- | --- | --- |
| Hot |  | time |
|  |  |  |
| Warm |  | time |
|  |  |  |
| Cold |  | time |
|  |  |  |
| Synchronization load |  | MW |
|  |  |  |
| Time from minimum generation to de-synchronization |  | time |
|  |  |  |

**Operation from technical minimum generation until maximum continuous generation capability (the rates established are also used in the DAS)**

|  |  |  |  |
| --- | --- | --- | --- |
| Minimum Guaranteed Ramp Up Rate (hereinafter |  |  |  |
| referred to as Ramp Up Rate) from technical minimum |  | MW/minute |  |
| generation to maximum continuous generation |  |  |
|  |  |  |
| capability |  |  |  |
|  |  |  |  |
| Minimum Guaranteed Ramp Down Rate (hereinafter |  |  |  |
| referred to as Ramp Down Rate) from maximum |  | MW/minute |  |
| continuous generation capability to technical minimum |  |  |
|  |  |  |
| generation |  |  |  |
|  |  |  |  |

**A2 Unit technical information for Ancillary Services**

**Maximum continuous reactive power capability (under injection point nominal voltage)**

Leading for active power generation equal to technical minimum generation, maximum generation capability and for five (5) intermediate active power levels.

MW Mvar

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
| Lagging for active power generation equal to technical |  | MW | Mvar |  |
| minimum generation, maximum generation capability |  |  |  |  |
|  |  |  |  |
| and for five (5) intermediate active power levels. |  |  |  |  |
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|  |  |  |  |  |
| **Automatic Generation Control (AGC)** |  |  |  |
|  |  |  |  |
| AGC Maximum load |  |  | MW |  |
|  |  |  |  |  |
| AGC Minimum load |  |  | MW |  |
|  |  |  |  |  |
| Rate of generation change while operating under AGC |  |  | MW/minute |  |
|  |  |  |  |  |
| Secondary Control Range |  |  | MW |  |
|  |  |  |  |  |
| **Other technical information related to ancillary services** |  |  |  |
|  |  |  |  |
| Black start capability |  |  | YES/ NO |  |
|  |  |  |  |  |
| Primary Control Reserve |  |  | MW |  |
|  |  |  |  |  |
| Standing reserve |  |  | MW |  |
|  |  |  |  |  |

**A3. Additional technical information for Hydro Units established in accordance**

|  |  |  |  |
| --- | --- | --- | --- |
| **with** | **Article 282** |  |  |
|  |  |  |  |  |
| Prohibited | continuous operation zones due to | (……, ……) | (MW, | MW) |
| oscillations |  | above | and |
|  |  |  | under | the zone |
|  |  |  | definition limit |
|  |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | (……, ……) |  | (MW, | MW) |  |
|  |  |  |  | above | and |  |
|  |  |  |  | under the | zone |  |
|  |  |  |  | definition limit |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |
| **B. Variable Cost Parameters for thermal generation Units** |  |  |  |  |
|  |  |  |  |  |
| Fuel Specific Consumption Stepwise Function | Net Generation Level | Specific Fuel |  |  |
| The interval between the load with | (MW) | Consumption |  |  |
| synchronization up to maximum continuous |  |  | (GJ/MWh) |  |  |
|  |  |  |  |  |  |
| generation capability is divided into ten (10) |  |  |  |  |  |  |
| steps which are taken so as to better approach the |  |  |  |  |  |  |
| technical input-output curve. |  |  |  |  |  |  |
|  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fuel cost by fuel type | Fuel A |  | €/quantity |  |
|  |  |  | measuring |  |
|  | Fuel B |  |  |
|  |  | unit |  |
|  |  |  |  |
|  |  |  |  |  |
|  | Fuel C |  |  |  |
|  |  |  |  |  |
| Fuel Lower Heating Value (LHV) | Fuel A |  | GJ/quantity |  |
|  |  |  | measuring |  |
|  | Fuel B |  |  |
|  |  | unit |  |
|  |  |  |  |
|  |  |  |  |  |
|  | Fuel C |  |  |  |
|  |  |  |  |  |

Percentage fuel composition at each capacity interval of the Fuel Specific Consumption Stepwise Function.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Net | Fuel | A Fuel | B | Fuel C |
| Generation | (%) | (%) |  | (%) |
| Level |  |  |  |  |
| (MW) |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
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|  |  |  |  |  |

Special cost for raw materials besides fuel in each capacity interval of the Special Fuel Consumption Stepwise Function.

|  |  |
| --- | --- |
| Net Generation Level | Cost (€/MWh) |
| (MW) |  |

Special cost of additional maintenance expenses due to operation (with the exception of fixed maintenances expenses) at each capacity interval in the Fuel Special Consumption Stepwise Function.

|  |  |
| --- | --- |
| Net Generation Level | Cost (€/MWh) |
| (MW) |  |

Special cost for additional workforce expenses due to operation (besides workforce fixed expenses) at each capacity interval in the Fuel Special Consumption Stepwise Function.

|  |  |
| --- | --- |
| Net Generation Level | Cost (€/MWh) |
| (MW) |  |

**C. Cost Parameters following Dispatch Instructions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Description** | **Numerical value** | **Measuring** |  |
| **unit** |  |
|  |  |  |  |  |
|  |  |  |  |  |  |  |
| Additional variable cost (expenses corresponding |  |  |  |  |  |  |
| to additional operation or maintenance cost) to |  |  |  | €/Mvar-h |  |
| supply reactive power besides the maximum |  |  |  |  |
| continuous reactive power generation capability |  |  |  |  |  |  |
| established in A2 of this table |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Start up cost from cold, warm or hot standby until | From | cold |  |  |  |  |
| load with synchronization | standby |  |  |  |  |  |
|  |  |  |  |  |  |
|  | From | warm |  |  | €/start |  |
|  | standby |  |  |  | up |  |
|  |  |  |  |  |  |  |
|  | From | hot |  |  |  |  |
|  | standby |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Fuel cost concerning the maintenance of Unit |  |  |  | €/MW-h |  |
| standby when not generating |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Operation and maintenance cost besides fuel cost, |  |  |  | €/MW-h |  |
| concerning the maintenance of Unit standby when |  |  |  |  |
| not generating |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

1. The fuel cost stated in Techno-Economic Declarations corresponds to all expenses incurred by production license holders to supply fuel regardless of the type of individual cost elements. Supply is defined as if the license holder were supplied with fuel from an independent person, which uniformly charges a fuel price for each unit of fuel quantity it supplies. Where there is lack of documentation through purchase invoices or other equivalent documents, fuel cost shall be computed as the ratio of total fuel supply expenses or cost as such expenses or cost have been registered for a sufficient time period to the total fuel quantity a production license holder is supplied

with for the Generation Unit during such time period. All details are established in the Variable Cost Calculation Manual prepared by the Transmission System Operator and approved by RAE. Fuel cost may be checked by RAE.

1. In order for the Transmission System Operator to establish the Thermal Unit Variable Cost, it processes the information in Techno-Economic Declarations as follows:

Α) the Variable Cost curve is taken by Part B of Techno-Economic Declarations as

are in force.

Β) the minimum numerical value of the Variable Cost curve is established which as

documented corresponds to optimum Generation Unit operation. This value

establishes the Minimum Variable Cost for a Generation Unit for a Dispatch

Day.

1. For the implementation of the provisions of the present Code, the variable cost of the Hydro Units is determined upon a numerical value expressed in Euro per MWh, constant and unique for each set of cascade Hydro Units. Such value is established annually by RAE based on the water usage value for each set of cascade Hydro Units, as this is readjusted by the water opportunity value reflecting variable cost savings of the thermal generation system. RAE’s decision shall be taken at least two months prior to the end of a calendar year, it shall be in force for the next calendar year and it may not be modified within such year.
2. Techno-Economic Declarations submitted for an Auto-Producer Unit not falling within the scope of the provision of Article 35 of Law 2773/1999, shall concern only the part of the Unit's capacity corresponding to such Unit's Net Capacity *NCAP* , as this is computed in accordance with ~~Article 217~~.
3. As Unit Declared Characteristics shall be taken the characteristics established by responsibility of the Transmission System Operator as a combination of the following technical and operational characteristics of a Unit and represent the applicable technical capabilities of such Unit for a specific Dispatch Period and Day:

Α) Registered Unit Characteristics

Β) Techno-Economic Declaration

1. Approved Exceptions in accordance with Article 282 and Article 23 related to the technical characteristics.
2. Non Availability Declaration (Total or Partial)
3. Information submitted to the Transmission System Operator in accordance with ~~Article 79~~.

**Article 23**

**Technical information for Ancillary Services**

1. Especially the information established in parts A2 and A3 of Techno-Economic Declarations must meet the special planning and performance specifications for thermal and hydro units in accordance with Article 241. The information under parts Α2 and Α3 may not comply with such specifications only if an exemption from such specifications has been approved in advance in accordance with Article 282 and only for the time period to which such exemptions apply.
2. If an application for exemption regarding the information under part A2 of Techno-Economic Declarations entitled Unit technical information for Ancillary Services, regards the reduction of a unit's capability, the respective production license holder must submit along with their application a declaration for the increase of the numerical values for the respective Technical information for Ancillary Services of other Dispatchable Units, in order to offset the reduction applied for throughout the period to which the application for exemption refers. Production license holders accepting the increase of the mandatory provision of Ancillary Services by their Units shall submit another declaration along with this declaration.

Alternatively to the above requirement to offset Ancillary Services, production license holders may submit a request for temporary postponement of performance of such obligation. The Transmission System Operator shall examine the possible consequences the granting of such postponement may have, documenting such consequences on the short- and long-term adequacy of the country’s transmission system in terms of the Ancillary Services to which the production license holder’s request for exemption refers and shall present a motion to RAE, the latter being responsible to grant the relevant approval. The approval of the temporary postponement of the performance of such obligation by a production license holder shall be valid for a year and may be renewed for the following year using the same procedure.

1. Applications for exemption from a unit’s technical information for Ancillary Services shall be submitted to the Transmission System Operator who, taking into account the technical evaluation of the capabilities of the suggested units and ensuring an adequate provision of Ancillary Services for the Transmission System, shall decide on approval of such applications within forty five (45) days. If such period elapses it shall be considered that the application has been rejected. Within five (5) days from which such decision has been received, the production license holder may lodge an objection to RAE. RAE, following a motion by the Transmission System Operator submitted within five (5) days, shall decide on such objection within seven (7) days by issuing a justified decision, which is notified in writing to the production license holder and the Transmission System Operator. If such period elapses it shall be considered that the objection has been rejected.
2. Where an application for exemption from a unit’s Technical information for Ancillary Services is approved and throughout the period of its validity, the information established in part A2 “Unit technical information for Ancillary Services” of the Techno-Economic Declaration and refer to the Units established in the exemption in question, must comply with the increased capability to provide Ancillary Services during the period of such approved exemption.

**Article 90**

**Automatic Load Shedding**

1. The Transmission System Operator may appoint per Connection Point between the Distribution Network and the System the frequency and/ or voltage limits where automatic Load Shedding occurs, the automatic Load Shedding percentage, as well as

the frequency and/ or voltage levels where loads are resupplied, and which it notifies to the Distribution Network Operator.

1. The Distribution Network Operator is required to take all necessary measures to comply with the above limits and percentages during automatic Load Shedding and resupply in the Distribution Network.
2. The Transmission System Operator, once having received the opinion of a Customer connected to the System, it may appoint for the installations of such Customer the frequency and/ or voltage limits where automatic Load Shedding occurs, the percentage of the relevant automatic Load Shedding, as well as the frequency and/ or voltage limits where load is resupplied, which it notifies to it.
3. Such Customer is required to take all necessary measures to comply with the above limits and percentages during automatic Load Shedding and resupply in its installations.
4. In the cases under paragraphs (1) and (3), the Transmission System Operator may issue an Instruction to the Distribution Network Operator or the Customer, to prevent automatic load resupply, by any means, manually or automatically. In this case Distribution Network or Customer load shall be resupplied by a new Instruction of the Transmission System Operator in accordance with ~~Article 117~~ .

**Article 91**

**System Recovery Test**

1. The Transmission System Operator, in cooperation with the System Users and Owner, shall carry out a System recovery test once every year, following blue alert activation. The test time shall be agreed on by the Transmission System Operator, users and the System Owner.
2. Users and the System Owner are required to cooperate with the Transmission System Operator in the test, in accordance with the mutually accepted specifications in this area.

**Article 93**

**Individual Ancillary Services**

1. There are the following individual Ancillary Services:

1. Primary Control and Reserve;

Β) Secondary Control and Range;

* 1. Tertiary Control and Spinning Reserve;
	2. Tertiary Non-Spinning Reserve;
	3. Standing reserve
	4. Voltage Control;
	5. Black Start.
1. The individual Ancillary Services under paragraphs 1 (Α) to (D) above are briefly referred to as Frequency and Active Power Control Ancillary Services.

**Article 94**

**Frequency and Active Power Control Ancillary Services -**

**Definitions**

1. System Primary Control shall mean the collective automatic corrective response of Generation Units and Loads to deviations of the real System frequency from the reference frequency, by which it is sought to balance the total generation with the total energy absorption and frequency stabilization within thirty (30) seconds from the occurrence of frequency distortion. Such regulation may not restore frequency to reference frequency levels. More specifically, the automatic corrective response is the result of automatic regulation of the output Active Power of Units depending on the droop of the load regulator.
2. Primary Control Reserve is the change of the generated Unit Active Power as automatic response of the frequency regulator, in order for the System Primary Control to take place, for a frequency deviation from the reference frequency equal to ±200 mHz. The change of Unit Active Power must take place within thirty (30) seconds from the occurrence of frequency distortion and the level of Unit Active Power generation must be analogous to the value of the frequency deviation for at least fifteen (15) minutes. Primary System Control shall be the collective contribution of the System Units in Primary Control Reserve, so that assisted by the Loads participating in the Ancillary Service, System Primary Control takes place.
3. System Secondary Control shall be the regulation which is the result of the central operation of the Automatic Generation Control through which active power

generation by Generation Units is tele-controlled, provided that such regulation can take place from ten (10) seconds to fifteen (15) minutes from its activation. This regulation seeks to minimize the Area Control Error, the tolerance limit of which is established by the Transmission System Operator.

1. Secondary Control Reserve is the margin of change of the generated Unit Active Power at a specific rate through tele-control by the central operation of the Automatic Generation Control in order for the Secondary System Control to take place, provided this change margin is fully available within fifteen (15) minutes from the activation of the System Secondary Control. Secondary Control Range shall be the interval between minimum and maximum Unit Active Power that may be established through tele-control. Positive or negative Secondary Control Reserve shall be margins of increase or decrease respectively of the Unit Active Power taking account of the current Active Power level of a Unit. System Secondary Reserve and System Secondary Control Range shall be the collective contribution of the System Units respectively to Reserve and Secondary Control Range, in order for the System Secondary Control to take place.
2. System Tertiary Control shall be the regulation which takes place periodically, within a few minutes which is established by the Transmission System Operator in order to restore the System Secondary Reserve level if this has changed as a result of the operation of the System Secondary Control. This regulation concerns the change of the Active Power of Units which the Transmission System Operator Instructions by means of a relevant Dispatch Instruction, based on the criterion of minimizing the total energy injection expense through Automatic Generation Control or of sending a relevant warning to the Unit using another way.
3. Tertiary Control Reserve shall be the margin of change of the generated Unit Active Power between ninety (90) seconds and fifteen (15) minutes after the relevant Instruction, in order for the System Tertiary Control to take place, which range is established based on the generation increase and decrease rates of each Unit. System Tertiary Reserve shall be the collective contribution of the System Units in Tertiary Control Reserve in order for the System Tertiary Control to take place.
4. Unit Tertiary Spinning Reserve shall be the Unit Tertiary Control Reserve in accordance with the definition under paragraph (6), which is synchronized in the System.
5. Unit Tertiary Non-Spinning Reserve shall be the Unit Tertiary Control Reserve in accordance with the definition under paragraph (6), which is non synchronized with the System.
6. Interruptible Load Ancillary Service shall be the possibility to automatically interrupt load supply for a given Customer aiming at contributing to regulating frequency through the provision of a respective reserve. The provision of Interruptible Load Ancillary Service is only allowed when such load may be automatically interrupted by the Transmission System Operator through tele-operation under the responsibility of the Transmission System Operator or through under-frequency switches installed by the Customer in accordance with the Transmission System Operators instructions. The provision of this Ancillary Service shall commence following the approval of the Transmission System Operator's relevant study and the relevant modification of this Code.
7. Generation Pick up Ancillary Service shall be the possibility for automatic rapid generation pick up by Units in synchronous condenser or motor operation, or the response of Pumping Units which are activated due to a specific and increased frequency deviation. Such service shall start being provided as an Ancillary Service, and the relevant payments shall be made, following the approval of the Transmission System Operator's relevant study and the relevant modification of this Code.

**Article 95**

**Standing Energy Reserve Ancillary Service - Definition**

Unit Standing Reserve shall mean the maximum active power quantity which may be made available to the System by a synchronized Unit, within a period from between twenty (20) minutes to four (4) hours following the issue of a Unit synchronization Dispatch Instruction, as this magnitude is established in the Unit's Declared Characteristics. System Standing Reserve shall mean the sum of the Standing Reserves of Units which have been or may be scheduled to provide such service for each Dispatch Period. Scheduling for the provision of this service is carried out by the Transmission System Operator in order to render possible Active Power and Frequency Control in view of unforeseen disturbances of the System load balance in real time during a Dispatch Day.

**Article 96**

**Voltage Control Ancillary Service - Definitions**

1. System Voltage Control aims at maintaining voltage within normal operation limits in accordance with CHAPTER 47. For that purpose it is required that there be sufficient standing and dynamic Active Power reserve.
2. System Voltage Control is achieved under the responsibility of the Transmission System Operator through the following means:
3. use of System devices, notably control of autotransformers’ tap changers, switch of lines and cables, use of electronic compensators or alternative means of reactive power production, switch of reactors and capacitors;

Β) change of Unit Transformer tap positions; and

* 1. control of the Active Power generation of Units locally or centrally, as well as manually or automatically.
1. Voltage Control Ancillary Service shall be all services provided in the context of indents (B) and (C) under paragraph (2).
2. Increased Demand for Customers Reactive Power Ancillary Service shall be the operation of Customer installations connected to the System, with a mean hourly power factor which for each Dispatch Period or for certain Dispatch Periods established by the Transmission System Operator, shall be significantly higher than the lower limits established in Article 243 paragraph (19). System Voltage Support Ancillary Service shall be the operation of energy generation units which are not Dispatchable nor Contracted Units, with regulated inactive power injection in order to assist the System Voltage Control in the way established by the Transmission System Operator. Such services shall start being provided as Ancillary Services, and the relevant payment shall be made, following the approval of the Transmission System Operator's relevant study and the relevant modification of this Code.

**Article 97**

**Black Start Ancillary Service - Definition**

Black Start Ancillary Service following a general or partial System operation interruption shall be the service provided by Units (hereinafter referred to as Black Start Units) and consists in the possibility to black start Units without being supplied externally, and in injecting energy into the System within one (1) hour or fifteen (15) minutes in the case of hydro units.

**Article 98**

**Supplementary System Energy - Definitions**

1. Supplementary System Energy from a Contracted Unit shall mean the active power quantity of a Contracted Unit for Supplementary System Energy, which is supplied to the System by responsibility of the Transmission System Operator in order for the System Supplementary Energy needs to be met.
2. Supplementary System Energy from Emergency Imports shall mean the active power quantity from imports which is supplied to the System by responsibility of the Transmission System Operator in order for the System Supplementary Energy needs to be met.
3. Supplementary System Energy from Cold Reserve Units shall be the active power quantity from a Cold Reserve Unit, provided that such Unit is contracted for that purpose, which is supplied to the System by responsibility of the Transmission

System Operator in order for the System Supplementary Energy needs to be met if this is required in order to avoid an Emergency Situation.

1. Total Supplementary System Energy shall be the sum of System Supplementary Energy from Contracted Units, Emergency Imports and Cold Reserve Units.

**Article 99**

**Provision Availability, Provision Standby, Supplementary**

**System Energy Provision - Definitions**

1. Supplementary System Energy Provision Availability from a Contracted Unit or Cold Reserve Unit shall be the technical capability of such Unit in accordance with its Declared Characteristics, and the relevant contract, to remain in Provision Standby and provide Supplementary System Energy following a Dispatch Instruction.
2. Supplementary System Energy Provision Standby of a Contracted Unit or Cold Reserve Unit shall be real time standby of such Unit, in accordance with its Declared Characteristics and the relevant contract, to provide Supplementary System Energy following a Dispatch Instruction. More specifically, Provision Standby corresponds to a non synchronized Contracted or Cold Reserve Unit that is in suitable standby in order to be able to be synchronized and operate at a given capacity level and within the time required in accordance with the relevant contract, while Supplementary System Energy Provision concerns the operation of a Contracted or Cold Reserve Unit in synchronized mode so that it injects energy into the System following a Dispatch Instruction and in accordance with the relevant contract.
3. Supplementary System Energy Provision Availability from Emergency Imports shall be the possibility which the Transmission System Operator ensures through the relevant contracts in order to have energy injected into the System through interconnections, if necessary.
4. There shall be Supplementary System Energy Provision Standby from Emergency Imports when the Transmission System Operator ensures the standby of the other party of the relevant contract to inject energy into the System through interconnections, in accordance with the relevant contract.
5. Supplementary System Energy Provision from Emergency Imports shall be the injection of energy into the System through interconnections based on the relevant contract and if considered necessary.

**CHAPTER 24**

**DETERMINING ANCILLARY SERVICE AND SUPPLEMENTARY SYSTEM ENERGY NEEDS**

**Article 103**

**Frequency and Active Power Control - Need Forecast**

The Transmission System Operator shall estimate the need for the provision of Frequency and Active Power Control Ancillary Services per individual Ancillary Service and Dispatch Period of the Dispatch Day in accordance with the provisions of ~~Article 55~~.

**Article 104**

**Standing Reserve - Determination of needs**

The Transmission System Operator shall establish the Standing Reserve quantities required each time per Dispatch Period of the Dispatch Day taking account of all uncertainty factors and in particular the reliability level of each Unit, Load Forecast reliability, the DAS Schedule, the extent of allowed Load Shedding, the time that has elapsed since the last Load Shedding, particular events that have occurred in the energy system, which includes the transfer System and the Units, or in neighboring energy system and which justify the provision of additional Reserve, the total available capacity for the specific Dispatch Period, the expected generation from Renewable Energy Sources, and particularly from those that are directly affected by weather conditions, the weather conditions directly or indirectly affecting the operation of Units and the reliability of the System, the possibility of special high load cases, and the constraints imposed by agreements with operators of other energy transfer systems.

**Article 105**

**Voltage and System Voltage Stability Control – Determination**

**of needs**

1. The Transmission System Operator controls the System voltage and sees that it remains within the limits established in CHAPTER 47, implementing dynamic and standing regulation methods and seeing to System voltage stability. In order to determine the needs for Voltage and System Voltage Stability Control Ancillary Services, account is particularly taken of daily, weekly or seasonal factors, so that the Transmission System Operator can establish the voltage levels sought, the optimum use of available means for Voltage Control, and minimize the cost of the relevant Ancillary Services.
2. The Transmission System Operator shall ensure using the means established by Article 96 all necessary margins for Voltage Control taking account of the following factors:
3. System Load;

Β) System state and the available means for Voltage Control; and

1. the possibility of Units to generate Inactive Power (leading or lagging).

**Article 106**

**Black Start - Determination of needs**

The Transmission System Operator shall see during the preparation of the Maintenance Schedule to the availability of sufficient Black Start Units. In an emergency where a problem is found based on the Declared Characteristics of Units, the Transmission System Operator and production license holders are required to cooperate to face such problem by modifying the Maintenance Schedule if necessary.

**Article 107**

**Supplementary System Energy - Determination of needs and criteria**

1. The Transmission System Operator must ensure through contracts with Contracted Units sufficient Supplementary System Energy Availability so that there is Provision Standby or Supplementary System Energy Provision under competitive financial conditions to minimize the risk of not covering the total System load due to contingencies and/ or to mitigate the uncertainty of DAS Participants relating the cost of balancing load in unforeseen situations. Unforeseen situations shall be particularly increases of maximum peak load beyond those provided for in the Capacity Adequacy Study, cases beyond the anticipated extended Unit faults, and the reduction of the possibility of energy flow from neighboring energy systems.
2. In addition, and only in the context of avoiding Emergency Situations, the Transmission System Operator shall also see to the conclusion of suitable contracts with Cold Reserve Units ensuring that the respective cost is competitive and equivalent to the reserve service provided by them.
3. The above scheduling shall extend over a suitable timeframe in order to face all unforeseen situations relating to System load coverage and achieve the lowest possible cost in the context of contracts, especially where a cost reduction is achieved through sufficiently long-term contracts.
4. The Transmission System Operator shall ensure to the extent possible that scheduling of the Supplementary System Energy Provision Standby from Contracted Units or Emergency Imports or Cold Reserve Units takes place before the Dispatch Day on which the Provision of the relevant services is expected to be required.

**Article 108**

**Medium-term scheduling of Ancillary Service and Supplementary System Energy Availability**

1. The Transmission System Operator shall prepare and notify to RAE by the end of each calendar year the schedule of meeting Ancillary Service and Supplementary System Energy needs at least for the following calendar year.
2. In this scheduling, the Transmission System Operator shall take account of the elements in the Capacity Adequacy Study and other similar studies that it may prepare.
3. Details regarding the methodology used to calculate the needs for Ancillary Service and Supplementary System Energy availability per individual service, are given in the Capacity Assurance Mechanism Manual.

**Article 109**

**Keeping Ancillary Service and Supplementary System Energy**

**Records**

1. Within one month from the beginning of each calendar year, the Transmission System Operator shall prepare and notify to RAE a report concerning the previous calendar year and which shall include total expenses for Ancillary Services and Supplementary System Energy, as well as statistics regarding the extent of the Ancillary Services and the Supplementary System Energy provided in the context of the Dispatch Procedure, the Supplementary System Energy services for which it gave a Provision Standby Instruction, and the Supplementary System Energy Provision Instructions issued, incidents where the available Ancillary Services and the Supplementary System Energy did not suffice, and the cases of non-compliance with the Dispatch Instructions in respect of the provision of such services. The report may include proposals regarding the improvement of Ancillary Service and Supplementary System Energy scheduling and management.
2. An extensive summary of such report shall be published in accordance with ~~CHAPTER 2~~.

**CHAPTER 25**

**OBLIGATION TO PROVIDE ANCILLARY SERVICES AND SUPPLEMENTARY SYSTEM ENERGY**

**Article 110**

**Primary Control and Reserve - Provision Obligations**

1. To meet the needs of Primary Control and Reserve, production license holders with Units with maximum generation capability above 2 MW are required to constantly operate their Units that are synchronized in the System under the control of a Unit load regulator. The Units under Article 35 of Law 2773/1999 are excluded. A Unit may be temporarily released of this obligation only if an exemption is granted in accordance with Article 23.
2. In terms of the response of Units, no time delay shall be admitted with the exception of those related to the technical characteristics of the load regulator. During the operation of the load regulator no inactive frequency zone above ±20 mHz may be implemented, inclusive of the measurement error.
3. Exceptionally, the operation of the load regulation may be constrained for a short period not exceeding one Dispatch Day only in the following cases:
	1. following the granting of approval by the Transmission System Operator, which is granted upon request of a production license holder, provided that such constraint is required for reasons pertaining to the safety of the personnel or the installations of the Unit; or

Β) if a relevant Dispatch Instruction has been issued.

1. Each time paragraph (3) is implemented, the Transmission System Operator must record the nature of the constraint, the reasons causing it, as well as its duration.

**Article 111**

**Secondary Control and Range - Provision Obligations**

1. Units with a registered capacity over 60 MW are required to provide Secondary Control and Range operating under automatic generation control, if they remain inside the control area established in their Declared Characteristics. The Units under Article 35 of Law 2773/1999 are excluded. A Unit may be temporarily released of this obligation only if an exemption is granted in accordance with Article 23.
2. The Transmission System Operator may issue Dispatch Instructions to Units operating under automatic generation control to stop operating under the automatic generation control system.
3. Unit operation under automatic generation control may be interrupted for a short period of time, which may not exceed one Dispatch Day, and the production license holder may undertake the control of Unit's output Active Power manually upon approval of the Distribution Network Operator, following a justified application filed by the production license holder, if this is required for reasons pertaining to the safety of the Unit personnel or installations. A production license holder is required to immediately restore the operation of a Unit under automatic generation control, immediately after the problem has been solved, after having previous informed the Transmission System Operator to that respect.

**Article 112**

**Voltage and System Voltage Stability Control – Provision**

**Obligations**

1. Units with maximum generation capability over 2 MW and if they are synchronized in the System, are required to provide Inactive Power in accordance with the relevant Dispatch Instruction issued by the Transmission System Operator. The Units under Article 35 of Law 2773/1999 are excluded. A Unit may be temporarily released of this obligation only if an exemption is granted in accordance with Article 23.
2. To that end, the Unit excitation system shall operate under the constant control of an automatic voltage regulator, which must be set so as to ensure fixed voltage at the generator terminals. The deactivation of and constraints to the operation of the automatic voltage regulator are not allowed.
3. The automatic voltage regulator of the production units with a registered capacity greater than 50 MW should contain a stabilizer (Power System Stabilizer - PSS) to contribute positively to the damping of power oscillations in the frequency range from 0.1 up to 3.0 Hz . The stabilizer should be continuously activated as long as the unit remains in synchronism and produces more than 10% of the registered Net Capacity. Deactivation of the stabilizer can not be made without prior approval of the TSO. The configuration parameters of the stabilizer will be communicated to the TSO and will not be altered without prior approval. Upon request of the TSO, the Producer is obliged to submit frequency response measurements of the unit over a specified frequency range. The TSO reserves the right to conduct further measurements and testing to assess the contribution of the unit to the damping of power oscillations, if it deems it necessary.
4. The deactivation of or constraints to the operation of the automatic voltage regulator are allowed exceptionally upon approval by the Transmission System Operator and for a short period of time not exceeding one Dispatch Day, if this is imperative for reasons pertaining to the safety of the Unit personnel or installations.
5. In the case of the previous paragraph, the Transmission System Operator, taking account of assuring the reliable and safe operation of the System, may impose additional constraints to the operation of the Unit, if the safety of the Unit personnel or installations is not jeopardized. In that case, the Transmission System Operator may also issue a Dispatch Instruction for the de-synchronization of the Unit.

**Article 113**

**System Black Start – Provision Obligations**

1. A production license holder is required to keep its Unit in System black start technical capacity if such Unit is included among Black Start Units.
2. Where during black start a Black Start Unit is unable to respond to the load complying with the limits for its safe operation, the Transmission System Operator shall be notified immediately. The Transmission System Operator may either issue Instructions for changing the load or reconfigure the System, so that the problem of the Black Start Unit is tackled, and to that end it shall cooperate with the relevant production license holder taking into consideration the safety of the Unit personnel or installations.

**Article 114**

**Supplementary System Energy - Provision Obligations**

1. Production license holders of Contracted Units for Supplementary System Energy or Cold Reserve Units are required to provide, following a Dispatch Instruction, Supplementary System Energy, in accordance wit their Declared Characteristics and the relevant contract.
2. Production license holders of Contracted Units for Supplementary System Energy or Cold Reserve Units are required to place their Units, following a Dispatch Instruction, in Supplementary System Energy Provision Standby, in accordance wit their Declared Characteristics and the relevant contract.

**SECTION VII**

**SYSTEM OPERATION AND MAINTENANCE**

**CHAPTER 47**

**SYSTEM STANDARDS**

**Article 213**

**System Operation Standards**

1. The Transmission System Operator shall operate the System and plan its development so as to meet operating requirements at the connection points as set out in this Chapter.
2. Normal System frequency (reference frequency) is set at 50Hz and the operating range is set as follows:

Α) Normal operating range: 49.85 Hz to 50.15 Hz;

Β) During disturbances on the System or on transmission systems connected to it:

49.75 Ηz to 50.20 Hz;

* 1. During exceptional disturbances on the System or on transmission systems connected to it: 49.50 Ηz to 50.50 Hz.
1. Nominal System voltages are set at 400kV and 150 kV and the normal operating range is set as follows:

Α) 380 kV to 420 kV on the 400kV System;. Β) 142.5kV to 162kV on the 150 kV System;

1. During System disturbances, abnormal conditions or faults, the allowed voltage operating range is as follows:

Α) 350kV to 420kV on the 400kV System; Β) 135kV to 170kV on the 150kV System.

1. Some System disturbances, such as short circuits to earth or lightning strikes, may result in short-term voltage deviations outside the above ranges. Also in abnormal conditions and in particular when, following an opening of synchronous interconnecting lines, the System is islanded, the frequency may take values outside the ranges under paragraph (2) of this Article, however, such values shall be inside the ranges established in Article 241 paragraph (2), until the load generation balance has been restored.
2. Due to the electrical characteristics of the System, the voltage for installations operating under common nominal voltage may not be the same at all points of the System.
3. The negative phase-sequence component of the System phase voltage may not exceed 2% under normal operating conditions.
4. The System must be effectively earthed on the neutral system with a fault factor to earth of less than 1.4.
5. The System is designed and operated to maintain short circuit levels below the following:

Α) 40kA on the 400kV System; Β) 31kA on the 150kV System.

1. During System design, maximum subtransient short circuit fault levels shall not be greater than 90% of the limits under the previous paragraph, and in particular for three-phase or single-phase to earth faults, the design maximum subtransient short circuit fault levels shall not be greater than 36 kA for 400kV and 28 kA for 150kV.
2. The 400kV, 150kV and 66kV Systems must be effectively earthed. The line to earth voltage during single line to earth faults should not rise above 80% of the rated line to line voltage.
3. A safe margin should be provided between the System loading in an area and the voltage collapse point determined by parametric studies, as the System loading increases.
4. Thermal limits on equipment shall be as determined by the assumed seasonal ambient conditions. Normal and overload ratings must take account of the ratings of auxiliary and ancillary equipment such as switchgear, bushings, instrument transformers. No overloading on equipment shall be acceptable during equipment selection and design phase, under neither normal nor emergency operation, except in the immediate aftermath of a Disturbance, while corrective action, either automatic or manual, is being taken.
5. For base case operation with all lines and transmission self-transformers in service, the voltage step resulting from capacitor switching shall not exceed 3.0%. For single Contingencies (N-1), the maximum step change between pre- and post-contingency steady-state voltages shall be no more than 10%.

**Article 214**

**System Operations**

1. The Transmission System Operator may proceed to operations or order the System Owner to proceed to such operations particularly imposed by the following:

Α) installation and devices isolation for the purposes of maintenance, construction of new projects, emergency repairs, system tests, protection tests, isolation of a diagnosed or suspected fault and user works;

Β) voltage regulation needs;

* 1. limitation of energy flows in the System at levels compatible with the capacities of installations and the System safety.
1. If an operation, and in particular an operation altering the System topology, has an operational impact on a User, the Transmission System Operator shall inform the User prior to such future operation, if such notification is necessary and possible given the time frame, in accordance with the terms and conditions of the connection agreement or other agreement between the Transmission System Operator and the User.
2. The installations and devices of a given User may be deactivated at any time and extent that the Transmission System Operator considers necessary for the safe and reliable operation of the System within the specifications provided for. The deactivation of installations and devices of a User is imposed particularly in cases in which the following may arise:

Α) risk for the personnel safety; Β) risk for the System stability;

Γ) risk for the System or a specific User installation or device;

D) overloading of System components beyond the emergency limits;

Ε) voltage deviations in the System beyond the limits established under Article 213;

1. behavior causing the continuous operation of the System beyond normal frequency limits;
2. substantial breach of the connection terms;

Η) any User action or omission hindering the Transmission System Operator from fulfilling its legal obligations or the obligations arising from its license.

**Article 215**

**Protection of the System**

1. The stability of the System shall be maintained following a three-phase zero impedance line-end fault. The fault must be correctly cleared by primary protection and automatic line reclosing shall be in operation where appropriate. This requirement may be met in special cases at the Transmission System Operator discretion and shall apply to single line fault stages.
2. A contingency shall not result in the islanding of major portions or in the shutdown of the system due to the cascade tripping of transmission circuits and generators. Existing protection equipment and capabilities thereof shall be taken into account for System design purposes.
3. There may be automatic changes in the circuit breakers status in the System without a warning due to the activation of protection configurations for the isolation or clearing of faults in System installations or in the installations of a given User connected to the System. The limitation of energy flows or voltage or frequency deviations in case of faults may be automatic.
4. When the performance of urgent operations is necessary as a result of the conditions or a fault in the System, the Transmission System Operator must inform the Users that may be affected.
5. When there is a fault in the System or the protection or other automatic procedure is activated, and the implementation of the procedure set out in the previous paragraph is not possible, or when the Transmission System Operator must perform urgent operations, it shall inform the users that may have been affected after the performance of such operations, unless there is no more reason for it, because the emergency conditions were temporary and have been fully restored in the meantime. The Transmission System Operator shall inform users about the estimated duration of emergency conditions and update such estimate when needed. In addition, the Transmission System Operator shall inform users with regard to the ending of such emergency conditions.

**Article 216**

**Safety rules**

The Transmission System Operator shall coordinate compliance with the applicable safety rules and shall issue the necessary working permits and authorizations for the issue and execution of orders for operations, isolations and for all works to be carried out on the System. The working permit shall be granted to persons entitled to such a permit, indicated by the Transmission System Operator. Such persons shall be responsible for compliance with the safety rules when performing the works mentioned in the permit granted. The recipient of the permit shall be responsible for the performance of works and for taking appropriate measures for the safety of the staff at work. As regards any works on or beyond the System boundaries, the Transmission System Operator shall take all safety measures related to the System and shall notify these to the Users that might be affected.

**CHAPTER 48**

**MONITORING, TESTING AND INVESTIGATION OF SYSTEM AND USER INSTALLATION OPERATION**

**Article 217**

**Tests performed by the Transmission System Operator**

1. The Transmission System Operator shall perform all necessary operating tests aiming at controlling and developing operating procedures, the training of staff, and the collection of information pertaining to the System behavior under abnormal conditions.
2. The operating tests performed by the Transmission System Operator in accordance with the provisions of the present Chapter are particularly the following:

Α) tests including the controlled imposition of frequency and/or voltage changes for the purpose of information collection regarding the behavior of the System;

Β) System restoration controls;

* 1. tests concerning the procedures applying to System emergencies and alarm situations;
	2. energy quality control and monitoring procedures at various System states.
1. The Transmission System Operator ought to notify the User about the time schedule and the impact of operating tests, as well as about any change in such time schedule or in the nature of operating controls, pursuant to the provisions of ~~CHAPTER 22~~. Users may request a time period for studying the impact of operating tests on their installations. The Transmission System Operator ought to collaborate with the user in assessing the risks implied by the tests. No operating tests shall be performed without the user’s consent, unless the Transmission System Operator reasonably believes that the user's refusal to give its consent is unjustified.

**Article 218**

**User required tests**

1. All users are obliged to perform the minimum required number of operating tests in order to check and develop operating procedures, improve and measure the performance of their installations, fulfill the obligations arising from licenses, comply with generation requirements or other obligations and staff training requirements, ensuring that the impact of such checks on the Transmission System are kept to a minimum.
2. With regard to the performance of operating tests, users must submit relevant proposals within a reasonable time limit pursuant to the provisions of ~~CHAPTER 22~~, or complying with any possible alternative procedures jointly established with the Transmission System Operator. By means of such proposals, users provide sufficient information to the Transmission System Operator in order for the latter to be able to assess with accuracy any operating impact of tests and particularly:

Α) the cause mandating the performance of the suggested tests, which might be a law requirement, the need for compliance with the user license terms and conditions, regulations or safety codes;

Β) the suggested hour or hours for the performance of operating tests;

1. the milestone time points for each specific stage of operating tests that may be completed separately or for which there is no need for repetition once performed;
2. estimates with regard to any adverse impact that a delay or interruption in the operating test might have on the user, for which delay or interruption the user is informed on a short notice;

Ε) if the operating tests are to be performed on a Generation Unit, along with the proposal for the performance of the test, the dispatch load or loads required by the production license holder for the completion of tests, as well as the duration of tests shall be submitted to the Transmission System Operator. If the production license holder is unable to determine the required unit loads until the completion of tests, then they are obliged to perform tests in appropriate stages, to indicate and discuss with the Transmission System Operator which test stages may be implemented partially and which should not, and to indicate possible changes in the tests for those stages that may be completed partially. The proposals also establish the factors that affect the completion of individual stages, and whether the procedure used for certain stages depends on the result of the previous ones.

1. The proposal of a production license holder for the performance of an operating test, including the execution of a dispatch instruction from a given Generation Unit for a given MW figure or under specific operating conditions is not considered as a repeated Declaration of Availability or of the capacity to provide Ancillary Services, or operating characteristics.

**Article 219**

**Evaluation of proposals for the performance of operating tests**

1. Following the submission by a given User of a request for the performance of operating tests , the Transmission System Operator ought to assess the impact of the suggested tests on the operation of the System. The Transmission System Operator may, in addition, request from the User information which they deem necessary for the assessment of the impact of tests.
2. The Transmission System Operator shall assess the impact of the proposed operating tests on the continuity and reliability of supply to the Users. The Users affected by operating tests are entitled to raise objections which the Transmission System Operator is required to take into account. The Transmission System Operator ought to observe the commercial confidentiality of the information concerning a User, which is disclosed to them in relation to a request for the performance of operating tests.
3. Should the operating test suggested by a certain production licence-holder requires the issue of a Dispatch Instruction, which exceeds the limits of declared values for availability, capacity to provide ancillary services, or operating characteristics of the respective generation unit, the Transmission System Operator may issue a Dispatch Instruction for the Generation Unit, for the time period required for the performance of the operating test, pursuant to the special requirements of the present Code.

**Article 220**

**Approval of proposals for operating tests**

1. Following the submission of a request for the performance of operating tests, the assessment of the possible impact thereof and consultations with the User requiring the tests and the Users whose operation is affected by them, the Transmission System Operator shall decide on the approval of the operating tests.
2. The criteria for the approval of operating tests include particularly the impact of operating tests on the safety and cost effective operation of the System, the impact of operating tests on other Users, as well as their impact on the continuity and reliability of power supply.
3. Following the approval of operating tests for a specific production license holder, the Transmission System Operator shall send to the User a proposal related to the dispatch procedure and planning. Such proposal is not a Dispatch Instruction. The User may either accept such proposal or reject it and submit a request for alternative planning or for a postponement of the operating tests. Should the Transmission System Operator accept the proposal, all Users that are considered to be significantly affected by the tests to be performed shall be informed about the time planning and the type of tests. Such Users are entitled to raise objections to the Transmission System Operator, in case they do not agree with the approved tests. Tests shall be cancelled by the Transmission System Operator, should they consider that the objections raised are justified. Any disputes between the parties shall be settled in accordance with the procedure under ~~Article 10~~.
4. Should the Transmission System Operator reject the operating tests suggested by a given User, such User shall be entitled to propose an alternative planning or other operating tests or the performance of suggested tests at a different time. With regard to the approval and performance of checks, the provisions of the previous paragraph shall apply accordingly. Any disputes between the parties shall be settled in accordance with the procedure under Article 10.

**Article 221**

**Operating test planning**

1. Operating tests shall be planned by the Transmission System Operator in the context of the Dispatch Procedure.
2. The Transmission System Operator must give priority to the operating tests proposed by a specific User, when such User argues that the performance of the said tests is required pursuant to the terms and conditions of their license, safety rules or when the delayed performance of such tests may have important material consequences for the User.
3. Should the Transmission System Operator foresee a need for or the possibility of interruption, postponement, or any other significant change to a given agreed procedure, they must immediately inform the User having proposed the test.
4. Where the Transmission System Operator estimates that the impact of a given operating test on the safety of the System and the reliable supply to the User is more serious than the initially assessed, they shall investigate jointly with the User the possibility to review the procedure or the planning.
5. Should the User that has proposed the tests wishes the interruption or no performance of a given operating test, they shall inform the Transmission System Operator in accordance with Article 218.
6. The Dispatch Instructions required for the performance of operating tests are issued by the Transmission System Operator in accordance with the provisions of ~~SECTION III~~.

**Article 222**

**Notification of operating test results**

1. After the planned time period for the performance of a given operating test has elapsed, the User that has proposed the test must inform the Transmission System Operator about whether all tests have been completed, or in case the tests have been broken down into stages, about the part of the tests that has been completed.
2. Following the completion of operating tests, the User that had proposed the tests is responsible for compiling a written report with regard to the checks performed (Final Report), which shall remain at the disposal of the Transmission System Operator, of the Users whose operation was affected, and of RAE, for three months following the completion of operating tests.
3. The contents of the Final Report shall be notified to third parties only following the granting of approval by the Transmission System Operator and RAE.
4. The Final Report includes the description of the installation and machinery tested, a description of System tests performed, as well as the results, any conclusions, and proposals relating to the Transmission System Operator and the Users operationally affected.

**SECTION VIII**

**PLANNING OF SYSTEM DEVELOPMENT**

**CHAPTER 50**

**PROCEDURE**

**Article 227**

**Definitions and scope**

1. Development of the System, which includes both its reinforcement and its extension, may be due to the following reasons:

Α) growth in demand for electricity;

Β) need for interconnection capacity increase;

1. removal of System inter-zonal constraints and/ or improvement of System quality and security;
2. development of User sites already connected to the System;

Ε) introduction of new connection sites or modification of existing connection sites between User systems and the System;

* 1. changing requirements for electricity transmission facilities due to factors such as demand changes, generation changes, technology changes, reliability requirements, or environmental requirements;
	2. the cumulative effect of a number of such factors referred to in this paragraph.
1. The reinforcement or extension of the System may involve work:

Α) at a new or existing connection site where a given User’s plant and apparatus is connected to the System;

Β) on new or existing transmission lines or other facilities which join a specific User to the System;

* 1. on new or existing transmission lines or other facilities at or between points remote from the connection site of a given User.
1. The time required for the planning and development of the System will depend on the type and extent of the necessary reinforcement or extension work, the time required for obtaining planning permission and wayleaves, including any associated hearings, and the degree of complexity in undertaking the new work while maintaining satisfactory security and quality of supply on the existing System.
2. The provisions of this Chapter set out the requirements and procedures necessary during planning of the System in order to ensure cooperation between the Transmission System Operator and a particular User in relation to any proposed development on User facilities that may affect the System operation or concerning the User’s direct connection to the System. Moreover, provision is made for the supply of information required by the Transmission System Operator from users in order for the Transmission System Operator to undertake the planning of the System in accordance with the transmission planning criteria and relevant standards, and the preparation of the annual forecast statement for the development of the System.

**Article 228**

**Planning Operations**

1. The Transmission System Operator shall plan development of the Transmission System to ensure secure, reliable and economic supply of electricity and meet the operating requirements under CHAPTER 47.
2. System reserve shall be sized by the Transmission System Operator in accordance with N-1 Criterion and the effect of multiple disturbances arising on the System shall be limited by large-scale failure and restoration strategies.
3. System planning by the Transmission System Operator shall consider the current load and generation situation and projected load and generation growth, RAE’s estimates on generation growth and geographical distribution, as well as the anticipated requirements of Users.

**Article 229**

**Transmission System Development Study (TSDS)**

1. By October 1st each year the Transmission System Operator shall prepare and publish a draft Transmission System Development Study (SDS) which shall be submitted to RAE. RAE, taking account of the Transmission System Operator’s obligation to ensure uninterrupted access to the System in the most cost-effective, transparent and direct way and without discriminations among Users or User categories, shall proposed to the Transmission System Operator in a documented manner the alterations and supplements to the draft TSDS it considers necessary. The Transmission System Operator shall prepare the final draft TSDS taking account of RAE's remarks. The final draft TSDS shall be submitted to the Minister of Development for approval which shall be granted following the issue of RAE's opinion, and it shall be accompanied by documentation prepared by the Transmission System Operator regarding the reasons for any differences in the final draft as compared to RAE's remarks on the original draft.

2. The TSDS shall be prepared taking account of the following objectives:

Α) improvement of the supply security level and increase of the transmission capability and the System stability limit, as well as technological improvements;

Β) removal of technical constraints imposed by the operating limits of the System elements, and in particular the systematic Transmission System Constraints;

1. the provision of direct, if possible, priority to new Users regarding access to the System, in the context of the obligations to provide uninterrupted System access to third parties in accordance with Community Law;
2. the increase of the transmission capability of existing interconnections and the development of new interconnections;

Ε) reduction of transmission losses in the System.

1. The term for the TSDS is set to five (5) years and includes time scheduling for all extension or reinforcement projects, including all projects to be completed within the term of the TSDS, as well as projects the construction of which must start within the TSDS term regardless of the time for their completion.
2. For each new project, the TSDS shall include a technical description setting out the main planning elements such as:

Α) for transmission lines, the type and their estimated length;

Β) for Substations and Extra-high Voltage Centers, the general electrical configuration, namely the number of busbars, the type and number of bays, and the nominal capability of power transformers and self-transformers;

1. for reactive power leading or lagging compensation apparatus, their nominal capability, and the Substation or Extra-high Voltage Centers where they shall be installed;
2. for other projects and in particular those involving the application of new technologies, basic technical specifications in accordance with the provisions of this Code.

For each project the feasibility of its construction shall be documented against the criteria under paragraph (2) of this Article.

1. The TSDS shall include a time schedule for the implementation of each project establishing the estimated time for the completion of each stage of the project such as technical studies, submission of dossier for the issue of environmental terms, any appropriations, commencement of construction, completion of construction and tests, and commissioning. Projects shall be grouped by geographical area and efforts shall be made for the joint time scheduling of such projects, in order to attain coordination and the timely achievement of the TSDS objectives.
2. The Transmission System Operator shall ensure the implementation of the schedule and compliance with the relevant time schedules. To that end, the Transmission System Operator shall monitor progress in the implementation of TSDS projects and shall prepare and publice relevant half-yearly reports.

**Article 230**

**Data about the TSDS**

1. For the purposes of System planning and development, Users are required to regularly provide data and information to the Transmission System Operator following a relevant request by the latter. Such data and information shall constitute data for System planning.
2. The data submitted by Users regarding the planning of a System project shall be considered confidential, with the exception of the data submitted by the System Owner or the Distribution Network Operator.
3. By May 1st, each year, RAE shall prepare and notify to the Transmission System Operator a report with regard to generation growth and distribution in space, for the following five-year period. The Transmission System Operator shall take into account the contents of the RAE report in order to fulfill its competencies under Article 15 paragraph (3) of Law 2773/1999.
4. The project planning data, along with other data that the Transmission System Operator disposes and which regard the System shall constitute the basis for the analysis and assessment of the new requests of Users. Such data shall be confidential, unless used by the Transmission System Operator to prepare the annual forecast report, to provide information in relation to such report, assess the requests of other Users or candidate Users or for the purposes of System planning, or if provided for in the connection contract.

**Article 231**

**Data verification and validation**

1. Should the Transmission System Operator consider that the data submitted by a given User are erroneous or inaccurate, they may require from such User to submit additional information, which in their opinion is necessary to verify the accuracy of data.
2. If following the assessment of the information submitted in accordance with the previous paragraph, the Transmission System Operator estimates in a justified manner

that it does not have sufficient information to verify the initial data, it may ask the User to perform data verification tests. Tests shall be carried out in accordance with CHAPTER 54.

1. If the data submitted by the User are verified by the tests, the cost of such tests shall be borne by the Transmission System Operator.
2. If the data submitted are not verified, the cost of tests shall be borne by the User. The figures resulting from the tests shall be used as data. Where, in the reasonable judgment of the Transmission System Operator data changes which result from a given test render necessary the conduct of further System studies, the User shall bear the cost of such studies.

**CHAPTER 51**

**REINFORCEMENT AND EXTENSION PROJECTS**

**Article 232**

**Design criteria and standards**

1. For the purpose of System design, the Transmission System Operator shall apply the design criteria laid down in this Chapter, as well as the established rules and standards.
2. In determining the technical requirements of a User connection, the Transmission System Operator ought to refrain from discriminations among Users of the same category, location and size, and if it is technically and economically possible to attain uniform connection ways each time.
3. The System voltage level to which a Unit is connected and the busbar configuration accepted shall depend on the size and number of generation units comprising the User’s installations, compatibility with future System development, and the geographical distance from the existing System.
4. Customers connected to the System shall, as a rule, connect to the 150kV transmission voltage level. The Transmission System Operator may connect any such System customer to a different transmission voltage level for reasons mainly relating to demand in MW at the connection point, compatibility with future System development, proximity with the existing System, and the cost of the proposed connection.
5. As a rule, the Distribution Network is connected to a 150kV transmission voltage level. The Transmission System Operator may connect the Distribution Network to a different transmission voltage level for reasons mainly relating to demand in MW at the connection point, compatibility with future System development, compatibility with the combined System and Distribution Network design, the geographical distance from the existing System and the cost of the proposed connection.
6. The User shall bear the full cost of extension projects for the connection of its installations with the System, which are among the financially most advantageous and technically acceptable way of connection with the System, in accordance with the N-1 reliability criterion and the requirements of this Code.
7. Upon request of a User and if the Transmission System Operator agrees, in establishing the technical requirements for the connection, specifications stricter than the established ones may apply. In that case, the additional cost generated shall be borne by the User.

**Article 233**

**Ν-1 design criterion**

1. The N-1 criterion means that under all operating conditions the loss of any given element, in particular line, transformer, Generation Unit, will not jeopardize the operation of the System or lead to further loss of System elements or supply interruptions. As a result of loss of one element, the configuration of the Transmission System will need to be reorganized in order to comply again with the N-1 Criterion within the shortest possible time so that the loss of a further element will not jeopardize security of operation.
2. The N-1 criterion shall be used for System development and the design of schemes for connection of User installations to the System in accordance with CHAPTER 58.
3. The Transmission System Operator shall carry out System operation analyses and simulations, and in particular regarding its stability and reliability, which shall check the consequences of various load, generation unit, cross-border energy trade, and System topology scenarios.

**Article 234**

**System stability**

1. The Transmission System Operator shall install and size Transmission System control facilities to ensure stable operation for all relevant conditions and to face oscillatory phenomena whether transient or steady-state either by limiting amplitude or damping to a sufficient extent so that they will not impair System operation. The Transmission System Operator shall specify measures to be taken to maintain System stability in the event of a change to technical or operational parameters of Users or the connection of a new installation to the System.
2. Steady state stability is the situation in which minor changes to operating conditions do not lead to self induced oscillations which may result in large-scale collapse of the System and result in damage to Users’ plant or facilities. Steady-state stability must be ensured at all times and at all points of the System. The Transmission System Operator shall ensure maintenance of the short circuit levels and Transmission System voltages in accordance with the provisions of CHAPTER 47 and shall examine whether purchases or injections by System Users are possible without risk to steady state stability or whether a constraint must be imposed. The Transmission System Operator shall endeavor to ensure that changes in load and injection situations, such as low-load operation with under-excited Generation Unit, and changes to System configuration shall not endanger steady state stability of the System pursuant to the provisions of CHAPTER 47
3. Transient stability is the situation in which following clearance of a short circuit on the System, no Generation Units loses synchronism with respect to the System and generator pole slipping does not occur. During System design, the Transmission System Operator shall be able to ensure that the short circuit levels at the System / Generation Units interface do not violate those specified in CHAPTER 47, following fault clearance by the System protection in accordance with its design.
4. Where a generation unit cannot be prevented from pole slipping following System short circuits, the generation unit must be disconnected from the System by means of generator protection to prevent risk to the Transmission System and to generator operation. The System shall withstand the effects upon it, which arise during these dynamic processes.

**Article 235**

**Simulation assumptions**

1. System operating analyses shall be based on current energy demand, maximum and minimum load forecasts. The performance of the planned System must meet the transmission design criteria under various load conditions, including but not limited to maximum load.
2. System operating analyses shall be based on the best information on generation development, including RES units. Due to the random nature of RES unit generation, their effect on the System shall be analyzed for two extreme scenarios regarding generation by such units:

Α) they generate their maximum capacity; Β) they do not operate.

1. System planning shall take account of alternative scenarios regarding the distribution of generation and load on the System. The strength of the System should be such that:

Α) no limitation shall be put on the output of any Unit under normal and N-1 conditions;

Β) a pre-arranged complete shutdown of a generating unit or part of it, during a suitably chosen load period may be tolerated. The duration of such period must be suitably minimized in the context of System planning.

1. The System must be capable of transmitting the net flows resulting from imports or exports through interconnections with other foreign transmission system.

**Article 236**

**Special planning criteria**

1. With regard to the supply of energy to transmission substations, the System Owner’s regulations in force each time shall apply.
2. The generation units arrangement shall be such that the loss of generation capacity arising from a busbar fault shall have no serious impact on the System. The loss of generation capacity arising from a fault involving any System element shall not, to the extent possible, exceed twice the rating of the largest single generation unit on the System.

**Article 237**

**Implementation of System Reinforcement Projects**

1. The System reinforcement projects shall be assigned to the System Owner in accordance with the Transmission System Control Concession Contract. The System Owner shall be responsible for the perfect completion of such projects in accordance with the specifications in the TSDS, as well as for compliance with the implementation time schedules included in the TSDS. The System Owner shall implement the TSDS projects assigned to it assuming all relevant expenses, in accordance with the terms of its license. The cost of such projects shall be recovered by the Transmission System Operator through charges for the use of the System and shall be paid to the System Owner.
2. When the System Owner demonstrably invokes reasons of inability to comply with the project implementation time schedule in accordance with the TSDS or its funding, the Transmission System Operator may, subject to RAE’s approval, undertake itself or assign to third parties the construction of System projects, the expenses being borne either by the Transmission System Operator or third parties through self-funding, or through any other suitable method to be decided by the Transmission System Operator, subject to RAE's approval. The cost of such projects shall be recovered by the Transmission System Operator or the latter shall ensure such recovery through charges for the use of the System.
3. In any case ownership of such assets past their final delivery shall pass to the System Owner, who shall next undertake the maintenance of the project in accordance with the provisions of the Code and the construction financing method for such works shall be taken into account in the calculation of the remuneration to be paid to the System Owner.

**Article 238**

**Implementation of System Extension Projects for User Connection**

System extension projects for User Connection may be implemented either by each User or by the System Owner. In any case, a trilateral implementation Contract shall be entered into among the System Owner, the Transmission System Operator and the respective User in accordance with the Transmission System Control Concession Contract, in which express provision is made for the project parts which each party shall undertake, the respective implementation time schedules as well as testing and acceptance procedures, and the procedures for any remuneration. Upon performance of all the obligations arising from the Implementation Contract, the System Owner shall take all legal actions in order to gain ownership of the project part which is part of the System, and shall next undertake the maintenance of the project in accordance with the provisions of the Code.

**SECTION IX**

**USER INSTALLATION OPERATION AND**

**MAINTENANCE**

**CHAPTER 52**

**REGISTERED CHARACTERISTICS AND OPERATION SPECIFICATIONS FOR USER INSTALLATIONS**

**Article 239**

**User Registered Characteristics Table**

1. The Transmission System Operator shall keep in its records a Registered Characteristics Table for the installations of each User that is connected to the System. The information in the Registered Characteristics Table shall be notified to all interested parties following a relevant request, provided such request documents a lawful interest of the requesting party.
2. The Registered Characteristics Table includes data and information pertaining to the technical and operating characteristics of a User’s installations and it includes at least the information basically established in the Connection Contract in accordance with CHAPTER 55.
3. The information in the Registered Characteristics Table shall be established by the Connection Contract in accordance with Article 267.
4. The information in the Registered Characteristics Table shall be further established by the testing and acceptance of equipment in accordance with Article 255.
5. At a later time the User may submit a documented application to the Transmission System Operator for the modification of the information in its Registered Characteristics Table if imposed by technical reasons and if the suggested information is compatible with the specifications set out in CHAPTER 52. The Transmission System Operator shall decide on the application after having applied the testing and investigation procedures in accordance with CHAPTER 54.
6. The information in the Registered Characteristics Table must be compatible with the specifications established in CHAPTER 52. Where a deviation is ascertained from such specifications, the Transmission System Operator shall carry out tests and investigations in accordance with CHAPTER 54, activate the procedures provided for with regard non compliance with the terms of the Connection Contract or the Registered Characteristics and shall inform RAE to that respect.
7. Where there are serious technical reasons for which the User is unable to comply with certain specifications, it shall submit to that end a relevant exemption application to the Transmission System Operator where it shall indicate in detail the technical reasons documenting the exemption request, as well as the measures that it intends to adopt in order to comply with the specifications within reasonable time which it shall establish in its application. The submission of an exemption application does not release a User from its obligation to comply with the specifications regarding the Registered Characteristics of its installations.
8. The Transmission System Operator with a view to the technical evaluation of the capabilities of the User’s installations and to ensure reliable and efficient System operation, shall decide on the acceptance of the application within fifteen (15) days. Should such time elapse it shall be considered that the application has been rejected. Within five (5) days from receipt of the decision, the User may lodge an objection before RAE, also notifying it to the Transmission System Operator. RAE, following a motion by the Transmission System Operator presented within ten (10) days, shall decide on such objection within twenty (20) days, and notify its decision to the User and the Transmission System Operator. Should such time elapse, it shall be considered that the objection has been rejected.
9. Once an exemption has been approved in accordance with Article 282, the Transmission System Operator shall modify the information in the Registered Characteristics Table for that User. Once the time for which the exemption has been granted has elapsed, the Transmission System Operator shall proceed to the necessary controls and investigations in accordance with CHAPTER 54 and update the information in the Registered Characteristics Table for the User.
10. Where the Transmission System Operator has ascertained a systematic deviation of the information in the Techno-Economic Declaration from the respective information in the Registered Characteristics Table for the User, as well as in all other cases where data and information are collected regarding the real operation of the User’s installation beyond its Registered Characteristics, the Transmission System Operator shall launch procedures for testing, investigation and non-compliance with the terms of the Connection Contract or the Registered Characteristics in accordance with CHAPTER 54.

**Article 240**

**General design and operation specifications**

1. For the safe and reliable operation of the System to the benefit of Users, their plants and apparatus will be designed to meet the operating requirements of the System in various conditions.
2. The earthing of all User plants and apparatus and the installation of the earthing system must by made at least in accordance with the relevant standards. The following rules apply for the earthing systems:

Α) the Transmission System Operator must contact each user for the exact specifications of the earthing network to be installed;

Β) each user’s earthing devices must be earthed by direct earthing with the central substation earthing network;

* 1. each user must ensure that any fault in their plants is limited to the confines of the substation and that any dangerous voltage rise shall not be transmitted outside the earthing zone;
	2. each user guarantees that the staff working at the earthing system is properly trained for the performance of the relevant works in a safe manner.
1. The design of each user's plant and apparatus must meet the following minimum specifications for each level of voltage:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter (minimum)** |  | **150kV** |  | **400kV** |  |
|  |  |  |  |  |  |  |
| Insulation | level, |  | impulse |  | 1550 kV |  |
| voltage (1.2/50 msec) |  |  |  | with the following exceptions for |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  | 750 kV | autotransformers: |  |
|  |  |  |  |  |  |  |  | • | 1550 kV for bushings, |  |
|  |  |  |  |  |  |  |  | • | 1425 kV for windings. |  |
|  |  |  |  |  |  |  |
| Insulation | level | for | power |  | 680 kV with the following exceptions: |  |
| frequency (50Hz for 1 min) |  |  | Switches: |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | • 620 kV between phase-earth |  |
|  |  |  |  |  |  |  |  |  | and among phases |  |
|  |  |  |  |  |  |  |  | • 800 kV along open contacts |  |
|  |  |  |  |  |  |  |  | Disconnectors: |  |
|  |  |  |  |  |  |  | 325 KV | • 620 kV between phase-earth |  |
|  |  |  |  |  |  |  |  |  | and among phases |  |
|  |  |  |  |  |  |  |  | • 800 kV along the insulation |  |
|  |  |  |  |  |  |  |  |  | distance |  |
|  |  |  |  |  |  |  |  | Autotransformers: |  |
|  |  |  |  |  |  |  |  | • 680 kV for bushings |  |
|  |  |  |  |  |  |  |  | • 630 kV for windings |  |
|  |  |  |  |  |  |  |  |
| Clearance | in | air | between |  | • 3100 mm between conductor |  |
| conductors and metal parts in |  |  |
| 1550 mm |  | and metal part. |  |
| the area of outdoor Substations |  |  |
| • 4100 mm between Rod and |  |
| and | Extra-High |  | Voltage |  |  |
|  |  |  | metal part |  |
| Centers |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |
| Height of live parts above over |  |  |  |  |
| pedestrian passageways in the | 5000 mm |  | 7000 mm |  |
| area | of outdoor | Substations |  |  |
| and the Extra-High Voltage |  |  |  |  |
| Centers |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Height | of | bottom | of |  |  |  |  |
| unscreened |  | live | bushings | 2300 mm |  | 2300 mm |  |
| above ground in the area of |  |  |
|  |  |  |  |
| outdoor Substations and Extra- |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| High Voltage Centers |  |  |  |
|  |  |  |  |
| Height of live conductors | 9000 mm | 11000 mm |  |
| above roadways |  |
|  |  |  |
|  |  |  |  |

1. All control and protection cables must be equipped with a suitable metallic screen. Facilities for earthing these screens at the base of cabinets shall be provided. LV supply cable and auxiliary wiring shall be routed from the transmission substation to each User’s control building through a mutually agreed cable corridor. The cables will be laid in concrete troughs with reinforced concrete covers, or as mutually agreed, to the User’s marshalling rack, which will be situated near the Transmission Station, or in any other way established by joint agreement between the User and the Transmission System Operator.
2. The facility to lock in the open/closed position and interlocking facilities shall be provided by each User on appropriate disconnectors and/or circuit breakers (with withdraw facilities) in order to ensure that the incoming feeder(s) to the facility can be safely isolated when required by the Transmission System Operator. The specific details of this requirement will be outlined at the design phase. Existing generation stations operating in accordance with the safety rules provided for in the provisions of CHAPTER 47 must also comply with this paragraph.
3. Generation units, with installed Registered Capacity greater than 100MW shall provide onload tap-changing (OLTC) facilities for all generator transformers. Customers connected to the System are advised to provide on-load tap-changing (OLTC) facilities for all transformers connected to the System. The design specifications applied by a user for the operation of the OLTC system for transformers connected to the system are approved by the Transmission System Operator.
4. The following specifications apply to transformers installed at connection points:

Α) generator transformer windings shall be connected in star (with the neutral brought out) on the System side (high voltage side) and in delta on the generator side (low voltage).

Β) Other transformers connected to the System are connected in:

1. delta on the high voltage and in star on the low voltage side, with the neutral node brought out to terminals for resistance or direct earthing; or
2. star on both high and low voltage sides with the neutral node brought out to a terminal either for direct or resistance earthing and a tertiary winding connected in delta.
3. generating units general ancillary transformers are connected in star on the high voltage side with the neutral node brought out to a terminal for direct earthing and in delta on the medium/ low voltage side;
4. provision should be made for the earthing of the neutral of each transformer connected to the 66kV system by bringing out the neutral to a terminal for direct earthing and ensuring that the insulation is such that the transformer can be operated unearthed;

Ε) provision should be made for the earthing of the neutral of each transformer connected to the 150kV system by bringing out the neutral. The Transmission System Operator will consider on a case by case basis if the transformer is required to be operated with the 150kV neutral unearthed, and will notify the user accordingly;

* 1. extra-high voltage neutral nodes of all generator transformers connected to 400kV systems must be solidly earthed. The capability of being operated unearthed is unnecessary;
	2. the common high and extra-high voltage neutral node of 400/150/30 kV autotransformers is earthed through a circuit breaker also enabling operation without earthing of the neutral node.
1. The User shall be responsible to supply and install the circuit breaker tripping mechanism of the transformer that is connected to the System from the user transformer protection system and other apparatus. The Transmission System Operator shall provide the required settings of the tripping mechanisms for such circuit breaker due to failure concerning the User’s Connection Substation that fall within the Transmission System Operator’s scope of responsibility.

**Article 241**

**Special design and performance specifications for thermal and hydro generation units**

1. The specifications laid down in this Article apply to thermal and hydro generation units that are connected to the System. In any case a Contract shall be entered into for the Connection of Units with the System between the Transmission System Operator and a production license holder. For thermal or hydro generation units that have been connected to the System or for which Connection Contracts were signed prior to the entry into force of this Code, and which are not in compliance with the specifications of this Article and their modification is not possible, an application for exemption shall be submitted in accordance with Article 282.
2. The generation units must meet at least the following requirements:

Α) operate continuously at normal rated output at System frequencies in the range 49.5Hz to 50.5Hz;

Β) remain synchronized to the System at System frequencies within the ranges 47.5Hz to 49.5 and 50.5 to 52.5Hz for a duration of 60 minutes;

1. remain synchronized to the System at System frequencies within the range 47.0Hz to 47.5Hz for a duration of 20 seconds, whenever this is required in case the Frequency is below 47.5Hz;
2. remain synchronized to the System at System frequencies within the range 52.5Hz to 53Hz for a duration of 5 seconds, whenever this is required in case the Frequency is above 52.5Hz;
3. remain synchronized to the System during rate of change of System frequency of values up to and including 0.5 Hz per second;
4. sustained operation at the specified minimum generation within the range 49.8 to 51.0 Hz;
5. remain synchronized to the System at normal rated output at System voltages within the ranges specified in Article 213 for step changes in System voltage of up to 10%;

Η) sustained operation in accordance with the reactive power capability as required by paragraph (17) hereof at System voltages within the ranges specified in Article 213, unless otherwise agreed;

1. remain synchronized following a short circuit close to the generator during voltage dips on the HV side of the generator transformer of 95% of nominal Voltage (5% retained) for a duration of 0.2 seconds and voltage dips of 50% of nominal Voltage (50% retained) for duration of 0.7 seconds. The characteristic for nominal voltage retained versus duration synchronized in the range between 100% retained voltage and 50% retained voltage shall be a straight line between 1.5 seconds duration and 0.7 seconds duration;
2. remain synchronized to the System during a negative phase sequence load unbalance in accordance with IEC 60034-1;
3. the short circuit ratio of each Generation Unit shall be in accordance with IEC 60034-1.

3. Lignite Plants shall have the following characteristics:

|  |  |  |
| --- | --- | --- |
| Technical Minimum | not greater than 50% of registered capacity |  |
| Generation |  |  |
|  |  |  |
| Ramp-up capability | not less than 1.5% of registered capacity per |  |
|  | minute when the unit is in normal operation |  |
|  |  |  |
| Ramp-down capability | not less than 1.5% of registered capacity per |  |
|  | minute when the unit is in normal dispatch |  |
|  | operation |  |
|  |  |  |
| Minimum Up-Time | not greater than 4 hours |  |
|  |  |  |
| Minimum Down- Time | not greater than 4 hours |  |
|  |  |  |
| Forbidden Zones | not permitted for thermal units |  |
|  |  |  |
| Block Loading | not greater than 10% of registered capacity |  |
|  |  |  |
| Time off-load before going | Remain in a hot condition for at least 12 hours |  |
| into longer cold operating | Remain in a warm condition for at least 60 hours |  |
| reserve conditions |  |  |
|  |  |  |
| Time to Synchronize (from | Hot: not greater than 3 hours |  |
| instruction) | Warm: not greater than 8 hours |  |
|  |  |
|  | Cold: not greater than 12 hours |  |
|  |  |  |
| Time from Synchronizing to | Hot: not greater than 40 minutes |  |
| Minimum Generation | Warm: not greater than 90 minutes |  |
|  |  |
|  | Cold: not greater than 180 minutes |  |
|  |  |  |

4. Oil or Gas steam electric Plants shall have the following characteristics:

|  |  |  |
| --- | --- | --- |
| Technical | Minimum | not greater than 35% of registered capacity |
| Generation |  |  |
|  |  |
| Ramp-up capability | not less than 1.5% of registered capacity per |
|  |  | minute when the unit is in the normal dispatch |
|  |  | condition |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Ramp-down capability | not less than 1.5% of registered capacity per |  |
|  |  |  | minute when the unit is in the normal dispatch |  |
|  |  |  | condition |  |
|  |  |  |  |
| Minimum Up-Time |  | not greater than 4 hours |  |
|  |  |  |
| Minimum Down- Time | not greater than 4 hours |  |
|  |  |  |  |
| Forbidden Zones |  | not permitted |  |
|  |  |  |  |
| Block Loading |  | not greater than 10% of registered capacity |  |
|  |  |  |
| Time off-load before going | Remain in a hot condition for at least 12 hours |  |
| into | longer | standby | Remain in a warm condition for at least 60 hours |  |
| conditions |  |  |  |
|  |  |  |
| Time to Synchronize (from | Hot: not greater than 3 hours |  |
| instruction) |  | Warm: not greater than 8 hours |  |
|  |  |  |  |
|  |  |  | Cold: not greater than 12 hours |  |
|  |  |  |
| Time from Synchronizing to | Hot: not greater than 40 minutes |  |
| Minimum Generation | Warm: not greater than 90 minutes |  |
|  |  |  |  |
|  |  |  | Cold: not greater than 180 minutes |  |
|  |  |  |  |  |

5. Coal plants shall have the following characteristics:

|  |  |
| --- | --- |
| Technical Minimum | Minimum generation not greater than 40% of |
| Generation | registered capacity |
|  |  |
| Ramp-up capability | not less than 1.5% of registered capacity per |
|  | minute when the unit is in the normal dispatch |
|  | condition |
|  |  |
| Ramp-down capability | not less than 1.5% of registered capacity per |
|  | minute when the unit is in the normal dispatch |
|  | condition |
|  |  |
| Minimum Up-Time | not greater than 4 hours |
|  |  |
| Minimum Down- Time | not greater than 4 hours |
|  |  |
| Forbidden Zones | not permitted |
|  |  |

|  |  |  |
| --- | --- | --- |
| Block Loading | not greater than 10% of registered capacity |  |
|  |  |  |
| Time off-load before going | Remain in a hot condition for at least 12 hours |  |
| into longer standby | Remain in a warm condition for at least 60 hours |  |
| conditions |  |  |
|  |  |  |
| Time to Synchronize (from | Hot: not greater than 3 hours |  |
| instruction) | Warm: not greater than 8 hours |  |
|  |  |
|  | Cold: not greater than 12 hours |  |
|  |  |  |
| Time from Synchronizing | Hot: not greater than 40 minutes |  |
| to Minimum Generation | Warm: not greater than 90 minutes |  |
|  |  |
|  | Cold: not greater than 180 minutes |  |
|  |  |  |

1. Non-CCGT plants and internal combustion engine plants shall have the following characteristics:

|  |  |
| --- | --- |
| Technical Minimum | not greater than 10% of registered net capacity |
| Generation |  |
|  |  |
| Ramp-up capability | it must be such so that within 20 minutes from |
|  | unit synchronization it is possible to provide full |
|  | unit capacity |
|  |  |
| Ramp-down capability | it must be such so that within 10 minutes unit |
|  | capacity can drop from maximum generation to |
|  | technical minimum generation. |
|  |  |
| Minimum Up-Time | not greater than 1 hour |
|  |  |
| Minimum Down- Time | not greater than 2 hours |
|  |  |
| Forbidden Zones | not permitted |
|  |  |
| Block Loading | not greater than 10% of registered capacity |
|  |  |
| Time to Synchronize (from | 15 minutes |
| instruction) |  |
|  |  |
| Time from Synchronizing to | 5 minutes |
| Minimum Generation |  |
|  |  |

7. CCGT plants shall have the following characteristics:

|  |  |  |
| --- | --- | --- |
| Technical Minimum | not greater than 60% of registered net capacity |  |
| Generation | for 1 GT+1 ST units and 35% in all other cases |  |
|  |  |  |
| Ramp-up capability | not less than 1.5% of registered capacity per |  |
|  | minute when the unit is in the normal dispatch |  |
|  | condition |  |
|  |  |  |
| Ramp-down capability | not less than 1.5% of registered capacity per |  |
|  | minute when the unit is in the normal dispatch |  |
|  | condition |  |
|  |  |  |
| Minimum Up-Time | not greater than 4 hours |  |
|  |  |  |
| Minimum Down- Time | not greater than 4 hours |  |
|  |  |  |
| Forbidden Zones | not permitted |  |
|  |  |  |
| Block Loading | not greater than 10% of registered capacity |  |
|  |  |  |
| Time off-load before going | Remain in a hot condition for at least 12 hours |  |
| into longer standby | Remain in a warm condition for at least 60 hours |  |
| conditions |  |  |
|  |  |  |
| Time to Synchronize (from | Hot: not greater than 3 hours |  |
| instruction) | Warm: not greater than 8 hours |  |
|  |  |
|  | Cold: not greater than 12 hours |  |
|  |  |  |
| Time from Synchronizing to | Hot: not greater than 40 minutes |  |
| Minimum Generation | Warm: not greater than 90 minutes |  |
|  |  |
|  | Cold: not greater than 180 minutes |  |
|  |  |  |

1. Thermal and hydro plants with a registered capacity of at least 100MW must meet the following operating reserve requirements::

Α) Each generation unit must have primary frequency control capability. The controller droop shall be adjustable according to the specifications of the Transmission System Operator. They must provide primary operating reserve expressed in MW output not less than 3% of the registered capacity in the range of 50% to 97% of the registered capacity, with such provision that in the range of 97% to 100% registered capacity, primary operating reserve shall not be less than that indicated by a straight line with fixed slope from 3% of registered capacity at 97% output to 0% at 100% output. The production license holder must be capable of activating, within 30 seconds, the total primary operating reserve requested at a quasi-steady frequency deviation of ±200mHz and of maintaining supply for at least 15 minutes. The primary operating reserve must be available again 15 minutes after activation assuming that the reference frequency has been attained again;

Β) they must provide for a secondary operating reserve expressed in MW output not less than XX% of the registered capacity in the range of 50% to (100-XX)% of the registered capacity, with such provision that in the range of (100-XX)% to 100% registered capacity, secondary operating reserve shall not be less than that indicated by a straight line with fixed slope from XX% of registered capacity at (100-XX)% output to 0% at 100% output. XX% shall be set to 40% for Hydro Units, 15% for CCGT units, and to 3% for other thermal units;

* 1. they must provide for a tertiary operating reserve expressed in MW output not less than 10% of the registered capacity in the range of 50% to 90% of the registered capacity, with provision that in the range of 90% to 100% registered capacity tertiary operating reserve shall not be less than that indicated by a straight line with fixed-slope from 10% of registered capacity at 90% output to 0% at 100% output;
	2. they must provide for non-spinning reserve expressed in MW output not less than the technical minimum generation increased by 25% of registered capacity.
1. The Transmission System Operator may request generation units greater than or equal to 60MW to have the capability to operate under AGC at all loads between AGC Minimum Load and AGC Maximum Load.
2. Users shall not change unit load-frequency or governor control settings without agreement with the Transmission System Operator.
3. The generation units operating characteristics shall be registered in the Transmission System Operator records. These units shall operate in consistency with their type and model, ensuring maximum operating flexibility, in accordance with good industry practice. Where appropriate, operating characteristics and in particular start times, should be registered separately for normal and planned starts, and for starts required under system emergencies, such as following the loss of a generation unit. Production license holders shall maintain operational procedures and practices, which ensure immediate response dispatch instructions in accordance with the technical capabilities of the generation plant.
4. Production license holders shall upon a relevant request cooperate with the Transmission System Operator in the development of procedures and facilities to improve the response of each generation unit during system emergencies. These particularly include automatic start up of fast-start generation units following a loss of generation unit(s) or in advance of an anticipated loss of generation unit(s). Production license holders are required to inform the Transmission System Operator providing full documentation where the above procedures are not consistent with secure operation of their units.
5. Where start-up time of a generation unit exceeds thirty (30) minutes, it shall be designed to have the capability, where supply from the System is lost, to reduce output to match auxiliary load.
6. Synchronizing operations shall be performed by production license holders at circuit breakers identified by the Transmission System Operator. These circuit breakers, depending on the unit, shall include the generation unit circuit breaker and the HV and LV transformer circuit breakers. The Transmission System Operator will provide signals to the production license holder regarding plant and apparatus in operation, to facilitate synchronizing on the generator transformer HV circuit breaker, in accordance with the relevant provisions of the connection contract.
7. The synchronizing facilities set out in this Article shall facilitate synchronizing under the following conditions:

Α) System frequency within the limits 48.0 to 52.0 Hz; and

Β) System voltage within the limits specified in Article 213, and paragraph (17) hereof.

1. Each generation unit shall be designed to mitigate the risk of common mode failure with other generation units. In particular each generation unit shall be designed so that it can operate with its essential auxiliaries supplied through a unit transformer which shall be connected between the generation unit circuit breaker and the generator transformer LV busbar terminals, or from another backup source as agreed between the Transmission System Operator and the production license holder. Auxiliary supplies may be taken from an alternative source during plant commissioning, testing, start-up or emergencies, always in accordance with good industry practice. In the case of a CCGT module this applies to the combustion turbine units only.
2. The following shall apply to the reactive power generation capability:

Α) Each Generation Unit shall have the following Reactive Power capability as measured at the generator terminal busbars:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Voltage | Network | At Maximum | At 35% of Maximum |  |
| Range | Continuous Rating | Continuous Rating |  |
|  |  |
|  |  |  |  |  |
| 140kV to |  | 0.93 power factor | 0.7 power factor |  |
| 163kV |  | leading to 0.85 power | leading to 0.4 power |  |
|  | 150kV | factor lagging | factor lagging |  |
|  |  |  |  |
| 125kV to | power factor 1.00 to | 0.7 power factor |  |
|  |  |
| 140kV |  | 0.85 lagging | leading to 0.4 power |  |
|  |  |  | factor lagging |  |
|  |  |  |  |  |
| 360kV to |  | power factor 0.93 | 0.7 power factor |  |
| 420kV |  | leading to 0.85 lagging | leading to 0.4 power |  |
|  | 400kV |  | factor lagging |  |
|  |  |  |  |
| 350kV to | power factor 1.00 to | 0.7 power factor |  |
|  |  |
| 360kV |  | 0.85 lagging | leading to 0.4 power |  |
|  |  |  | factor lagging |  |
|  |  |  |  |  |

Β) for load levels of a particular generation unit between maximum continuous rating and 35% of maximum continuous rating, MVAr reactive power capability may not be less than indicated by a straight line drawn between the two points derived from the values above, on a plot of MVAr capability against MW output;

1. for load levels of a particular generation unit below 35% of maximum continuous rating, MVAr reactive power capability may not be less than that at 35% of maximum continuous rating ;
2. the generation unit transformer shall have nominal rating to allow reactive power supply and/ or absorption over the full range of System voltages, as specified in indent (A) of this paragraph;

Ε) the Transmission System Operator and the production license holder shall cooperate at the design stage to resolve any issues that might arise in the application of this paragraph .

1. Each generation unit shall be equipped with a fast analogue speed governor and a unit load controller or equivalent control device to provide frequency response under normal operating conditions. The speed governor design and operation at normal regulation shall be between 3% and 5% and shall be made in accordance with the relevant European Standards or, otherwise, in accordance with the relevant standards generally applied in the European Union, as in force at the time of the design of the plant of which it forms part .
2. All generation units shall be capable of contributing to the control of System voltage by continuous modulation of the unit voltage by means of a suitable continuously acting Automatic Voltage Regulator (AVR), in accordance with the relevant standards as determined by the Transmission System Operator and the characteristics accepted by the latter prior to the connection date. The Transmission System Operator may not accept some characteristics recommended by a particular user following a reasonably justified decision.
3. Unit transformers shall have on-load tap changing facilities. The tap step may not alter the voltage ratio at the terminals by more than 2.5% on the 150kV System and 1.6% on the 400kV System, unless otherwise agreed with the Transmission System Operator.
4. Generation units with a registered capacity greater than 100MW shall have a generator protection function with a fault clearing time of greater than 200ms, or the duration to be determined by the Transmission System Operator based on local conditions. During this time and after the fault is cleared, the generation unit maintains synchronized and pole-slipping does not occur. Production license holders must prevent instability or disconnection of the unit from the System throughout the operating range due to short circuit close to the unit, when the system short circuit power following fault clearing at the System and System connection plant exceeds six times the nominal active power of the unit. The auxiliary supply may not be automatically redirected to reserve supply connections under these circumstances.

**Article 242**

**Design and operational requirements for wind turbines and wind power plants**1. For system safety and reliability issues, design specifications and operation of wind turbines and wind power plants connected to the System either directly or through the distribution network are set out in the Annex "Technical Requirements for Wind Stations". This Annex is drawn up by the System Operator and approved by RAE.

2. These specifications relate to at least the following:

A) frequency and voltage limits for mandatory functionality

B) Mandatory possibility voltage regulation

C) voltage regulation requirements, reactive power and power factor

**Article 243**

**User installation protection and power quality**

1. Every user shall be responsible for ensuring that faults on plant and apparatus cause minimal disturbance to the System. Faults on plant and/or apparatus connected to the system should be cleared as soon as possible. The maximum period for fault clearance is set as follows:

Α) 120 msec for the 150 kV System; and Β) 80 msec for the 400 kV System.

1. These clearance times concern primary protection systems only. At the latest until connection to the System, Users shall install and maintain, in accordance with good industry practice, the protection equipment specified in this Article.
2. Subject to the prior approval of the Transmission System Operator, the User must install the protection equipment at plants and apparatus against System disturbances, as deemed appropriate. The Transmission System Operator shall set the requirements deemed appropriate for the protection of System installations, also taking into account users plant protection.
3. Minimum protection requirements for each User’s plant connected to the System may vary depending on the type, size, earthing and connection method. The Transmission System Operator must operate the User protection installations throughout the operation of the connected plant.
4. High speed automatic reclosing (HSAR) characterized by the sudden re-activation of the power supply after a dead time of approximately 600 milliseconds on the 400kV system and 500 milliseconds on the 150kV system is a feature of the System operation. All tripping and high speed reclosing on the 150kV and 66kV Systems is threepole.
5. It is recommended that Users take precautions against disturbances on the System including without limitation protection against:

Α) load unbalance (negative sequence) protection; Β) over or undervoltage;

* 1. under or over-frequency;
	2. a combination of the previous two cases that may result in overexcitation; and Ε) high-speed automatic reclosing (HSAR), where applicable.
1. Settings for a User's protection systems that may have an operational effect, shall be notified to the Transmission System Operator. The Transmission System Operator may prohibit the settings of some user protection systems within certain ranges, based on such criteria as assuring secure System operation, the perfect cooperation between protection systems and the identification of faults per area, namely System, Distribution Network and User faults, and especially of the following protection systems:

Α) generation unit under-frequency, overcurrent, or distance protection; Β) transformer overexcitation, over-current, or distance protection; and

* 1. Loss-of-Mains protection.
1. A mechanism for the notification, approval and determination, of such settings will be set out in the user's connection contract or other agreements.
2. The Transmission System Operator shall provide to the user the information and signals necessary for the interface coordination and operation of the user’s protection equipment, in accordance with the relevant provisions of the connection contract or other agreements, and the provisions of this Article. .
3. Where possible, the Transmission System Operator shall provide circuit breaker failure protection on System Connection Point circuit breakers installed in new transmission substations.
4. Production license holders must provide:

Α) differential protection on the generator transformer. The connections between the connection point circuit breaker and the HV terminals of the unit transformer shall be included in the protected zone of above differential protection ;

Β) backup protection to the System on generation units. The Transmission System Operator shall reasonably require the installation of generator overcurrent protection, voltage controlled generator overcurrent protection or unit distance protection, or a combination of the above from production license holders;

C) under-frequency protection;

* 1. generation Unit loss of excitation protection.
1. The Transmission System Operator may require production license holders, to install additional protection schemes, where reasonably considered appropriate. Such schemes include the following:

Α) generation unit overvoltage/ undervoltage protection; Β) generation unit overfrequency protection;

* 1. generation unit transformer neutral displacement voltage detection;
	2. loss-of-mains protection (rate of change of frequency or vector shift); and Ε) generation unit pole slip protection.
1. Regulation of protection regarding faults within the Transmission System Operator’s scope of responsibility, acting on the connection point circuit breaker of generator transformers shall be provided by the Transmission System Operator
2. The Distribution Network Operator shall provide differential-protection on System connected transformers. The Transmission System Operator may require the Distribution Network Operator to install additional protection schemes, where reasonably considered necessary. Such schemes include the following:

Α) directional overcurrent protection or distance protection on User’s transformer;

Β) direct intertripping between the grid connection point circuit breaker and the User connection point circuit breaker;

1. neutral voltage displacement protection on HV side of User’s transformer;
2. Loss-of-Mains protection;

Ε) over or undervoltage protection;

1. under or over-frequency protection;
2. differential protection on distribution lines or cables;

Η) distance protection on the user connection point circuit breaker on distribution lines or cables;

I) bus zone protection on 150 kV distribution busbars; and

* 1. teleprotection channels for use with distance protection between the System connection point circuit breaker and User connection point circuit breaker .
1. Regulation of distance protection or over-current protection shall be provided by the Transmission System Operator on System connection point circuit breakers.
2. System connected Customers shall provide differential-protection on System connected transformers. Additional protection schemes may be installed by System connected customers, following a documented request by the Transmission System Operator. Such schemes include the following:

Α) directional overcurrent protection or distance protection on System connected transformers when the user system contains embedded generation;

Β) neutral voltage displacement protection on HV side of System connected transformers when the user system contains embedded generation;

Γ) loss-of-mains protection when the user system contains embedded generation;

∆) under/over voltage protection when the user system contains embedded generation;

Ε) under/over frequency protection when the user system contains embedded generation.

1. Users shall ensure that their connection to the System does not result in distortion or fluctuation of the supply voltage at the connection point, exceeding the relevant limits. Distortion and fluctuation limits are outlined in IEC/TR3 61000-3-6 (Harmonics) and IEC/TR3 61000-3-7 (Voltage fluctuation). The Transmission System Operator may allocate different distortion and fluctuation limits at connection points by a documented report. Users shall also operate their plant in a manner which will not cause the requirements contained in CENELEC Standard EN 50160 to be breached.
2. The hourly average power factor (APF) for a System Connected Customer is calculated in accordance with the following formula:

|  |  |  |
| --- | --- | --- |
| ΜΣΙ = | *En* |  |
| ( *En* ) 2 +( *Qn*)2 |  |



where:

En is the active power supplied to the System connected customer for the specific hourly period;

Qn is the reactive power supplied to the System connected customer for the same hourly period

1. Each System connected user shall ensure that, at any load above 50% of maximum import capacity, the hourly average power factor as determined at the Connection Point in any hourly period shall be within the range 0.95 lagging to unity. In case of leading load, namely reactive power injection to the System, the hourly average power factor must not exceed 0.98.

**Article 244**

**Power supplies**

Each user shall provide:

Α) 400 V ac / 230 V ac power supplies as required by the Transmission System Operator for transmission substation facilities. The capacity and other details shall be specified by the Transmission System Operator and provided for in the connection contract;

Β) a standby supply for all AC power supplies for transmission substation facilities by a diesel generator, unless otherwise agreed with the Transmission System Operator. The Transmission System Operator must provide reasonable grounds for its refusal to agree to a different manner of ensuring standby supply. In the event of loss of mains, standby supplies shall be capable of being sustained for a minimum of 10 hours.

**Article 245**

**User provided signals**

1. Each User must provide signals and indications about their installations and machinery as the Transmission System Operator may reasonably require in accordance with the Connection Contract.
2. The signals and indications that Users must provide include but are not limited to the following:

Α) MV circuit breaker positions for each transformer connected to the System, through two auxiliary contacts off voltage (one open and one closed under normal conditions when the circuit breaker is open) for each circuit breaker;

Β) voltage at the transformer's MV terminals; and

* 1. at least four auxiliary contacts off voltage, that under normal conditions shall be closed on the MV side of each transformer to indicate faults.
1. More specifically, production license holders are required to provide the following signals:

Α) MW and ±Mvar at the generator terminals of each generation unit; Β) voltage at the MV terminals of each unit transformer;

* 1. unit transformer tap position.
1. If the signals or indications that Users must provide in accordance with this Article are not available or in line with the applicable specifications due to failure or insufficiency of the User’s equipment, the User must in accordance with good professional practice immediately restore or correct such signals and indications.
2. The signals provided by a user shall be transmitted in the form established in the connection contract.
3. Where the Transmission System Operator has decided that due to a modification in the System in order to meet a System requirement there is need for supplementary signals or indications relating to the User's plant and machinery, they must inform the User, who shall immediately and in accordance with good professional practice ensure the availability of such supplementary signals or indications.
4. At transmission substations and at the installations of HV or MV Customers, cabinets shall be placed in a suitable area to for connection and adaptation with the Transmission System Operator's equipment.
5. The supply and maintenance of wiring and signaling, as well as of the device in the interconnection room of the unit, of the Distribution Network Operator and of Customers connected to HV or MV shall be their responsibility. The Transmission System Operator shall provide the cables for connection to the connection and adaptation cabinets.

**Article 246**

**Additional equipment**

1. Production license holders, the Distribution Network Operator, and System connected Customers must make available the necessary equipment and be electronically interconnected with the Transmission System Operator having at the same time made provision for the uninterrupted supply of energy at their own expenses. Such equipment shall be used only for communication with the Transmission System Operator.
2. The users under the previous paragraph must make available the necessary telephone and telefax equipment, having at the same time made provision for the uninterrupted supply of energy at their own expenses. They must also have at least two telephone connections with the PSTN and at least on telefax connection through such network.
3. The Transmission System Operator may provide to such Users connection to the telephone system it owns, which shall be only used for operating purposes by an authorized person, as provided under this Code.

**Article 247**

**Access to equipment**

No access is allowed to unauthorized persons to the metering equipment, the SCADA, the computers and the telecommunications equipment connected with the Transmission System Operator. The Transmission System Operator may have access to such equipment for maintenance, testing or signal reception purposes. Details regarding access to such equipment are established in the instructions issued by the Transmission System Operator.

**Article 248**

**Clock setting**

Time shall be set using the devices established by the Transmission System Operator and shall be the reference for all System or User apparatus, which must operate in a synchronized manner. Such time shall be transferred to the respective System or User apparatus in order to achieve their synchronized operation.

**Article 249**

**Special rules regarding the operation of User installations**

1. Each user shall prepare a site operation regulation.
2. The Transmission System Operator shall issue operation instructions for each user site, including, but not limited to:

Α) detailed switching sequences, in accordance with the requirements of the safety rules for faults or emergencies;

Β) control and operation procedures;

* 1. identification of operational boundaries;
	2. identity of the Transmission System Operator and user representatives to be provided with access to the transmission substation or facility for operation and during emergencies.
1. The terminology and nomenclature used with regard to a User's installations and apparatus that connect to the System must use the standardized terminology of the Transmission System Operator. The Transmission System Operator may approve deviations from this rule following a documented User request.
2. Each User must procure, install and maintain clear and legible signs indicating the terminology and nomenclature of the installations and apparatus at its site.

**Article 250**

**Security responsibility**

1. Users must cooperate with the Transmission System Operator to develop detailed procedures and achieve agreement on each issue relating to the security in all their installations and in particular their connection equipment.
2. The installation operation regulation details the responsibility of persons carrying out works in or tests on the User's connection installations and on circuits that cross with such installations at any point, in accordance with the provisions of this Code.

**CHAPTER 54**

**MONITORING, TESTING AND INVESTIGATION**

**Article 254**

**Scope**

1. To ensure economic and secure System operation, the Transmission System Operator must monitor, perform control tests on and investigate the performance of User installations in order to be able to verify if their operation meets the design, operation and connection requirements as these are established in the Registered Characteristics Table, connection contracts, Ancillary Service Contracts, Supplementary System Energy Contracts, Cold Reserve Contracts, and in all other specific agreements between Users and the Transmission System Operator.

2. Monitoring, testing and control shall mean in particular:

Α) evaluation of the operation of generation units in accordance with Dispatch Instructions;

Β) assessment of compliance on the part of production license holders with Availability Declarations, CATs, the Ancillary Service and Supplementary System Energy provision capability, Registered Characteristics, Declared Characteristics, and all other information registered pursuant to this Code;

* 1. assessment of compliance with the IEC standards on energy quality, and in particular IEC/61000-3-6 and IEC/61000-3-7 standards;
	2. assessment of compliance on the part of Users with the protection requirements and the respective arrangements provided for in this Code, connection contracts and in all other specific agreements between Users and the Transmission System Operator.
1. The provisions of this Chapter shall apply to Units in the Unit Register, as well as to all other generation units with a registered net capacity over 10 MW in a position and to System connected Customers.

**Article 255**

**Equipment test and commissioning**

1. The connection contract sets out the equipment test and commissioning procedures, including commissioning test and operating code tests. .
2. Users shall carry out the necessary tests in order to confirm that the plant and apparatus meet all requirements, effect on the operational date. In order to ensure design and operational compliance, the Transmission System Operator may carry out or cause the user to carry out particular tests. It is the responsibility of users to ensure successful tests and operation, in accordance with the provisions of this Code.
3. Where test and commissioning is likely to involve a requirement for dispatch instruction for test purposes, the user shall immediately notify the Transmission System Operator of this requirement, including reasonable details as to the duration and type of testing required. This information shall be indicative. Users shall give the Transmission System Operator reasonable notice at least fifteen (15) Business Days prior to the date of carrying out of the commissioning tests. The date of such commissioning shall be confirmed at least three (3) business days before the time of carrying out such tests. In the event that, having given such confirmation the user reasonably determines that such tests must be carried out prior to the date agreed, the User shall give the Transmission System Operator reasonable notice. The user must promptly notify the Transmission System Operator in relation to any material change to the requirements and details of the tests.
4. Commissioning tests requiring the issue of a dispatch instruction shall only be carried out following the issue of the dispatch instruction and subject to it.
5. In order to carry out commissioning tests requiring the issue of a Dispatch Instruction, the user shall submit a written request to the Transmission System Operator, which shall include the following information:

Α) details of the proposed commissioning test;

Β) proposal in relation to the dispatch instruction considered necessary by the user for the carrying out of the test, including the duration of the dispatch instruction;

1. where the user may not know the number of operating tests required for completion of the commissioning test, then the User, when proposing the test, shall:
	1. divide the commissioning tests into sections;
	2. indicate and discuss which sections of the tests can be completed in stages and which cannot; and
	3. indicate possible variations of the tests for the sections which can be completed in stages.

Factors which might influence the completion of the stages and especially procedures to be followed if a certain stage depends on the outcome of the previous one, shall be notified to the Transmission System Operator.

D) proposal in relation to the time or times for the tests

Ε) The milestones for individual sections of the tests which can be completed separately, and need not be repeated if the test is interrupted by the Transmission System Operator after completion of a section.

1. Following the connection date but not later than the operational date Users shall verify the technical data provided under the provisions of CHAPTER 55and other technical data which the Transmission System Operator reasonably requires to be verified to assess compliance with the provisions of this Code or the connection contract. In order to verify such data, the users shall provide the Transmission System Operator with the evidence reasonably required, including the results of the commissioning tests or such other tests provided for in this Code.
2. Based on the values verified under this Article, the user’s Registered οperating Characteristics shall be modified.

**Article 256**

**Monitoring**

1. The monitoring process is continuous and is carried out by data recording, checks and analysis, in accordance with the methods as the Transmission System Operator shall reasonably determine are appropriate in the circumstances or mutually agreed with users.
2. Monitoring is performed without advance notification from the Transmission System Operator to Users. Where a data recording and analysis system is used for monitoring, the Transmission System Operator shall inform the User that such data recording and analysis system is being used and shall make available all necessary information.
3. Monitoring may be carried out at any time. The Transmission System Operator may, based on the monitoring results and without the application of further testing, determine noncompliance of a certain user. Where the user disputes a finding of non-compliance, the Transmission System Operator shall provide the user with any data collected during monitoring, which document noncompliance.
4. Performance parameters monitored include:

Α) compliance with dispatch instructions;

Β) compliance with declarations in respect of primary, secondary and non-spinning operating reserve, and frequency control provided by each generation unit, in order to confirm consistency with the declared governor droop;

1. compliance with IEC Power Quality standards;
2. provision of static and dynamic reactive power; . Ε) monitoring systems and procedures.

**Article 257**

**Testing**

1. Testing involves attendance by the Transmission System Operator at user sites in order to carry out tests in accordance with the Transmission System Operator dispatch instructions or other procedures specified. The results of a test may be derived from the monitoring of performance during the test.
2. Tests may be carried out in order to determine that a user is complying with its connection contract conditions, registered operating characteristics and declarations. .
3. When carrying out tests, the Transmission System Operator may:

Α) for the purposes of testing, issue dispatch instructions;

Β) induce controlled power system frequency or voltage conditions or variations for the purpose of determining that the generation unit’s response is in accordance with its declared availability, ancillary service capabilities and operating characteristics;

* 1. carry out on-site tests in accordance with the provisions of this Chapter, having given the User at least three business days advance notice .
1. The Transmission System Operator may assign on-site tests to a third person, following agreement of the user subject to testing.
2. Three (3) business days prior to a certain test, the Transmission System Operator shall notify the User of the testing procedure to be followed. In case of the first application of a test procedure, an advance notice of seven (7) business days shall be given. Five (5) business days prior to the execution of a test, the user, in accordance with good industry practice, may raise documented objections, on the grounds that there will be a material risk to the safety of the user's plant or personnel, or that the proposed procedure is technically infeasible or inappropriate to the purpose, The Transmission System Operator shall, as it considers necessary, modify the procedure, taking the user’s objections into account.
3. Users must cooperate with the Transmission System Operator to perform control tests and provide all relevant information and additional assistance the Transmission System Operator may request to that end.
4. The Transmission System Operator shall treat information collected during monitoring and testing as confidential, in accordance with the provisions of this Article.
5. Where the user calls for a test, the user will pay for the costs of the test. Where the Transmission System Operator calls for a test, the user will provide to the Transmission System Operator an estimate of the costs. Transmission System Operator shall pay the direct costs of that test if in agreement with the estimate, otherwise costs shall be established by an independent firm. Costs established by an independent firm shall be charged to both parties on a pro rata of the deviation of their estimate of the test costs from the costs established by such independent firm. The User shall cover the costs of tests entirely if these are required due to problems that have been demonstrated to be caused to the operation of the System due to the operation of such User' s plant.

**Article 258**

**Black Start Test**

1. The Transmission System Operator may require for black start test either while the unit remains connected to an external electrical supply or while it is disconnected from it.
2. Black Start test may be carried out on more than one units and may not, in the absence of exceptional circumstances, affect any other unit.
3. Black start tests may not be carried out more than once each year in respect of any particular unit unless the necessity for further tests or re-test can be reasonably justified.
4. The Transmission System Operator shall notify the users at least seven (7) business days prior to the time of the black start test with details of the proposed black start test.
5. All black start tests shall be carried out in the presence of representatives of the Transmission System Operator, who shall be given access to all information relevant to the black start test.
6. Should synchronization of a certain generation unit in the System not be achieved within the required time for the start of the auxiliary gas turbines or the auxiliary diesel engine in accordance with Article 97, it is considered that the unit black start test has failed.
7. In the event of a start-up test failure, the user is required within five (5) business days to submit to the Transmission System Operator a written report detailing the reasons for failure detected. Should the Transmission System Operator and the user disagree on the reasons behind such failure, the user may request the repetition of the start-up test, following a notification 48 hours prior to the test. The test shall be repeated in accordance with the procedure agreed upon for the initial test.
8. Should it be ascertained that such failure was due to the fact that the station does not have a real start capability with the System being off voltage, the user is required to submit to the Transmission System Operator within 15 days a proposal for restoring the station to a black start capable status with the System being off voltage on a specific date and at a specific time. The Transmission System Operator may approve such proposal or ask the user to proceed to the modifications considered necessary.

**Article 259**

**Investigation**

In order to ascertain User installation or apparatus compliance with the design, operation or connection requirements, established in this Code, the Registered Characteristics Table, connection contracts, Ancillary Service Contracts, Supplementary System Energy Contracts, Cold Reserve Contracts and in all other specific agreements between the Transmission System Operator and Users, the Transmission System Operator is entitled to carry out investigations to collect information not normally collected using the monitoring or control tests method.

**Article 260**

**Non-compliance with the terms of the Connection Contract or the Registered Characteristics**

Should the Transmission System Operator estimate that a certain generation unit does not operate in compliance with the terms and conditions of the connection contract, or the registered operating characteristics, he ought to notify the user to that respect. The user is required to take all necessary actions to restore the unit operation in accordance with the terms and conditions of the connection contract and the registered operating characteristics. The Transmission System Operator is, in this case, entitled to place the user’s installation and devices off voltage.

**CHAPTER 55**

**PROVISION OF USER INFORMATION**

**Article 261**

**Data submission by Users or prospective Users**

1. This Chapter specifies data to be submitted to the Transmission System Operator by Users or prospective Users of the System as is provided for in the procedure for connection to the System under SECTION XII, as well as in all cases of changes to such data.
2. The data that all users must submit are:

Α) full name of the user; Β) address of the user;

1. contact person;
2. telephone number; Ε) telefax number;
	1. e-mail address.
3. The data that all users must submit for new connections are: Α) Projected Operational Date;

Β) Projected Connection Date;

* 1. reliability of connection requested subject to system security and reliability standards;
	2. 1:50.000 map, with the location of the facility and the coordinates of connection substation clearly marked;

Ε) Geographical Army Service map indicating the geographical coordinates of the connection substation lot;

1. a plan of the site, 1:200 or 1:500, of the proposed facility, in hard copy or digitized format, indicating the proposed location for the transmission substation, location of the connection point, transformers, site control buildings and all other necessary information;
2. an electrical single line-diagram of the proposed facility detailing all significant items of plant in hard copy or possibly digitized format;

Η) Users submitting applications only for generation, are required to provided data concerning any possible production licenses granted to them or relevant applications they have submitted, as well as data concerning the license or license applications for the construction or reconstruction of a generation station with which connection is pursued .

**Article 262**

**Production license holder data**

1. Each production license holder shall submit to the Transmission System Operator detailed information as required to design, construct and operate the System.
2. The general data that must be submitted by production license holders are:

Α) station name;

Β) number of generation units;

1. Primary Fuel Type / Prime Mover;
2. secondary fuel type;

Ε) Generation Export Connection Capacity Required in MW.

1. Minimum requirements for generator operating conditions are specified in CHAPTER 52.
2. For thermal units, a functional block diagram of the main plant components, showing boilers, heat exchangers, any heat or steam supplies to other processes etc. indicating single shaft or multiple shaft configuration.
3. For each individual generation unit the following data shall be provided:
	* Unit number
	* Registered capacity in MW
	* Nominal Maximum Continuous Generation Capacity in MW
	* Nominal Maximum Net Capacity in MW
	* Unit auxiliary load in MW;
	* Unit auxiliary load in MVAr;
	* Overload capacity (gross) in MW
	* Overload capacity (net) in MW
	* Nominal Minimum Continuous Generating Capacity (gross) in MW
	* Nominal Minimum Continuous Generating Capacity (net) in MW
	* Generator rating (MVA base) in MVA
	* Nominal Maximum Lagging Power Factor in Cosφ or MVAr
	* Nominal Maximum Leading Power Factor in Cosφ or MVAr
	* Governor Droop (R)
	* Forbidden zones in MW
	* Terminal Voltage adjustment range in kV
	* Short Circuit Ratio
	* Rated Stator Current in Amps
	* Capability Chart showing full range of operating capability of the generator including thermal and excitation limits
	* Open Circuit Magnetization Curves
	* Short Circuit characteristic
	* Zero power factor curve
	* V curves
	* Time to synchronize from hot condition in hours
	* Time to synchronize from cold condition in hours
	* Time to synchronize from warm condition in hours
	* Block loading in MW
	* Soak Time in hours
	* Time from Synchronizing to Minimum Generation (hot condition) in hours
	* Time from Synchronizing to Minimum Generation (warm condition) in hours
	* Time from Synchronizing to Minimum Generation (cold condition) in hours
	* Minimum up-time in hours
	* Minimum down-time in hours
	* Ramp-up capability in MW / min
	* Ramp-down capability in MW / min
	* Loading rate in MW / min
	* Deloading rate in MW/ min
	* End Point of Start-up Period in MW
	* Generator capability to start on either fuel
	* Ability to change fuel on-load
	* Available modes (lean burn, etc.)
	* Time to change modes on-load
	* Control range for AGC operation in MW
	* Other relevant operating characteristics not otherwise provided
	* Primary Spinning Reserve
	* Secondary Spinning Reserve
	* Tertiary non-spinning reserve
	* Details of reserve capability of the generator in different operating modes, such as unit coordination, turbine follow, recirculation, base load
	* Possible available reserve with the unit off load.
4. The following data may be required for generators::
	* Direct axis Synchronous reactance as % on rating
	* Direct axis Transient reactance saturated as % on rating
	* Direct axis Transient reactance unsaturated as % on rating
	* Sub-transient reactance unsaturated as % on rating
	* Quad axis Synchronous reactance as % on rating
	* Quad axis Transient reactance unsaturated as % on rating
	* Negative Phase Sequence Synchronous reactance as % on rating
	* Zero phase sequence reactance as % on rating
	* Turbine generator Inertia constant for entire rotating mass in MW s/MVA
	* Stator resistance (Ra) as % of rating
	* Stator Leakage reactance as % on rating
	* Poiter reactance as % on rating
	* Direct axis open Circuit Transient (Tdo’) in Sec
	* Direct axis open Circuit sub-Transient (Tdo’’) in Sec
	* Quad axis open Circuit Transient (Tqo’) in Sec
	* Quad axis open Circuit sub-Transient (Tqo’’) in Sec
	* Direct axis short Circuit Transient (Td’) in sec
	* Direct axis short Circuit sub-Transient (Td’’) in sec
	* Quad axis short Circuit Transient (Tq’) in sec
	* Quad axis short Circuit sub-Transient (Tq’’) in sec.
5. The following parameters or a Laplace-domain control block diagram in accordance with IEEE standard excitation models, or as otherwise agreed with Transmission System Operator, completely specifying all time constants and gains to fully explain the transfer function from the compensator or generator terminal voltage and field current to generator field voltage must be supplied as follows: :
	* Excitation system type (AC or DC)
	* Excitation feeding arrangement (solid or shunt)
	* Excitation system Filter time constant (Tr) in sec
	* Excitation system Lead time constant (Tc) in sec
	* Excitation system Lag time constant (Tb) in sec
	* Excitation system Controller gain (Ka)
	* Excitation system controller lag time constant (Ta) in sec
	* Excitation system Maximum controller output (Vmax)
	* Excitation system minimum controller output (Vmin)
	* Excitation system regulation factor (Kc)
	* Excitation system rate feedback gain (Kf)
	* Excitation system rate feedback time constant (Tf) in sec.
6. A Laplace-domain control block diagram must be supplied in accordance with IEEE standard prime mover models for thermal and hydro units, or as otherwise agreed with Transmission System Operator, completely specifying all time constants and gains to fully explain the transfer function for the governor in relation to frequency deviations and setpoint operation.
7. An additional Laplace domain control diagrams for any outstanding control devices or special protection relays in the generating unit, must be supplied, for discrete control apparatuses or special generation unit protection relays, which automatically impinge on its operating characteristics within 30 seconds following a system disturbance and which have a minimum time constant of at least 0.02 seconds.
8. The following data are required for hydro units:

Α) Reservoir Capacity in volume (m3) and energy (MWh) Β) Special consumption in MWh/m3

* 1. upper and lower level management limit
	2. diagram showing level change per MWh generated for different levels
1. The following data are required for pumping units:

Α) Downstream Reservoir Capacity (MWh pumping) Β) Max Pumping Capacity in MW

* 1. Min Pumping Capacity in MW
	2. Efficiency (generating / pumping ratio) as a %
1. With regard to Wind Turbine Generators and asynchronous generator excitation devices the following data must be supplied:

Α) A statement whether turbines are Fixed Speed or Variable Speed

Β) Manufacturer details on electrical characteristics and operating performance with particular reference to Flicker and Harmonic performance

1. Details of the anticipated operating regime of generation, i.e. continuous, seasonal or other
2. The anticipated maximum net capacity level in MW for each calendar month, and indicate how generation would vary over a typical 24 hour period during the month of maximum net capacity

Ε) Details of expected rapid or frequent variations in output, including magnitude, max rate of change expected, frequency and duration.

1. Particularly for asynchronous generator excitation devices the following data shall also be supplied:

Α) the way in which the generator is run up to synchronous speed Β) magnitude of inrush / starting current in Amps

1. duration of inrush / starting current in Ms;
2. starting / paralleling frequency in Hz;

Ε) power factor on starting;

* 1. reactive power demand at zero output ('no load') in KVar;
	2. details of reactive power compensation to be installed
1. The following data are required for Generator Transformers: Α) Number of windings

Β) Vector group

* 1. Rated current of each winding in Amps
	2. Transformer Rating in MVATrans

Ε) Transformer nominal LV voltage in kV

1. Transformer nominal HV voltage in kV
2. Tapped winding

Η) Transformer Ratio at all transformer taps

* 1. Transformer Impedance at all taps as % on rating MVATrans
	2. Transformer zero sequence impedance at nominal tap (Z0) in Ohm
	3. Earthing Arrangement including neutral earthing resistance & reactance
	4. Core construction (number of limbs, shell or core type)
	5. Open circuit characteristic graph
1. The production license holder forecast data are submitted as follows:

Α) Expected Maintenance Requirements weeks / year

Β) Forecast availability during the time when units are not being maintained broken down in time and full availability, partial availability, and with an analysis of the causes for reduced availability such as poor fuel, loss of mill, loss of burners, hydro flow restrictions

1. Energy limitations, daily, weekly, monthly, annual in GWh
2. Expected Monthly Hydro Generation in GWh.

**Article 263**

**Demand information**

1. All System connected Customers and the Distribution Network Operator shall submit to the Transmission System Operator information required for the design, construction and operation of their connection. In addition, by May 31st each year they shall submit to the Transmission System Operator a demand forecast regarding their connection points for the following five (5) years by completing the relevant table created by the Transmission System Operator.
2. Customers connected to the System shall submit the following:

Α) the capacity that shall be the registered connection capacity in MW;

Β) single-line diagram of User plant to a level of detail to be agreed with the Transmission System Operator;

1. electrical characteristics of all 150kV and 400kV circuits and equipment (R, X, B, R0, X0, B0), continuous and overload ratings;
2. contribution from User plant to a three phase short circuit at connection point on the System side;

Ε) connection details of all transformers, shunt capacitors, shunt reactors etc. and other important equipment;

* 1. electrical characteristics of all 150kV circuits and equipment at a voltage lower than 50 kV that may form a closed tie between two connection points on the System;
	2. information on the source of alternative standby supply and standby capacity required in MW.
1. For each load that can fluctuate by more than 5 MVA at the point of connection to the System, the following information is required:

Α) rate of change of Active Power and Reactive Power, both increasing and decreasing (kW/s. kVAr/s respectively);

Β) the shortest repetitive time interval between fluctuations in active power and reactive power demand (in seconds);

* 1. the magnitude of the largest step change in active power and reactive power demand (kWand KVAr respectively).
1. Description of any Load causing harmonics or any other significant disturbance to the operation of the System.
2. Data about System connected transformers:

Α) Number of windings

Β) Vector Group

1. Rated current of each winding in A
2. Transformer Rating in MVATrans

Ε) Transformer nominal MV voltage in KV

1. Transformer nominal HV voltage in KV
2. Tapped winding

Η) Transformer Ratio at all transformer taps

1. Transformer Impedance (resistance R and reactance X) at all taps (R+jX) as a % on rating MVATrans
2. For 3 winding transformers, where there are external connections to all 3 windings, the impedance (resistance R and reactance X) between each pair of windings is required, measured with the third set of terminals open-circuit (ZHV:LV1, ZHV:LV2, ZHV:LV3) as a % on rating MVATrans
3. Transformer zero sequence impedances at nominal tap:
	1. zero phase sequence impedance (ZHΤ0) measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals open-circuit in Ohm;
	2. zero phase sequence impedance (ZHL0) measured between the HV terminals (shorted) and the neutral terminal, with the LV terminals short-circuited to the neutral in Ohm;
	3. zero phase sequence impedance (ZLT0) measured between the LV terminals (shorted) and the neutral terminal, with the HV terminals open-circuit in Ohm;
	4. zero phase sequence impedance (ZLH0) measured between the HV terminals (shorted) and the neutral terminal, with the HV terminals short-circuited to the neutral in Ohm;
	5. zero phase sequence leakage impedance (ZL0) measured between the HV terminals (shorted) and the neutral terminals (shorted), with the Delta winding closed in Ohm;
4. Earthing Arrangement plan including LV neutral earthing resistance & reactance, core construction and open circuit characteristics
5. Core construction (number of limbs, shell or core type
6. Open circuit characteristic graph
7. For each shunt capacitor or reactor with a rating in excess of 1 MVAr connected to or capable of being connected to a user plant, the following information must be provided:

Α) Rating in MVAr

Β) Resistance / Reactance / Susceptance of all components of the capacitor or reactor bank

1. Whether single or multiple step
2. In case of multiple step devices, control details (manual or not, required time for operation, load, voltage)

Ε) If automatic control is used, details of settings.

**SECTION XI**

**CONNECTION TO AND USE OF THE SYSTEM**

**CHAPTER 57**

**PROCEDURE FOR CONNECTION TO THE**

**SYSTEM**

**Article 267**

**Connection Contract**

1. Minimum technical and operational specifications to be met for the reliable and safe operation of the System to the benefit of Users, as well as plants and apparatus connected to the System, as determined by the terms of the contract for connection to the System, as provided for in the provisions of CHAPTER 52 of this Code.
2. The terms of the contract on connection set out the minimum specifications in relation to:

Α) the method for connection to the System and ensuring smooth System operation and the point of connection;

Β) the type of signs and labeling which must be provided to the System Operator by each user; and

* 1. the terminology and nomenclature requirements used for all plants and apparatus connected to the System.
	2. in case of thermal or hydro generation units, the special design and performance characteristics of the Unit in accordance with Article 241.
1. Connection contracts made between the Transmission System Operator and a specific user also include all special details in relation to connection to the System, in accordance with the provisions of this Code.

**Article 268**

**User connection procedure**

1. The Transmission System Operator shall adopt all necessary measures to ensure the immediate and uninterrupted new connection to the System and use thereof by the User in accordance with Community Law. To that end, it must propose a connection offer to the User aiming at the conclusion of or amendment to a connection contract. During the study for the connection of a User the financially most advantageous and technically suitable way of connection to the existing System shall be selected each time in accordance with the N-1 reliability criterion and the requirements of this Code.
2. Users proposing a new connection site or modification of an existing connection site will need to submit to the Transmission System Operator a completed connection offer application form, including:

Α) description of the desired connection or modification of the user equipment already connected to the System (user development);

Β) the data listed in CHAPTER 55;

* 1. the desired connection date and operational date of the proposed user development.
1. Data supplied in the application form or data submitted along with the application form which has been submitted in support of it will be treated as preliminary project planning data until such time as the Transmission System Operator’s connection offer has been accepted by the User.
2. The Transmission System Operator shall process the user’s application within sixty (60) business days. If the Transmission System Operator considers the connection to be a complex one, the provisions of paragraph (8) hereof shall apply and the time required for processing the application may be extended, in exceptional circumstances. The user may appeal to RAE if it considers that the length of time for processing its application is unreasonable. In this case, RAE shall propose a new deadline for the submission of the application following assessment of data provided by the user and the Transmission System Operator.
3. The connection offer of the Transmission System Operator shall necessarily include the following::

Α) details of how the connection is to be made, including details of the equipment to be used at the connection;

Β) description of any modifications that the applicant user is required to pay for;

1. indication of the connection and operational date;
2. estimate of the charges for connection. The general terms that apply to the charges regarding the connection of User installations with the System, the calculation method for such charges and, where applicable, the budgeted unit cost for each type of expense shall be established in accordance with the provisions of the System Administration and Operation License Code.
3. the effect of the connection offer.
4. The applicant must accept or reject the connection offer within the period stated therein. Upon lapse of this period, the offer connection shall automatically cease to be in effect. Acceptance of the connection offer shall be effected by execution of the connection contract, which shall be binding upon the parties for the System development works agreed. The User is entitled to appeal to RAE if it disagrees with the connection offer. In that case, RAE shall decide taking account of the information provided by the User and the Transmission System Operator.
5. In accordance with the accepted connection offer, a connection contract shall be signed by virtue of which the parties thereto commit to performing the System development works agreed upon. Within 60 business days from signing of the connection contract, the user shall supply the data pertaining to the user development as listed in CHAPTER 55 and which concern the project to be executed. . This data shall be the committed project planning data.
6. Considering the magnitude and complexity of any System extension or reinforcement, which depends by the nature, location and timing of the proposed user connection works, the Transmission System Operator may carry out additional more extensive system studies, on a case basis, in order to evaluate more fully the impact of the proposed user development on the System. Where the Transmission System Operator judges that such additional more detailed studies are necessary, the Connection Offer may indicate the areas that require more detailed analysis. Before such additional studies are carried out, the user shall indicate whether it wishes Transmission System Operator to undertake the work necessary to proceed to make a revised connection offer. The Transmission System Operator may carry out these additional studies itself or employ a competent consultant to perform the studies and in either case it may recover the reasonable cost of these studies from the user. .
7. To enable Transmission System Operator to carry out any of the studies provided for in the preceding paragraph, the User may, at the request of Transmission System Operator, be required to supply the data items reasonably necessary, which are listed in CHAPTER 55, prior to lapse of the deadline laid down in paragraph (7) of this Article. This data shall be treated as preliminary project planning data.
8. When planning the System, the Transmission System Operator may reasonably request one or more users to modify their plants or install new equipment. Where the user deems that such requirement is not feasible for technical reasons or disagrees with the cost involved, it may appeal to RAE. In this case, following approval by RAE, the Transmission System Operator and the user shall enter into an agreement to cover the cost incurred by the user due to such modification or installation.

**Article 269**

**Technical Specifications**

1. For the construction of a Transmission Substation and the installation of all other necessary equipment for the connection of user plant to the System, the user must avail of a fenced area, as provided for in the connection contract, adjacent to its plant or at any other location accepted by the Transmission System Operator.
2. Connection to the System must meet the minimum requirements laid down in this Section and in SECTION VIII. The connection method applied may meet stricter specifications than the above, where agreed between the user and the Transmission System Operator.
3. The limit between the System and user installations shall be the interrupter (circuit breaker or disconnector) at the high-voltage side of the power transformer of the user. Each individual issue on the limits and the more specific determination and allocation of liability between the two parties is defined in the connection contract.
4. Each user's plant and apparatus related to its connection to the System must meet the relevant European specifications adopted by ELOT or apply as national standards, if any, or the specifications normally applied in the European Union, in force at the commencement of the connection contract.
5. Where the Transmission System Operator reasonably considers that the safe and coordinated operation of the user’s plant and apparatus with the System requires the application of complementary terms or specifications, the Transmission System Operator shall notify the user. The user must comply with the Operator’s complementary requirements and is entitled to request that the Transmission System Operator procure information proving the need to apply such complementary terms and specification.
6. The user may propose to the Transmission System Operator that such complementary terms or specifications be amended. The Transmission System Operator shall decide thereon following the approval of RAE.

**CHAPTER 58**

**USER CONNECTION WORKS**

**Article 270**

**Special connection terms**

1. The confines between the System and the installation of a System User are set by a switching apparatus (circuit breaker or disconnector) located at the high voltage side of the User power transformer. Such apparatus shall belong to the user. Detailed provisions in this regard and other issues shall be the competence and responsibility of both parties and shall be stipulated by the respective connection contract.
2. The works required for the connection of new users to the System are divided into extension works for connection and reinforcement works due to connection. Extension works for the connection include the equipment and plant required for the connection from the user’s plant limit to the System. Reinforcement works due to the connection include those required in addition to the existing System due to connection and which are not extension works for Connection.
3. A full transmission line bay shall be the bay containing a transmission line disconnector and circuit breaker and busbar(s) disconnector(s). A simple transmission line bay shall be a bay containing only one disconnector.
4. The Transmission System Operator shall, upon request by the User, examine whether the system conditions prevalent at the existing or planned System connection Node (power available at the supply terminals, short-circuit power, reliability, etc.) are sufficient for operation of the latter’s installation without risk to the operation of the remaining Transmission System Users’ installations and without unacceptable disturbances (stability, flicker, harmonics, step-type voltage changes, violation of short-circuit limit values) to the System, and for electrical power/ energy transfer from the System to User connection points.
5. The User, shall supply the Transmission System Operator with all technical and operating data required for evaluation of the supply connection (e.g. power gradients, harmonics etc.) and shall cooperate in the search for technical solutions.

**Article 271**

**Customer and Distribution Network Connection**

1. Extension works for the connection of a User’s installation shall be dependent upon the System being dimensioned at least in accordance with the N-1 criterion. This minimum requirement may be waived at the request of the User on condition that unacceptable effects under N-1 conditions are avoided. This provision shall require separate agreement governing priority outages of the supply connection in order to avoid risks to the System. Should the system conditions at the system point of connection suffice for operation of the User’s System under the conditions stated above, the Transmission System Operator shall specify the system connection.
2. The detailed system connection shall be specialized in the relevant study carried out under responsibility of the Transmission System Operator on the basis of the requirements set out in the present Code, the data submitted by applicants and the user's special requirements. During the design the following are particularly complied with:

Α) if the connection is made to an existing System substation, this shall include at least one full transmission line bay in the substation from which connection is effected, the transmission line works, the respective simple or full transmission line bay at the user's HV busbars, as well as any other works required in accordance with the Code concerning the connection;

Β) if connection is effected at an intermediate point of an existing System transmission line, it shall be normally effected with an input-output of double circuit transmission line, at least of the same type as the transmission line on which connection is effected and full or simple transmission line bays on the user’s HV busbars.

**Article 272**

**Generation Unit connection**

1. In order for a generation unit to be connected to the System, the most cost efficient and technically acceptable connection mode shall be selected in accordance with the reliability N-1 criterion and the requirements of the present Code. Particularly with regard to generation by wind generators, due to the probabilistic nature of such generation, the criterion N-1 may not apply if, at the Transmission System Operator discretion, System reliability is not jeopardized. .
2. With regard to the connection to the System of a generation unit the following shall be particularly complied with:

Α) if the connection is effected at a node or nodes of the existing System it shall include full transmission line bays at the substation from where connection is effected, the transmission line works and the respective full transmission line bays at the generation unit HV busbars. The transmission line bays at the generation unit HV busbars shall, by exception, be of the simple type in the case of generation by wind generators, provided that System reliability is not jeopardized;

Β) if connection is effected at an intermediate point of an existing transmission line of the System, this shall be effected with an input-output of a transmission line double circuit, at least of the same type as the transmission line on which connection is effected, full transmission line bays at the generation unit HV busbars, as well as any works required in accordance with the present Code for the effectuation of the connection. The transmission line bays at the generation unit HV busbars shall, by exception, be of the simple type in the case of generation by wind generators, provided that System reliability is not jeopardized.

**Article 273**

**Execution of extension works for connection**

1. The technical specifications of extension works for the connection of new Users are laid down in this Chapter. The extension works for the connection of new Users for which connection contracts have been concluded are included in the TSDS. Moreover, the TSDS also provides a brief description of the works for which connection terms have been issued and the relevant contracts have not been signed.
2. In any case, the cost for the implementation and commissioning of the connection extension works, including the costs for land expropriation and any other expenses shall be exclusively borne by the applicant. Ownership of such works shall pass to the System Owner and shall be a connection fixed cost.
3. Should more than one users be connected or should a new user be connected in the future at a point included in the extension works for connection, then the new user shall assume part of the connection cost, following allocation on the basis of the installed capacity, from the date of its connection, also taking into account the respective financial expenses. The allocation method details and the method the previous users are refunded shall be determined by the Transmission System Operator and are subject to approval by RAE.

**SECTION XII**

**FINAL PROVISIONS**

**CHAPTER 61**

**FINAL PROVISIONS**

**Article 282**

**Exemptions from the obligation to comply with the provisions of this Code**

1. Exemption from compliance with the provisions of this Code shall be granted by decision of the Minister of Development, issued following a motion presented by the Transmission System Operator and the issue of RAE's opinion. Such exemption shall be in force for a set and reasonable period and may concern only technical inability of a User's installations to comply with the provisions of this Code. For an exemption to be granted, the interested party shall submit a request to the Transmission System Operator. The conditions under which such exemption shall be granted are:

Α) the exemption must not lead to direct or indirect breach of a term of such person's license;

Β) final settlement with regard to the most recent Dispatch Day must have been completed;

* 1. all ammounts due in accordance with this Code must have been paid in full;
	2. no breach which can be remedied by such person is pending.
1. The request of an interested party for the granting of the exemption shall also include a declaration by such person as to the date on which the requirements under the previous paragraph are met.
2. The decision of the Minister of Development granting the exemption shall establish the date of entry into force of the exemption. Such exemption may not enter in force prior to 15:00 hours on the fifth business day following the day on which it is ascertained that the above requirements are met.
3. In any case, the person to whom such exemption has been granted shall continue to be liable in accordance with the provisions of this Code:

Α) for ammounts owed under this Code that concern the period prior to the entry into force of the exemption; and

Β) for breaches of this Code that have been committed prior to the entry into force of such exemption and which have not been remedied.

1. The Transmission System Operator shall keep a special protocol where it shall enter the details and the terms for the exemptions granted. All Users may have access to such protocol upon request.

**Article 285**

**Validity of Standards**

1. All references in this Code to Standards (national or European or international) shall be for illustration purposes. Equivalent standards may be used in the following order of priority:

Α) European Standards (CEN, CENELEC or ETSI) adopted by ELOT as national; Β) European Standards (CEN, CENELEC or ETSI);

1. International Standards (ISO, IEC or ITU) adopted by ELOT as national;
2. International Standards (ISO, IEC or ITU);

Ε) National Standards of other European Union and European Free Trade Area Member States;

* 1. National Standards of other countries.
1. In any case, besides the standards under (Α), (Β) and (C) above, the equivalence of each Standard used must be demonstrated by the party employing such standards.