

ANNEX A

PROPOSED REVISIONS TO THE RULES AND PROCEDURES TO GOVERN THE MONITORING OF RELIABILITY PERFORMANCE OF GENERATING UNITS AND TRANSMISSION SYSTEM (HIGHLIGHTED IN RED)

ARTICLE I GENERAL PROVISIONS

Section 1. *Title of the Rules.* These Rules shall be known as the “*Rules and Procedures to Govern the Monitoring of Reliability Performance of Generating Units and Transmission System*”.

Section 2. *Purpose of the Rules.* These Rules are promulgated:

- a) To classify the Unit and Component states as well as outages of Generators and Transmission System;
- b) To have uniform technical code for the Unit and Component states/ outage classification of the Generating Units/Plants and Transmission System;
- c) To monitor of the reliability performance of all Generating Units/Plants and Transmission System at operations and maintenance level;
- d) To determine and specify the reliability performance of the Grid using Probabilistic and Deterministic Approach regularly through Unit and Component State reports in a certain period and to aid the power industry in evaluating Generating Plants and Transmission System reliability and availability;
- e) To promote accountability of Generation Companies and Grid Owner or its Concessionaire to achieve greater operation and economic efficiency.

Section 3. *Scope of Application.* These Rules shall apply to all Generation Companies with Generating Plants connected to the Grid, Embedded Generating Plants which have an aggregated capacity of 20MW and above, System Operator, Grid Owner or its Concessionaire and Market Operator as defined in these Rules.

Section 4. *Definition of Terms.* For purposes of these Rules, the following terms shall mean:

Actual Unit Start – The number of successful times the unit was synchronized after being shutdown within a specified period.²

Attempted Unit Start –The number of attempts to synchronize the unit after being shutdown. Repeated failures to start for the same cause, without attempting corrective action, are considered a single attempt.²

Availability Factor (AF)–The ratio of Available Hours to the Period Hours of a Unit and/or Component, expressed in percent.²

Component – A general term used in this rule to refer to a transmission line or power transformer.

Component State – A Component state is a particular condition that is important for purposes of collecting data on performance. The conditions are defined and classified in Article III Sec. 1 of these Rules.

Days Compliance of the Scheduled Start Date – The days compliance of the Scheduled Start Date of a Unit as a reference to the actual start date of maintenance

Derating State – is the state in operation of a Generating Unit at less than its **Net Maximum Capacity**. ~~maximum-rated capacity.~~

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Embedded Generators – refer to generating units that are indirectly connected to the Grid through the Distribution Utilities' lines or industrial generation facilities that are synchronized with the Grid.

Equivalent Availability Factor (EAF) –The fraction of maximum generation that could be provided if limited only by outages and deratings.¹

Equivalent Forced Outage Factor (EFOF) – The fraction of a given operating period in which a generating unit is not available due to forced outages and deratings.¹

Equivalent Forced Outage Rate (EFOR) – A measure of the probability that a generating unit will not be available due to forced outages or forced deratings.¹

Equivalent Maintenance Outage Factor (EMOF) – The fraction of a given operating period in which a generating unit is not available due to maintenance outages and maintenance deratings.¹

Equivalent Planned Outage Factor (EPOF) – The fraction of a given operating period in which a generating unit is not available due to planned outages and planned deratings.¹

Equivalent Unavailability Factor (EUF) – The fraction of maximum generation that could not be produced due to unit deratings and planned and unplanned outage.¹

Equivalent Unplanned Outage Factor (EUOF) – The fraction of a given operating period in which a generating unit is not available due to forced and maintenance outages and forced and maintenance deratings.¹

Extended Outage Factor (EOF) – The ratio of Extended Outage Hours to the Period Hours of a Unit and/or Component, expressed in percent.¹

Force Majeure Event – An event beyond the reasonable control of the Participant claiming force majeure which, through the exercise of due foresight and Good Industry Practice, that Participant could not have avoided and which, by exercise of due diligence, that Participant is unable to overcome. Such events include, but are not limited to the following, to the extent that such event prevents performance of a Participant of an obligation: typhoon, storm, tropical depression, flood or inundation; lightning strikes; earthquake; volcanic eruption, fire; epidemic; war; invasion; riot; national emergencies, civil disturbance; sabotage; explosion; insurrection; military or usurped power; action of any court or governmental authority, or any civil or military authority de facto or de jure; act of God or the public enemy; or any other event or cause of a similar nature beyond the reasonable control of the Participant claiming force majeure. A strike or labor dispute is not a Force Majeure Event.

Forced Outage Factor (FOF) – The ratio of Forced Outage Hours to the Period Hours of a Unit and/or Component, expressed in percent.²

Forced Outage Rate (FOR) – The ratio of Forced Outage Hours to the sum of Service Hours and Forced Outage Hours of a Unit and/or Component, expressed in percent.²

Generating Unit – A unit conversion apparatus including auxiliaries and associated equipment functioning as a single unit, which is used to produce electric energy from some other form of energy.

Generating Plant – A facility, consisting of one or more Generating Units, where electric energy is produced from some other form of energy by means of suitable apparatus.

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Generation Company – Any person or entity authorized by the ERC to operate a facility used in the Generation of Electricity.

Grid Owner – The party that owns the high voltage backbone Transmission System and is responsible for maintaining adequate Grid capacity in accordance with the provisions of the Philippine Grid Code.

Grid Operating and Maintenance Program (GOMP) – The Operating Program of the Grid prepared by the System Operator that contains the Scheduled Maintenance of grid components and/or facilities, its duration, estimated date and time of start and completion.

Gross Capacity Factor (GCF) – The ratio of the Gross Actual Generation to the Gross Maximum Generation of a Unit, expressed in percent.²

Gross Output Factor (GOF) – The ratio of the Gross Actual Generation to the product of Gross Maximum Capacity and Service Hours of a Unit, expressed in percent.²

Loss of Load Probability (LOLP) – The expected number of days in a specified period in which the daily peak demand will exceed the available generating capacity.

Market Operator – The entity responsible for the operation of the spot market governed by the Philippine Electricity Market (PEM) Board in accordance with clause 1.4 of the WESM Rules which, for the avoidance of doubt, is the Autonomous Group Market Operator (AGMO) for a period of twelve months from the spot market commencement date and thereafter the entity to which the functions, assets and liabilities of the AGMO are transferred in accordance with section 30 of the EPIRA.

Maintenance Outage Factor (MOF) – The ratio of Maintenance Outage Hours to Period Hours of a Unit and/or Component, expressed in percent.²

Net Capacity Factor (NCF) – The ratio of the Net Actual Generation to the Net Maximum Generation of a unit, expressed in percent.²

Net Output Factor (NOF) – The ratio of the Net Actual Generation to the product of Net Maximum Capacity and Service Hours of a unit, expressed in percent.²

Outage – The state of a Unit and/or Component when it is not available to perform its intended function due to some event directly associated with that Unit and/or Component. An Outage may or may not cause an interruption of service to customers.

Outage Duration – The period from the initiation of the Outage until the affected Unit and/or Component or its replacement becomes available to perform its intended function.

Percent Maintenance Slippages – The variance of delay or ahead of duration of Actual Maintenance of a Unit with respect to the Scheduled Maintenance Program expressed in percent.

Planned Outage Factor (POF) – The ratio of Planned Outage Hours to the Period Hours of a Unit and/or Component, expressed in percent.²

Reliability – The performance of the elements of the bulk electric system that results in electricity being delivered to customers within accepted standards and in the amount desired. Reliability may be measured by the frequency, duration, and magnitude of adverse effects on the electric supply.

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Seasonal Derating Factor (SDF) – The fraction of maximum generation that could not be produced due to seasonal deratings.¹

Service Factor (SF) – The ratio of Service Hours to the Period Hours of a Unit and/or Component, expressed in percent.²

Starting Failure – The inability of a unit to be synchronized after being shutdown within a specified period.²

System Operator –The party responsible for generation dispatch, or the implementation of the generation dispatch schedule of the Market Operator, the provisions of ancillary services, and operation to ensure the safety, power quality, stability, reliability and security of the Grid.

Transformer – An electrical device or equipment that converts voltage and/or current from one level to another.

Transmission System (Grid) –The high voltage backbone system of interconnected transmission lines, substations, and related facilities, located in each of Luzon, Visayas, and Mindanao.

Unavailability Factor (UF) – The ratio of Unavailable Hours to the Period Hours of a Unit and/or Component, expressed in percent.²

Unit – A general term used in this Rule to refer to a Generating Unit.

Unit Derating Factor (UDF) – The fraction of maximum generation that could not be produced due to unit deratings.¹

Unit State – A Unit state is a particular condition that is important for purposes of collecting data on performance. The conditions are defined and classified in Article II Sec. 1 of these Rules.

Unplanned Outage Factor (UOF) – The ratio of Unplanned Outage Hours to the Period Hours of a Unit and/or Component, expressed in percent.²

User – A person or entity that uses the Grid or Distribution System and related facilities to which the Grid Code or Distribution Code applies.

Weekly Grid Operations Report (WGOR) – a document prepared by the System Operator that contains outages of Generating Plants, Transmission Lines, and Power Transformers in a weekly basis.

Wholesale Electricity Spot Market (WESM) – The electricity market established by the Department of Energy (DOE) pursuant to Section 30 of RA 9136.

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ARTICLE II UNIT STATE CLASSIFICATION AND RELIABILITY INDICES FOR GENERATORS

Section 1. *Unit State Classification.* The Unit states shall be classified according to the state of event as it occurs to a certain User as defined in these Rules. (See Figure 1 and Figure 2)

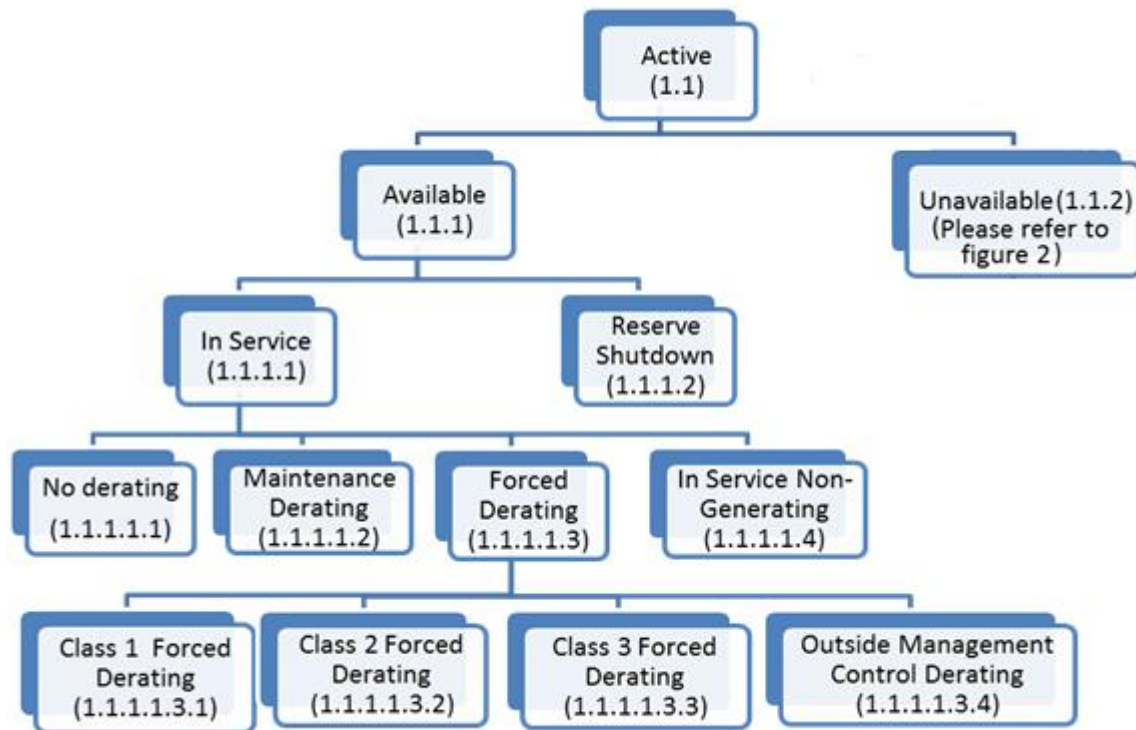


Figure 1. Unit States Diagram (for Available State)

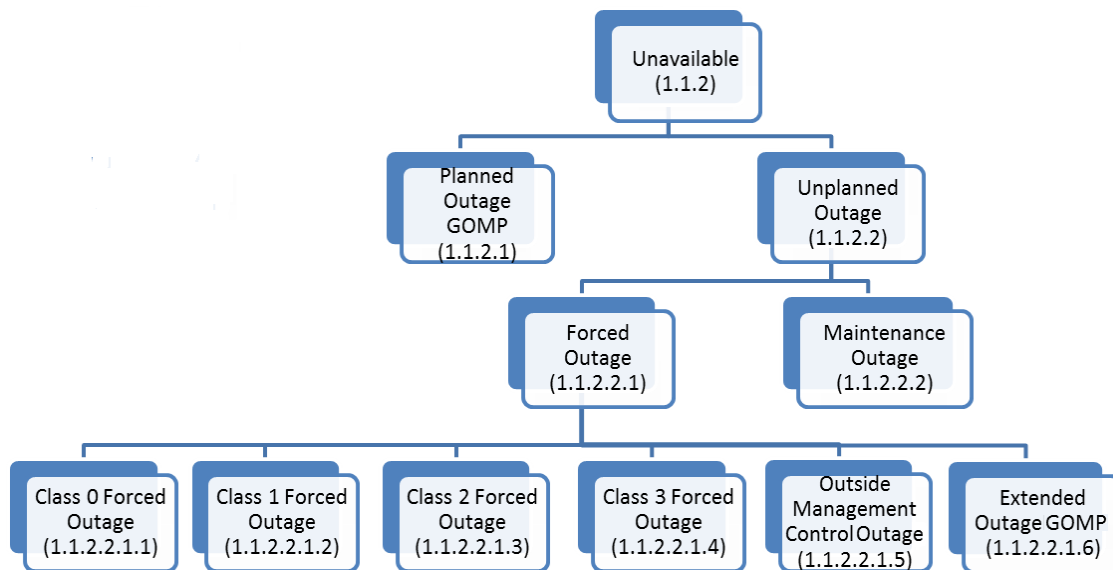


Figure 2. Unit States Diagram (for Unavailable State)

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1.1 *Active*. A Unit generally enters the active state on its service date.²

1.1.1 *Available*. The state in which a Unit is capable of providing service, whether or not it is actually in service and regardless of the capacity level that can be provided.²

1.1.1.1 *In Service*. The state in which a Unit is electrically connected to the Grid.²

1.1.1.1.1 *No Derating*. The state in which a unit has the same maximum capacity and available capacity.²

1.1.1.1.2 *Maintenance Derating*. A derating that can be deferred beyond the end of the next weekend (2400H of Sunday), but requires a capacity reduction before the next planned outage.²

1.1.1.1.3 *Forced Derating*. Events are classified according to the urgency with which the derating needs to be initiated.²

1.1.1.1.3.1 *Class 1 Forced Derating (Immediate)*. A derating that requires an immediate action for the reduction of capacity within 5 minutes.²

1.1.1.1.3.2 *Class 2 Forced Derating (Delayed)*. A derating that does not require an immediate reduction of capacity, but requires a reduction of capacity beyond 5 minutes but not exceeding 6 hours.²

1.1.1.1.3.3 *Class 3 Forced Derating (Postponed)*. A derating that can be postponed beyond 6 hours, but requires a reduction of the capacity before the end of the next weekend (2400H of Sunday).²

1.1.1.1.3.4 *Outside Management Control (OMC) Derating*. A derating wherein the cause is beyond the control of the Generation Company as enumerated in Sec. 1.1.2.2.1.5.

1.1.1.1.2 *In-service Non-generating Mode*. The state wherein a Unit is electrically connected to the Grid and performing non-generating functions, *i.e.*, pumping and synchronous condensing modes. Under this condition, only the generating hours shall be considered in the service hours based on Sec. 4.4.²

1.1.1.2. *Reserve Shutdown*. The state in which a Unit is available but not in service or not electrically connected to the Grid. This also includes Generating Plants/Units that are Available but not scheduled in the WESM.²

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1.1.2. **Unavailable.** The state in which a Unit is not capable of operation because of operational or equipment failures, external restrictions, testing, work being performed, or some adverse condition. This includes all types of Outage. The unavailable state persists until the Unit is made available for operation, either by being synchronized to the system (In-Service state) or by being placed in the Reserve Shutdown state.²

1.1.2.1 **Planned Outage (GOMP).** The state in which a Unit is unavailable due to inspection, testing, preventive maintenance or overhaul. A Planned Outage is scheduled with a pre-determined duration and is coordinated with the System Operator. The Planned Outage of a Unit shall be reflected in the Grid Operating and Maintenance Program (GOMP).

1.1.2.2 **Unplanned Outage.** The state in which a Unit is unavailable but is not in the Planned Outage state. Also, Unplanned Outage starts when Planned Outage (GOMP) ends but is extended due to unplanned work.

- a) When an Unplanned Outage is initiated, the Unplanned Outage is to be classified according to classes as defined in this Section. During the time the Unit is in the Unplanned Outage state, the class is determined by the outage class that initiates the state.
- b) Unlike Planned Outages, Unplanned Outages do not have a fixed duration that can be estimated each year.

1.1.2.2.1 **Forced Outage.** An outage that requires immediate removal of a unit from service, another outage state, or a reserve shutdown state.²

1.1.2.2.1.1 **Class 0 Forced Outage.** (Starting Failure) An outage, aside from Outside Management Control (OMC), that results from unsuccessful attempt to place the Unit In Service.²

1.1.2.2.1.2 **Class 1 Forced Outage.** (Immediate) An outage, aside from OMC, that requires immediate removal from the existing state. It can be measured within five (5) minutes of time of removal.²

1.1.2.2.1.3 **Class 2 Forced Outage.** (Delayed) An outage, aside from OMC, that does not require immediate removal from the In-Service state but requires removal beyond five (5) minutes but not exceeding six (6) hours. This type of outage can only occur while the Unit is in-service.²

1.1.2.2.1.4 **Class 3 Forced Outage.** (Postponed) An outage, aside from OMC, that can be postponed beyond six (6) hours but requires that a Unit be removed from the In-Service state before the end of the next weekend (2400H of Sunday). This type of outage can only occur while the Unit is in-service.²

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1.1.2.2.1.5 Outside Management Control (OMC) Outage. An outage wherein the cause is beyond the control of the Generation Company and has not resulted from planning error or negligence. The following are considered under this classification:

- a) Force majeure event;
- b) Grid connection or substation failure. This reason relates to problems with transmission lines, substation, and switchyard equipment outside the responsibilities of the Generating Plant;
- c) Lack of fuel (water from rivers or lakes, coal mines, gas lines, etc.) where the Generation Company is not in control of contracts, supply lines, or delivery of fuels;
- d) Special environmental limitations such as low cooling pond level, or water intake restrictions that could not be prevented by operator action; and
- e) Labor strike.

1.1.2.2.1.6 Extended Outage GOMP. This is an Outage state that is the extension of the Planned Outage (GOMP) beyond its predetermined duration. Extended GOMP applies only in instances where the original scope of work requires more time to complete than originally scheduled.

1.1.2.2.2 Maintenance Outage. An outage that does not require immediate removal from the In-Service state but requires a Unit to be removed from the Available state before the next planned outage. This is scheduled at least seven (7) days in advance.

1.2 Deactivated Shutdown. The state in which a Unit is unavailable for service for an extended period of time for reasons not related to the equipment. The unit must be inactive for more than 60 days to be considered as under Deactivated Shutdown.²

Section 2. CAPACITY TERMS

2.1 Maximum Capacity (MC). The maximum capacity that a unit can sustain over a specified period of time. The Maximum Capacity can be expressed as Gross Maximum Capacity (GMC) or Net Maximum Capacity (NMC).¹

2.2 Gross Maximum Capacity (GMC). The maximum capacity a unit can sustain over a specified period of time when not restricted by seasonal or other deratings.²

2.3 Net Maximum Capacity (NMC). The Gross Maximum Capacity less the unit capacity utilized for that unit's station service or auxiliaries.²

2.4 Dependable Capacity (DC). The maximum capacity, modified for ambient limitations for a specified period of time, such as month or a season.¹

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2.5 Available Capacity (AC). The dependable capacity, modified for equipment limitation at any time.¹

2.6 Seasonal Derating (SD). The difference between maximum capacity and dependable capacity.¹

2.7 Unit Derating (UD). The difference between dependable capacity and available capacity.¹

2.8 Rated Capacity (RC). The full-load continuous gross capacity of a unit under the specified conditions, as calculated from the electric generator nameplate based on the rated power factor.

Section 3. ENERGY TERMS

3.1 Actual Generation (AAG). The energy that was generated by a unit in a given period. Actual generation can be expressed as gross actual generation (GAG) or net actual generation (NAG).¹

3.2 Maximum Generation (MG). The energy that could have been produced by a unit in a given period of time if operated continuously at maximum capacity. Maximum generation can be expressed as gross maximum generation (GMG) or net maximum generation (NMG).¹

$$\begin{aligned}MG &= PH * MC \\GMG &= PH * GMC \\NMG &= PH * NMC\end{aligned}$$

Where;

PH (Period Hours) = the number of hours a Unit was in the active state.¹

3.3 Available Generation (AG). The energy that could have been produced by a unit in a given period if operated continuously at its available capacity.¹

3.4 Unavailable Generation (UG). The difference between the energy that would have been generated if operating continuously at dependable capacity and the energy that would have been generated if operating continuously at available capacity. This is the energy that could not be generated by a unit due to planned and unplanned outages and unit deratings.¹

$$UG = (POH + UOH + EUNDH) * MC$$

Where;

POH (Planned Outage Hours) = the number of hours a Unit was in the planned outage state (GOMP).²

UOH (Unplanned Outage Hours) = the number of hours a Unit was in the unplanned outage state.

EUNDH (Equivalent Unit Derated Hours) = the unit derated hours converted to equivalent hours in accordance with 4.22.¹

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3.5 Seasonal Unavailable Generation (SUG). The difference between the energy that would have been generated if operating continuously at maximum capacity and the energy that would have been generated if operating continuously at dependable capacity, calculated only during the time the unit was in the available state.¹

$$SUG = ESDH * MC$$

Where;

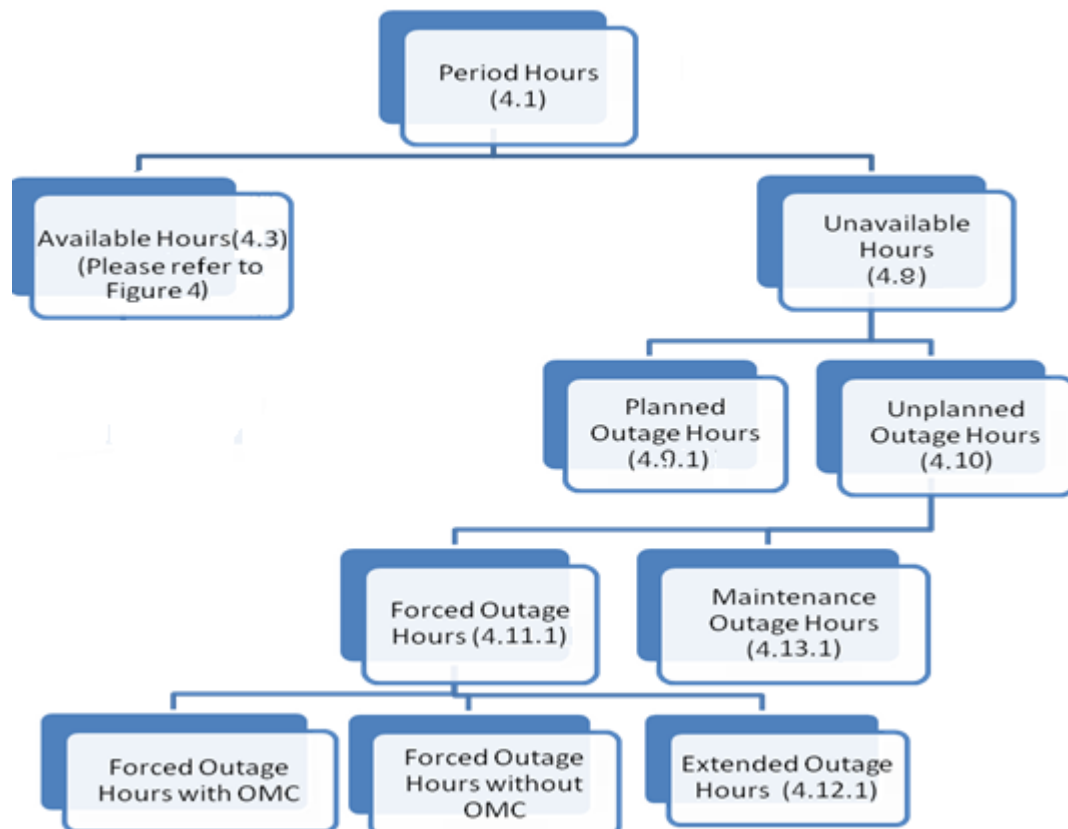
ESDH (Equivalent Unit Derated Hours) = the seasonal derated hours converted to equivalent hours in accordance with 4.22.¹

3.6 Reserve Generation (RG). The energy that a unit could have produced in a given period but did not, because it was not required in the system. This is the difference between available generation and actual generation.¹

3.7 Derated Generation (DG). The generation that was not available due to unit deratings.¹

$$DG = EUNDH * MC$$

Section 4. **Time Designations.** These are the time spent in the various Unit states defined in Section 1 of this Article. (See Figure 3 and 4)



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Figure 3. Time Designation Diagram (Unavailable)

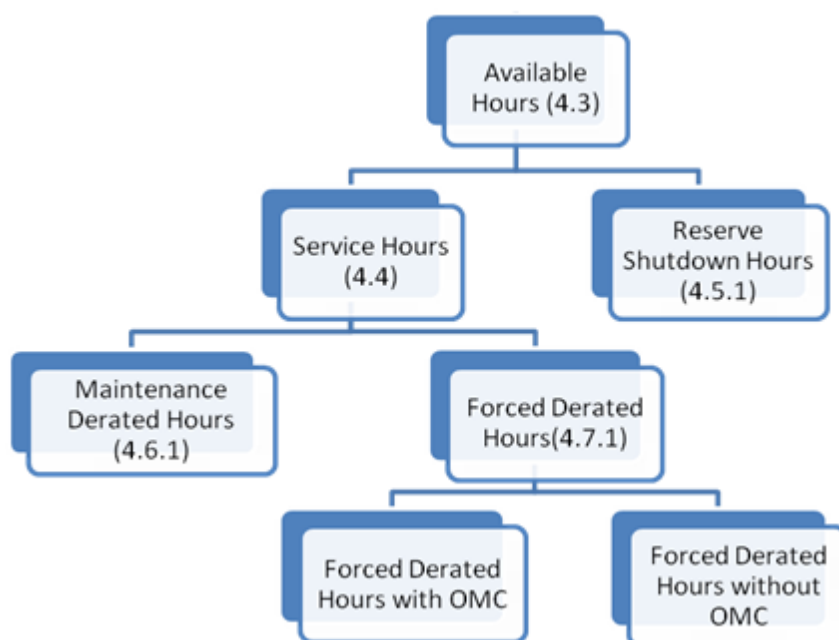


Figure 4. Time Designation Diagram (Available)

4.1. *Period Hours (PH)*. The number of hours a Unit was in the active state.¹

4.2. *Deactivated Shutdown Hours (DSH)*. The number of hours a Unit was in the deactivated shutdown state.¹

4.3. *Available Hours (AH)*. The number of hours a Unit was in the available state and should be the total of the Service Hours (SH) and the Reserve Shutdown Hours (RSH).²

4.4. *Service Hours (SH)*. The number of hours a Unit was in the in-service state, and performing generating functions only.²

4.5. *Reserve Shutdown*

4.5.1 *Reserve Shutdown Hours (RSH)*. The number of hours a Unit was in the reserve shutdown state.¹

4.5.2 *Reserve Shutdown Events (RSE)*. The number of events a Unit was in the reserve shutdown state.

4.6 *Maintenance Derated*

4.6.1 *Maintenance Derated Hours (MDH)*. The number of hours a Unit was in a maintenance derated state.²

4.6.2 *Maintenance Derated Events (MDE)*. The number of events a Unit was in a maintenance derated state.

4.7 *Forced Derated*

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4.7.1 *Forced Derated Hours (FDH)*. The number of hours during which a Class 1, Class 2, or Class 3 unplanned derating was in effect.¹

4.7.2 *Forced Derated Events (FDE)*. The number of events during which a Class 1, Class 2 or Class 3 unplanned derating was in effect.

4.8 *Unavailable Hours (UH)*. The number of hours a Unit was in the unavailable state.²

4.9 *Planned Outage*

4.9.1 *Planned Outage Hours (POH)*. The number of hours a Unit was in the planned outage state (GOMP).²

4.9.2 *Planned Outage Events (POE)*. The number of events a Unit was in the planned outage state (GOMP).

4.10 *Unplanned Outage Hours (UOH)*. The number of hours a Unit was in the unplanned outage state.

4.11 *Forced Outage*

4.11.1 *Forced Outage Hours (FOH)*. The number of hours a Unit was in a Class 0, 1, 2, or 3 Forced Outage state.¹

4.11.2 *Forced Outage Events (FOE)*. The number of events a Unit was in a Class 0, 1, 2, or 3 Forced Outage state.

4.12. *Extended Outage*

4.12.1 *Extended Outage Hours (EOH)*. The number of hours a Unit was in an Extended Outage GOMP state.

4.12.2 *Extended Outage Events (EOE)*. The number of events a Unit was in an Extended Outage GOMP state.

4.13. *Maintenance Outage*

4.13.1 *Maintenance Outage Hours (MOH)*. The number of hours a Unit was in Schedule Outage state or maintenance outage state.¹

4.13.2 *Maintenance Outage Events (MOE)*. The number of events a Unit was in Schedule Outage state or maintenance outage state.

4.14. *Outside Management Control*

4.14.1 *Outside Management Control Outage Hours (OMCH)*. The number of hours a Unit was in an Outside Management Control Outage state.

4.14.2 *Outside Management Control Outage Events (OMCE)*. The number of events a Unit was in an Outside Management Control Outage state.

4.14.3 *Outside Management Control Derated Hours (OMCDH)*. The number of hours a Unit was in an Outside Management Control Derated state.

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4.14.4 *Outside Management Control Derated Events (OMCDE)*. The number of events a Unit was in an Outside Management Control Derated state.

4.15. *Unit Derated Hours (UNDH)*. The number of hours during a unit derating was in effect.¹

4.16. *In-Service Unit Derated Hours (IUNDH)*. The number of in-service hours during which a unit derating was in effect.¹

4.17 *In-Service Planned Derated Hours (IPDH)*.The number of in-service hours during which a planned derating was in effect.¹

4.18 *In-Service Unplanned Derated Hours (IUDH)*. The number of in-service hours during which an unplanned derating was in effect.¹

4.19 *In-Service Forced Derated Hours (IFDH)*. The in-service hours during which a Class 1, 2, or 3 unplanned derating was in effect.¹

4.20 *In-Service Maintenance Derated Hours (IMDH)*. The in-service hours during which a maintenance derating was in effect.¹

4.21 *Seasonal Derated Hours (SDH)*.The number of hours during which a seasonal derating was in effect.¹

4.22 *Equivalent Hours (E)*. The summation of the number of hours a unit was in a time category involving unit derating, expressed as equivalent hours of full outage at maximum capacity.¹

$$E(t) = \frac{\sum D(t)_i T_i}{MC}$$

Where;

$E(t)$ = equivalent hours in the time category represented by parentheses, which can be any one of the time categories

$D(t)_i$ = the derating for the time category shown in parentheses, after the i^{th} change in either available capacity (unit deratings) or dependable capacity (seasonal deratings)

Note: In order to apportion equivalent hours among the various time categories, appropriate ground rules shall be established in the reporting system so that after each change in either available capacity or dependable capacity, the sum of all subcategories of unit derating is equal to the unit derating.

T_i = the number of hours accumulated in the time category of interest between the i^{th} and the $(i+1)^{\text{th}}$ change in either available capacity (unit deratings) or dependable capacity (seasonal deratings)

MC = maximum capacity

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4.22.1 *Equivalent Forced Derated Hours (EFDH)*. The forced derated hours converted to equivalent hours in accordance with 4.22.¹

4.22.2 *Equivalent Maintenance Derated Hours (EMDH)*. The maintenance derated hours converted to equivalent hours in accordance with 4.22.¹

4.22.3 *Equivalent Unit Derated Hours (EUNDH)*. The unit derated hours converted to equivalent hours in accordance with 4.22.¹

4.22.4 *Equivalent Seasonal Derated Hours (ESDH)*. The seasonal derated hours converted to equivalent hours in accordance with 4.22.¹

4.22.5 *Equivalent Outside Management Control Derated Hours (EOMCDH)*. The OMC derated hours converted to equivalent hours in accordance with 4.22.

Section 5. *Reliability Performance Indices*. The Reliability Performance Indices shall be computed by the Grid Management Committee. The relationships among the performance indices are based on Period Hours and are expressed in percent.

Section 6. *Formula for Computation of Reliability Performance Indices*. This shall include the formula for computation of reliability performance indices to be used in determining the Unit's reliability.

6.1. Planned Outage Factor (POF)¹

$$POF = \frac{POH}{PH} \times 100\%$$

6.2 Unplanned Outage Factor (UOF)²

6.2.1 UOF with OMC Outage

$$UOF = \frac{UOH + OMCH}{PH} \times 100\%$$

6.2.2 UOF without OMC Outage

$$UOF = \frac{UOH}{PH} \times 100\%$$

6.3 Forced Outage Factor (FOF)²

6.3.1 FOF with OMC Outage

$$FOF = \frac{FOH + OMCH}{PH} \times 100\%$$

6.3.2 FOF without OMC Outage

$$FOF = \frac{FOH}{PH} \times 100\%$$

6.4 Maintenance Outage Factor (MOF)¹

$$MOF = \frac{MOH}{PH} \times 100\%$$

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6.5 Unavailability Factor (UF)²

6.5.1 UF with OMC Outage

$$UF = \frac{UH + OMCH}{PH} \times 100\%$$

$$UF = \frac{POH + MOH + FOH + OMCH}{PH} \times 100\%$$

$$UF = \frac{POH + UOH + OMCH}{PH} \times 100\%$$

6.5.2 UF without OMC Outage

$$UF = \frac{UH}{PH} \times 100\%$$

$$UF = \frac{POH + MOH + FOH}{PH} \times 100\%$$

$$UF = \frac{POH + UOH}{PH} \times 100\%$$

6.6 Availability Factor (AF)¹

$$AF = \frac{AH}{PH} \times 100\%$$

6.7 Service Factor (SF)¹

$$SF = \frac{SH}{PH} \times 100\%$$

6.8 Extended Outage Factor (EOF)

$$EOF = \frac{EOH}{PH} \times 100\%$$

6.9 Forced Outage Rate (FOR)²

6.9.1 FOR with OMC Outage

$$FOR = \frac{FOH + OMCH}{FOH + OMCH + SH} \times 100\%$$

6.9.2 FOR without OMC Outage

$$FOR = \frac{FOH}{FOH + SH} \times 100\%$$

6.10 Seasonal Derating Factor (SDF)¹

$$SDF = \frac{SUG}{MG} \times 100\%$$

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$$SDF = \frac{ESDH}{PH} \times 100\%$$

6.11 Unit Derating Factor (UDF)²

6.11.1 UDF with OMC Derated State

$$UDF = \frac{EUNDH + EOMCDH}{PH} \times 100\%$$

6.11.2 UDF without OMC Derated State

$$UDF = \frac{DG}{MG} \times 100\%$$

$$UDF = \frac{EUNDH}{PH} \times 100\%$$

6.12 Equivalent Unavailability Factor (EUF)²

6.12.1 EUF with OMC Derated State and with OMC Outage State

$$EUF = \frac{POH + MOH + FOH + EUNDH + EOMCDH + OMCH}{PH} \times 100\%$$

6.12.2 EUF without OMC Derated State and with OMC Outage State

$$EUF = \frac{POH + MOH + FOH + EUNDH + OMCH}{PH} \times 100\%$$

6.12.3 EUF with OMC Derated and without OMC Outage State

$$EUF = \frac{POH + MOH + FOH + EUNDH + EOMCDH}{PH} \times 100\%$$

6.12.4 EUF without OMC Derated and without OMC Outage State

$$EUF = \frac{UG}{MG} \times 100\%$$

$$EUF = \frac{POH + MOH + FOH + EUNDH}{PH} \times 100\%$$

6.13 Equivalent Availability Factor (EAF)¹

$$EAF = \frac{AH - (EUNDH + ESDH)}{PH} \times 100\%$$

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6.14 Gross Capacity Factor (GCF)¹

$$GCF = \frac{GAG}{GMG} \times 100\%$$

6.15 Net Capacity Factor (NCF)¹

$$NCF = \frac{NAG}{NMG} \times 100\%$$

6.16 Gross Output Factor (GOF)¹

$$GOF = \frac{GAG}{SH \times GMC} \times 100\%$$

6.17 Net Output Factor (NOF)¹

$$NOF = \frac{NAG}{SH \times NMC} \times 100\%$$

6.18 Equivalent Forced Outage Rate (EFOR)²

6.18.1 EFOR with OMC Outage and with OMC Derated State

$$EFOR = \frac{FOH + EFDH + OMCH + EOMCDH}{SH + FOH + OMCH + EOMCDH} \times 100\%$$

6.18.2 EFOR with OMC Outage and without OMC Derated State

$$EFOR = \frac{FOH + EFDH + OMCH}{SH + FOH + OMCH} \times 100\%$$

6.18.3 EFOR without OMC Outage and with OMC Derated State

$$EFOR = \frac{FOH + EFDH + EOMCDH}{SH + FOH + EOMCDH} \times 100\%$$

6.18.4 EFOR without OMC Outage and without OMC Derated State

$$EFOR = \frac{FOH + EFDH}{SH + FOH} \times 100\%$$

6.19 Equivalent Unplanned Outage Factor (EUOF)²

6.19.1 EUOF with OMC Outage and with OMC Derated State

$$EUOF = \frac{FOH + EFDH + MOH + EMDH + OMCH + EOMCDH}{PH} \times 100\%$$

6.19.2 EUOF with OMC Outage and without OMC Derated State

$$EUOF = \frac{FOH + EFDH + MOH + EMDH + OMCH}{PH} \times 100\%$$

6.19.3 EUOF without OMC Outage and with OMC Derated State

$$EUOF = \frac{FOH + EFDH + MOH + EMDH + EOMCDH}{PH} \times 100\%$$

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6.19.4 EUOF without OMC Outage and without OMC Derated State

$$EUOF = \frac{FOH + EFDH + MOH + EMDH}{PH} \times 100\%$$

6.20 Equivalent Forced Outage Factor (EFOF)²

6.20.1 with OMC Outage and with OMC Derated State

$$EFOF = \frac{FOH + EFDH + OMCH + EOMCDH}{PH} \times 100\%$$

6.20.2 with OMC Outage and without OMC Derated State

$$EFOF = \frac{FOH + EFDH + OMCH}{PH} \times 100\%$$

6.20.3 without OMC Outage and with OMC Derated State

$$EFOF = \frac{FOH + EFDH + EOMCDH}{PH} \times 100\%$$

6.20.4 without OMC Outage and without OMC Derated State

$$EFOF = \frac{FOH + EFDH}{PH} \times 100\%$$

6.21 Equivalent Maintenance Outage Factor (EMOF)¹

$$EMOF = \frac{MOH + EMDH}{PH} \times 100\%$$

6.22 Mean Service Time to Forced Outage (MSTFO)²

$$MSTFO = \frac{SH}{FOE}$$

6.23 Mean Service Time to Maintenance Outage (MSTMO)²

$$MSTMO = \frac{SH}{MOE}$$

6.24 Mean Service Time to Planned Outage (MSTPO)²

$$MSTPO = \frac{SH}{POE}$$

6.25 Mean Forced Outage Duration (MFOD)²

$$MFOD = \frac{FOH}{FOE}$$

6.26 Mean Maintenance Outage Duration (MMOD)²

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$$MMOD = \frac{MOH}{MOE}$$

6.27 Mean Planned Outage Duration (MPOD)²

$$MPOD = \frac{POH}{POE}$$

6.28 Starting Reliability (SR)¹

$$SR = \frac{\text{number of actual unit starts}}{\text{number of attempted unit starts}} \times 100\%$$

6.29 Cycling Rate (CR)¹

$$CR = \frac{\text{number of actual unit starts}}{\text{service hours}} \times 100\%$$

Section 7. *Slippages*. Maintenance of a Unit must be performed in accordance with the maintenance schedule program and must be finished within the scheduled duration thereof.

Section 8. *Percent Slippages*. This shall include the computation of the performance of Generation Company in terms of percent delay or ahead on Scheduled Maintenance Program versus the Actual Maintenance Program.

$$\text{Percent Slippage} = \frac{\text{Actual Duration} - \text{Scheduled Duration}}{\text{Scheduled Duration}} \times 100\%$$

8.1 If the percentage slippage is zero (0.00%), it means that the actual maintenance program complied with the length or duration of the scheduled program.

8.2 If the percentage slippage is positive (>0.00%), it means that the actual maintenance program finished beyond the scheduled length or duration of maintenance program.

8.3 Otherwise (<0.00%), the actual maintenance program finished ahead the scheduled length of maintenance program.

Section 9. *Days of Compliance on the Scheduled Start Date (DCSSD)*. A Unit must conduct its maintenance program on the scheduled start date of its Scheduled Maintenance Program.

$$DCSSD = \text{Actual Start Date} - \text{Scheduled Start Date}$$

9.1 If *DCSSD* is zero (0.00), it means that the actual start of maintenance program complied with the scheduled start of Scheduled Maintenance Program.

9.2 If *DCSSD* is positive (>0.00), it means that the actual start of maintenance program started late with respect to the scheduled start of Scheduled Maintenance program.

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9.3 Otherwise (<0.00), the actual start of maintenance program started earlier than the scheduled start of Scheduled Maintenance Program.

ARTICLE III COMPONENT STATE CLASSIFICATION AND RELIABILITY INDICES FOR TRANSMISSION SYSTEM

Section 1. *Component State Classification*. The Component states shall be classified according to the state of event as it occurs to a certain User as defined in these Rules. (See Figure 5)

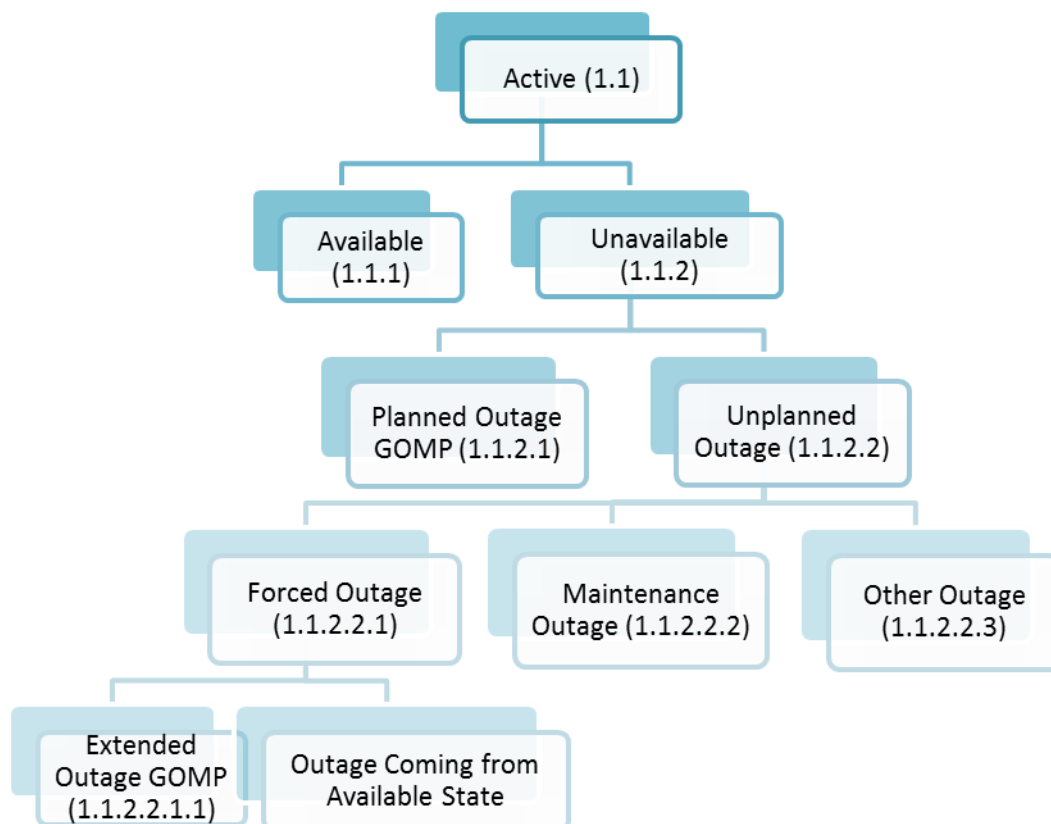


Figure 5. Component States Diagram

1.1 *Active*. A Component generally enters the active state on its service date.²

1.1.1 *Available*. The state in which a Component is capable of providing service.²

1.1.2. *Unavailable*. The state in which a Component is not capable of operation because of operational or equipment failures, external restrictions, testing, work being performed, or some adverse condition. The unavailable state persists until the Component is made available for operation.²

1.1.2.1 *Planned Outage (GOMP)*. The state in which a Component is unavailable due to inspection, testing, preventive maintenance or overhaul. A Planned Outage is scheduled with a pre-determined duration and is coordinated with the System Operator. The Planned Outage of a

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Component shall be reflected in the Grid Operating and Maintenance Program (GOMP).

1.1.2.2 *Unplanned Outage.* The state in which a Component is unavailable but is not in the Planned Outage state. Also, Unplanned Outage starts when Planned Outage (GOMP) ends but is extended due to unplanned work. Unlike Planned Outages, Unplanned Outages do not have a fixed duration that can be estimated each year.

1.1.2.2.1 *Forced Outage.* An outage that requires immediate removal of a component from available or another outage state.²

1.1.2.2.1.1 *Extended Outage GOMP.* This is an Outage state that is the extension of the Planned Outage (GOMP) beyond its predetermined duration. Extended GOMP applies only in instances where the original scope of work requires more time to complete than originally scheduled.

1.1.2.2.2 *Maintenance Outage.* An outage that does not require immediate removal but requires a Component to be removed from the Available state before the next planned outage. This is scheduled at least seven (7) days in advance.

1.1.2.2.3 *Other Outage.* An outage wherein the cause is beyond the control of the Grid Owner or its Concessionaire. The following are considered under this classification.

- a) Force majeure
- b) Manual Load Dropping due to Generation Deficiency
- c) Customer-Caused Outage
- d) Delayed Switching / Normalization of Load Affected by Customers
- e) Accidents / Intrusion / Incursion of Foreign Objects
- f) Temporary Lines after Force Majeure
- g) Outage/s Initiated by the System Operator after Occurrence of Significant Incident

1.2 *Inactive State* –The state in which a Component is unavailable for service for an extended period of time for reasons not related to the equipment. The unit must be inactive for more than 60 days to be considered as Inactive State.²

Section 2. *Time Designations.* These are the time spent in the various Component states defined in Section 1 of this Article. (See Figure 6)

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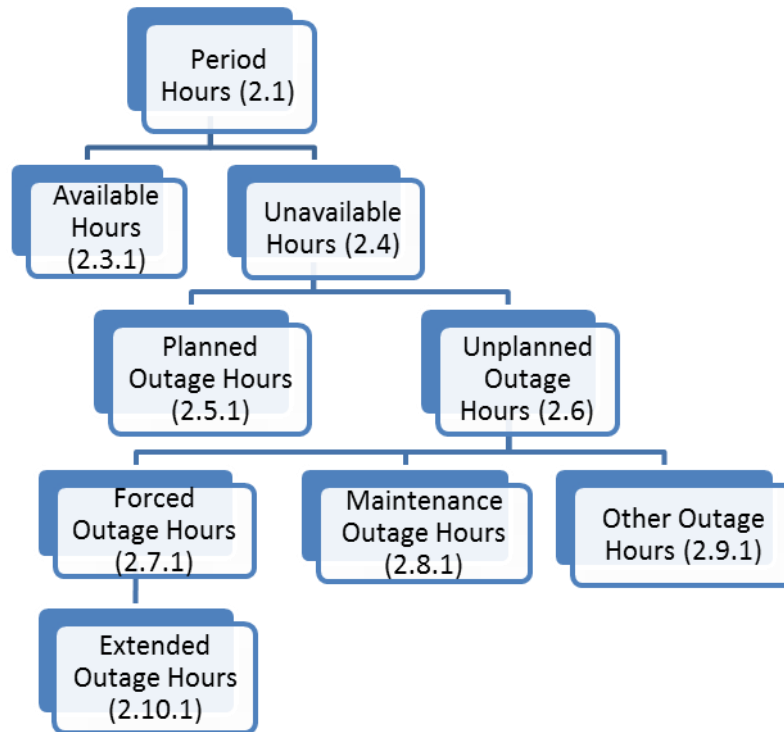


Figure 6. Time Designation Diagram

2.1. *Period Hours (PH)*. The number of hours a Component was in the active state.²

2.2. *Inactive Hours (IH)*. The number of hours a Component was in the inactive state.

2.3. *Available*

2.3.1 *Available Hours (AH)*. The number of hours a Component was in the available state.²

2.3.2 *Available Events (AE)*. The number of events a Component was in the available state.

2.4. *Unavailable Hours (UH)*. The number of hours a Component was in the unavailable state.²

2.5. *Planned Outage*

2.5.1 *Planned Outage Hours (POH)*. The number of hours a Component was in the planned outage state (GOMP).²

2.5.2 *Planned Outage Events (POE)*. The number of events a Component was in the planned outage state (GOMP).

2.6. *Unplanned Outage Hours (UOH)*. The number of hours a Component was in the unplanned outage state.²

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2.7. *Forced Outage Hours (FOH)*. The number of hours a Component was in a Forced Outage state.

2.7.1 *Forced Outage Hours (FOH)*. The number of hours a Component was in a Forced Outage state.²

2.7.2 *Forced Outage Events (FOE)*. The number of events a Component was in a Forced Outage state.

2.8. *Maintenance Outage*

2.8.1 *Maintenance Outage Hours (MOH)*. The number of hours a Component was in a Maintenance Outage state.²

2.8.2 *Maintenance Outage Events (MOE)*. The number of events a Component was in a Maintenance Outage state.

2.9. *Other Outage*

2.9.1 *Other Outage Hours (OOH)*. The number of hours a Component was in an Other Outage state.

2.9.2 *Other Outage Events (OOE)*. The number of events a Component was in an Other Outage state.

2.10 *Extended Outage*

2.10.1 *Extended Outage Hours (EOH)*. The number of hours a Component was in an Extended Outage state.

2.10.2 *Extended Outage Events (EOE)*. The number of events a Component was in an Extended Outage state.

Section 3. *Reliability Performance Indices*. The Reliability Performance Indices shall be computed by the Grid Management Committee for submission to ERC. The relationships among the performance indices are based on Period Hours and are expressed in percentage.

Section 4. *Formula for Computation of Reliability Performance Indices*. This shall include the formula for computation of reliability performance indices to be used in determining the Component's reliability.

4.1. Planned Outage Factor (POF)²

$$POF = \frac{POH}{PH} \times 100\%$$

4.2 Unplanned Outage Factor (UOF)²

$$UOF = \frac{UOH}{PH} \times 100\%$$

4.3 Forced Outage Factor (FOF)²

$$FOF = \frac{FOH}{PH} \times 100\%$$

4.4 Maintenance Outage Factor (MOF)²

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$$MOF = \frac{MOH}{PH} \times 100\%$$

4.5 Unavailability Factor (UF)²

$$UF = \frac{UH}{PH} \times 100\%$$

$$UF = \frac{POH + MOH + FOH + OOH}{PH} \times 100\%$$

$$UF = \frac{POH + UOH}{PH} \times 100\%$$

4.6 Availability Factor (AF)²

$$AF = \frac{AH}{PH} \times 100\%$$

4.7 Other Outage Factor (OOF)

$$OOF = \frac{OOH}{PH} \times 100\%$$

4.8 Forced Outage Rate (FOR)²

$$FOR = \frac{FOH}{FOH + AH} \times 100\%$$

4.9 Extended Outage Factor (EOF)

$$EOF = \frac{EOH}{PH} \times 100\%$$

Section 5. *Slippages*. Maintenance of a Component must be performed in accordance with the maintenance schedule program and must be finished within the scheduled duration thereof.

Section 6. *Percent Slippages*. This shall include the computation of the performance of Transmission Lines, and Transformers in terms of percent delay or ahead on Scheduled Maintenance Program versus the Actual Maintenance Program.

$$\text{Percent Slippage} = \frac{\text{Actual Duration} - \text{Scheduled Duration}}{\text{Scheduled Duration}} \times 100\%$$

6.1 If the percentage slippage is zero (0.00%), it means that the actual maintenance program complied with the length or duration of the scheduled program.

6.2 If the percentage slippage is positive (>0.00%), it means that the actual maintenance program finished beyond the scheduled length or duration of maintenance program.

6.3 Otherwise (<0.00%), the actual maintenance program finished ahead the scheduled length of maintenance program.

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Section 7. *Days of Compliance on the Scheduled Start Date (DCSSD)*. A Component must conduct its maintenance program on the scheduled start date of its Scheduled Maintenance Program.

$$DCSSD = \text{Actual Start Date} - \text{Scheduled Start Date}$$

7.1 If *DCSSD* is zero (0.00), it means that the actual start of maintenance program complied with the scheduled start of Scheduled Maintenance Program.

7.2 If *DCSSD* is positive (>0.00), it means that the actual start of maintenance program started late with respect to the scheduled start of Scheduled Maintenance program.

7.3 Otherwise (<0.00), the actual start of maintenance program started earlier than the scheduled start of Scheduled Maintenance Program.

ARTICLE IV SUBMISSION OF REPORTS

Section 1. *Submission of Report by Generation Companies.*

1.1. If the Generating ~~Plant~~ **Unit** is in the Unavailable and/or Derating State, the Generation Company must submit an event report to the ~~System Operator, Market Operator, Department of Energy (DOE), and to the Energy Regulatory Commission (ERC) thru the Grid Management Committee~~ within twenty-four (24) hours from the occurrence of the event. Thereafter, the Generation Company shall submit a weekly summary report (Monday to Sunday) on the circumstances of the event on the ~~Monday~~ **Tuesday** following the occurrence of the event and every following ~~Monday~~ **Tuesday** thereafter, ~~if applicable~~. The summary or weekly report must also contain the Reserve Shutdown states of the previous week. ~~The submission of the Generation Company shall be both in portable document format (pdf) and spreadsheet file (excel) format, as prescribed by the Grid Management Committee.~~

1.2 The submission of the Generation Company shall be in portable document format (pdf) to the System Operator, Market Operator, Department of Energy (DOE), and to the Energy Regulatory Commission (ERC) thru the Grid Management Committee (GMC), and in spreadsheet file (excel) format to the GMC through the Grid Reliability Monitoring System (GRMS) application. The format of the report shall be as prescribed by the GMC.

Section 2. *Submission of Report by the System Operator.*

2.1. The System Operator (SO) shall submit the Weekly Grid Operations Report (WGOR) (Monday to Sunday) every following ~~Monday~~ **Tuesday** to the ERC thru Grid Management Committee. The report shall contain the Generator's outage and derated state as well as Transmission System's outage of the previous week.

2.2. The System Operator shall also submit the Annual Grid Operating Program (GOP) (Original / Revision 0) of the following year every 15th day of September of the current year. Thereafter, the System Operator shall submit the actual planned outages of generating units every month and the quarterly revision of GOP before the end of the month immediately following the quarter.

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2.3. All submission of System Operator shall be in comma separated format (csv) to the GMC through the Grid Reliability Monitoring System (GRMS) application. The format of the report shall be as prescribed by the GMC.

Section 3. *Record Time of Report.* All recording time in the report of Generation Companies shall be synchronized with the System Operator and shall be based on the Philippine Standard Time.

Section 4. *Verification of Submitted Report.* In case of inconsistencies in the reports submitted, the Grid Management Committee shall validate the reported data with the Generation Companies, Grid Owner, System Operator and if necessary, with the Market Operator. Submission of incorrect, false or misleading data shall be subject to the imposition of fines and penalties under Section 1, Article V of these Rules.

Section 5. *Authorization.* The Reports required to be submitted under Sections 1 and 2 hereof, shall be accompanied by a Board Resolution or Secretary's Certificate showing that the person who signed the Report / Document(s) submitted to the ERC through the Grid Management Committee is duly authorized to do so for and in behalf of the corporation.

Section 6. *Reliability Analysis.* Reliability analysis based on the computed Reliability Performance Indices shall be performed by Grid Management Committee for submission to the ERC by the end of March of the current year to determine the generation deficiency of the Grid using probabilistic method such as Loss of Load Probability (LOLP) of the previous year and/or deterministic approach.

Section 6. *Quarterly Report and Annual Report.*

6.1 The Grid Management Committee shall submit to the ERC and DOE four (4) quarterly reports of the Generating Plants', Transmission Lines', and Transformers' reliability performance as computed from the indices before the end of the **second (2nd)** month immediately following the quarter.

6.2 The Grid Management Committee shall submit to the ERC and DOE an annual report of the Generating Plants', Transmission Lines', and Transformers' reliability performance as computed from the indices of the previous year by the end of March of the current year

ARTICLE V FINAL PROVISIONS

Section 1. *Administrative Sanctions.* Violation(s) of these Rules shall be subject to the imposition of appropriate sanctions, fines, and penalties in accordance with ERC Resolution No. 3, series of 2009, entitled a "Resolution Amending the Guidelines to Govern the Imposition of Administrative Sanctions in the Form of Fines and Penalties Pursuant to Section 46 of Republic Act No. 9136", or any other issuance(s) that may be imposed by the ERC in the future. Violation(s) of these Rules shall be without prejudice to sanctions or penalties for violations of other applicable laws or rules.

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Section 2. *Non-compliance with any provisions of these Rules.* In case of non-compliance of any person or entity with any of the provision of these Rules, the Grid Management Committee shall inform the ERC of such non-compliance and recommend the issuance of a Notice of non-compliance with an Order to comply and to explain within seven (7) days the reason or reasons therefor. After the Notice and Order shall have been issued by the ERC and the person or entity still refuses and fails to comply within the reglamentary period of what is incumbent upon it / him, the Grid Management Committee shall forthwith inform the ERC of such violation and recommend fines and penalties pursuant to ERC Resolution No. 3, Series of 2009.

Section 3. *Separability Clause.* If for any reason, any provision of these Rules is declared unconstitutional or invalid by final judgment of a competent court, the other parts or provisions hereof which are not affected thereby shall continue to be in full force and effect.

Section 4. *Repealing Clause.* Any rule or regulation inconsistent with the provisions of these Rules is hereby repealed and modified accordingly.

Section 5. *Effectivity.* These Rules shall take effect fifteen (15) days after publication in a newspaper of general circulation.

Pasig City, 04 March, 2013.

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ABBREVIATIONS AND UNITS

AAG	– Actual Generation, in MWh
AC	– Available Capacity, in MW
AF	– Availability Factor, in percent
AG	– Available Generation, in MWh
DC	– Dependable Capacity, in MW
DG	– Derated Generation, in MWh
EAF	– Equivalent Availability Factor, in percent
EFOF	– Equivalent Forced Outage Factor, in percent
EFOR	– Equivalent Forced Outage Rate, in percent
EMOF	– Equivalent Maintenance Outage Factor, in percent
EPOF	– Equivalent Planned Outage Factor, in percent
EUF	– Equivalent Unavailability Factor, in percent
EUOF	– Equivalent Unplanned Outage Factor, in percent
EOF	– Extended Outage Factor, in percent
FOF	– Forced Outage Factor, in percent
FOR	– Forced Outage Rate, in percent
GAG	– Gross Actual Generation, in MWh
GOMP	– Grid Operating and Maintenance Program
GCF	– Gross Capacity Factor, in percent
GMC	– Gross Maximum Capacity, in MW
GOF	– Gross Output Factor, in percent
LOLP	– Loss of Load Probability, in days
MC	– Maximum Capacity, in MW
MG	–Maximum Generation, in MWh
MOF	– Maintenance Outage Factor, in percent
NAG	– Net Actual Generation, in MWh
NCF	– Net Capacity Factor, in percent
NMC	– Net Maximum Capacity, in MW
NOF	– Net Output Factor, in percent
POF	– Planned Outage Factor, in percent
RC	– Rated Capacity, in MW
RG	– Reserve Generation, in MWh
SD	– Seasonal Derating, in MW
SDF	– Seasonal Derating Factor, in percent
SF	– Service Factor, in percent
SUG	– Seasonal Unavailable Generation, in MWh
UD	– Unit Derating, in MW
UF	– Unavailability Factor, in percent
UG	– Unavailable Generation, in MWh
UDF	– Unit Derating Factor, in percent
UOF	– Unplanned Outage Factor, in percent
WGOR	– Weekly Grid Operations Report
WESM	– Wholesale Electricity Spot Market

ANNEXES:

Annex A. Cause Code for Generators

1. Annex A-1. Geothermal Unit
2. Annex A-2. Hydroelectric / Pumped Storage Unit
3. Annex A-3. Gas Turbine Unit
4. Annex A-4. Diesel Unit

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5. Annex A-5. Combined Cycle Cogeneration Block
6. Annex A-6. Fluidized Bed Combustion Unit
7. Annex A-7. Fossil Steam Unit
8. Annex A-8. Solar Power Unit

Annex B. Cause Code for Transmission System

Annex C. Reporting Format for Generation Companies

1. Annex C-1. Weekly Report Format
2. Annex C-2. Event Report Format

Annex D. Sample Computation

REFERENCES:

1. IEEE Standard 762-2006 - Standard Definitions for Use in Reporting Electric Generating Unit Reliability, Availability, and Productivity
2. Circular No. 2010-0003 – IRR on the Reclassification of Outages by the National Grid Corporation of the Philippines
3. North American Electric Reliability (NERC) Generating Availability Data System (GADS)
4. Philippine Grid Code Amendment No. 1

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