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PART II

Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN

**NATIONAL ELECTRIC POWER REGULATORY  
AUTHORITY (NEPRA)**

NOTIFICATION

*Islamabad, the 17th November, 2009*

**S. R. O. 1005 (I)/2009.**—In exercise of the Powers conferred by and clause (k) of Section 46 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997), read with clause (c) of sub-section (2) of section 7 and section 34 thereof, the National Electric Power Regulatory Authority (NEPRA), with the prior approval of the Federal Government, is pleased to make the following Rules to ensure that the electric generation facilities and power plants are efficiently operated to further ensure electrical service reliability and adequacy to the transmission and distribution service provider within prescribed parameters, namely:—

**NATIONAL ELECTRIC POWER REGULATORY AUTHORITY  
PERFORMANCE STANDARDS (GENERATION) RULES, 2009**

1. **Short title, commencement, purpose and application.**—(1) These rules may be called the National Electric Power Regulatory Authority Performance Standards (Generation) Rules 2009.

(4581)

(2) They shall come into force at once.

(3) Unless specifically exempted, these rules are applicable to all holders of Authority's generation licences who shall provide information to the Authority regarding operation, maintenance and performance of their generation facilities, if required. .

2. **Definitions.**—(1) In these rules, unless there is anything repugnant in the subject or context,—

- (a) "Act" means the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997);
- (b) "active service" means the status of a generating unit in a generation facility to which it is connected, and is capable of operating in parallel with NTDC, other transmission licensees under the Act or a DISCO's electricity grid granted generation licence by the Authority and has achieved commercial operation;
- (c) "ancillary service" means the services ancillary or incidental to the safe, reliable, stable and efficient availability and utilization of electrical energy and net capacity and include, without limitation, the following, namely:—
  - (i) energy imbalance service;
  - (ii) spinning reserve service;
  - (iii) supplemental reserve service;
  - (iv) reactive supply and voltage control service; and
  - (v) regulation and frequency response service;
- (d) "generation" means the ownership, operation, management or control of generation facilities for delivery or sale of electric power

and not solely for consumption by the person owning, operating, managing, and controlling those facilities;

- (e) "generation facility" means the electrical facility used for the production of electric power;
- (f) "Generator Performance Data System" means the data and reports as required by the Authority under these rules;
- (g) "Pooling and Settlement Arrangement" means the arrangement for establishing or implementing a wholesale market for the sale and purchase of electrical energy, net capacity or ancillary services under relevant NEPRA rules and regulations; and
- (h) "Year" means the period of twelve months beginning from 1<sup>st</sup> July of a year and ending on 30<sup>th</sup> June of the following year.

(2) All other words and expressions used, but not defined herein, shall have the same meaning as are assigned to them under the Act.

3. **Quality of supply.**—(1) In order to maintain performance standards, the generation facilities are required to ensure that the voltage and frequency of electricity supplied to recipients shall be within normal operation limits contained in the 'applicable documents' as defined in clause (iv) of sub-rule(1) of rule 2 of the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000, rules 7 and 8 of the National Electric Power Regulatory Authority Performance Standards (Transmission) Rules, 2005, and clauses (d) and (e) of the rule 4 of the National Electric Power Regulatory Authority Performance Standards (Distribution) Rules, 2005.

(2) Subject to pooling and settlement arrangement and 'applicable documents', generation units are required to operate their facilities within a Power Factor band of 0.8 lagging to 0.9 leading. All generation facilities shall ensure that they are able to provide ancillary services relating to reactive support within the aforesaid band as and when instructed by system operator.

4. **Data requirement.**—As part of Generator Performance Data System, the licensee shall calculate the following key indicators and others as indicated in Forms I and II to these rules for its generating facilities and submit, on regular basis, a report to the Authority under sub-rule (2) of rule 5, namely:—

- (a) *Energy Loss Rate (ELR).*—This indicator shall be calculated for determining the potential (probability) that a generating unit will deliver its rated capacity at any particular time
- (b) *Energy Availability Factor (EAF).* EAF shall be calculated to assess performance with respect to both planned and unplanned outages.
- (c) *Equivalent Planned Outage Factor (EPOF).* This indicator shall be calculated to indicate the amount of time the generating unit spent in the unavailable state due to planned outages (planned well in advance such as annual maintenance outages).

5. **Reporting requirement.**—(1) In respect of rule 3, the licensee shall supply to the Authority, before 31st of October every year, for the preceding year, a statement, duly certified by an authorized person of the generation facility, stating as and when and what time it could not meet the instructions of system operator regarding its obligations of ancillary services.

(2) Reports required for the key indicators under rule 4 shall be submitted on quarterly basis and the first report thereof shall be due after the publication of these rules in the official Gazette.

[No. NEPRA/SPG-01/827-28.]

SYED SAFEER HUSSAIN,  
*Registrar.*



**REQUIRED ELEMENTS FOR CALCULATIONS  
(APPLICABLE TO FORM-I)**

**Reference Capacity (RC)(MW)**

RC is the unit's maximum generating capacity based on IDC (Initial Dependable Capacity) or AIDC (Annual Initial Dependable Capacity) less any station service or auxiliary power requirements in MW utilized for that unit. RC is determined when there are no short term equipment problems causing a temporary derating of the unit and all major equipment is operating at full load under designed temperatures and pressures. For hydro units RC will be the average maximum generation capacity in a month relative to water flow and head availability during that month.

**Net Actual Generation (NAG)(MW-HR)**

NAG is the unit's Gross Actual Generation less any generation utilized for that unit's station service or auxiliary loads. If NAG is negative during the month being reported, enter a minus sign in the column immediately before the reported value.

**Period Hours (PH)**

Enter the number of hours in the period being reported that the unit was in the active service. The sum of Available Hours and Unavailable Hours (total of POIH + UOIH) must equal Period Hours.

**Unit Service Hours (or Unit Operating Hours)(SH)**

Enter the number of hours the unit was synchronized to the system. For units equipped with multiple generators, count only those hours when at least one of the generators was synchronized, whether or not one or more generators were actually in service.

**Reserve Shutdown [or STANDBY HOURS] (RSH)**

Enter the sum of all hours the unit was available to the system but not synchronized for economy reasons. During the RSH time, the unit is capable of generating but is not operated because it is not needed for less load requirement or management decides not to operate it.

**Available Hours (AH)**

Enter the sum of the Unit Service Hours, Reserve Shutdown Hours, and Synchronous Condensing Hours (if applicable).

**Planned Outage Hours (POH) (excluding OMC and seasonal derates)**

Enter the sum of all hours the unit was off-line due to Planned or Scheduled Outages (Outages planned well in advance such as annual overhauls).

**Unplanned Outage Hours and Startup Failure Hours (UOH) (excluding OMC and seasonal derates)**

Enter the sum of all hours the unit was off-line due to sudden, delayed, postponed, startup failure outages

**FORM II**  
[See rule 4]

Company's Name \_\_\_\_\_  
For the Month(s) \_\_\_\_\_

Units	Attempted Unit Starts	Actual Units Starts	Synchronous Condensing Hours	Equivalent Planned Derated Hours (EPDH)	Equivalent Unplanned Derated Hours and Startup Failure Hours (EUDH)	Net Capacity Factor (NCF)	Net Output factor (NOF)	Energy Availability Factor (AE-EUDH-EPDH)/PH

Note: 1. Columns not relevant to particular generation facilities may be left blank  
 2. Data is to be entered for each individual unit except in the case of combined cycle where it would be entered as the "block" i.e., 2 Gas Turbines and 1 Steam Turbine would be defined as "Unit".



## (APPLICABLE TO FORM-II)

**Attempted Unit Starts**

Enter the number of attempts made to start the unit during the month to either generate, pump or operate as synchronous condenser where the unit goes from a stopped position to generate, pump or synchronous condensing mode. Repeated initiations of the starting sequence without accomplishing corrective repairs are counted as a single attempt.

If startup attempts are abandoned and the unit is shut down for repairs and then started at a future time, report two startup attempts.

**Actual Unit Starts**

Enter the number of times the unit actually starts during the month to generate, pump or condense where the unit goes from a stopped position to generate, pump or synchronous condensing mode.

The number of actual unit starts must be less than or equal to the number of attempted unit starts.

**Synchronous Condensing Hours**

Enter the number of hours the unit operated in the synchronous condensing mode (applies primarily to hydro/pumped storage and some combustion turbine units). Do not report these hours as Unit Service Hours.

**Equivalent Planned Derated Hours (EPDH) (excluding OMC and seasonal derates)**

Enter the sum of all equivalent hours the unit was temporarily reduced (restricted, derated) from its Reference Capacity (RC) due to Planned Deratings. These hours are computed from partial deratings (restrictions) only and do not include full, complete outage hours.

**To compute equivalent hours**

Each individual Planned Derating is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the Reference Capacity (RC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours} \times \text{Size of Reduction}}{\text{RC}}$$

The "size of reduction" is reference capability minus temporary capability as a result of the derating or restriction.

### Equivalent Unplanned Derated Hours and Startup Failure Hours (EUDH) (excluding OMC and seasonal derates)

Enter the sum of all equivalent hours the unit was temporarily reduced (restricted, derated) due to Unplanned Deratings. These hours are computed from deratings (restrictions) only and do not include full, complete outage hours.

#### To compute equivalent hours

Each individual Unplanned Derating is transformed into equivalent full outage hour(s). This is calculated by multiplying the actual duration of the derating (hours) by the size of the reduction (MW) and dividing by the Reference Capacity (RC). These equivalent hour(s) are then summed.

$$\frac{\text{Derating Hours} \times \text{Size of Reduction}}{\text{RC}}$$

The "size of reduction" is reference capability minus temporary capability as a result of the derating or restriction.

Sr. No.	Key Indicators for Reporting Requirement
1	Energy Availability Factor (EAF) = [(AH-EUDH-EPDH) / PH].
2	Unit Capability Factor (UCF) = [EAF with out OMC <sup>^^</sup> and ambient losses]
3	Unit Loss Capability Factor (ULCF) = [1-UCF]
4	Energy Loss Rate (ELR) = [(UOH+EUDH with out OMC <sup>^^</sup> , ambient Losses, Planned Outages or derates) / (SH+UOH with out OMC)]
5	Equivalent Unplanned Outages Factor (EUOF) = [(UOH with out OMC <sup>^^</sup> or ambient Losses + EUDH with out OMC <sup>^^</sup> or ambient losses) / PH.]
6	Equivalent Planned Outages Factor (EPOF) = [(POH with out OMC <sup>^^</sup> or ambient Losses + EPDH with out OMC <sup>^^</sup> or ambient losses) / PH.]
7	Net Capacity Factor (NFC) = [(Net actual Generation) / (Reference Capacity *PH)].
8	Net Output Factor (NOF) = [(Net actual Generation) / (Reference Capacity *SH)].

*(<sup>^^</sup>The outages and derates which are not controlled by management of generating facility are termed as "OMC")*