

**EXTRAORDINARY
PUBLICISHED BY AUTHORITY**

ISLAMABAD, TUESDAY, NOVEMBER 15, 2005

PART-II

Statutory Notification (S.R.O)

GIVERNMENT OF PAKISTAN

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

NOTIFICATION

Islamabad the 15th November, 2005

S.R.O. 1138(I)/ 2005. - In exercise of the powers conferred by 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, with the approval of Federal Government, is pleased to make the following rules, namely:-

**PART I
PRELIMINARY**

1. Short title, commencement and application. - (1) These Rules shall be called the National Electric Power Regulatory Authority **Performance Standards (Transmission) Rules, 2005.**

- (2) These rules shall come into force at once.
- (3) The performance standards as set out in these rules shall be applicable to all transmission and special purpose transmission licence holders (SPTL) who shall annually report the operational performance of their transmission system according to the criteria laid down in these rules. The format for reporting performance is shown in Performance Standards Forms as set out in Annexure I to these rules.

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) "circuit" means an arrangement of one or more cables, or conductors of an overhead line or underground cable for the purpose of conveying electric power and forming a transmission system or a branch of transmission system;

- (c) “energy not served” means loss of supply to distribution company or bulk power consumer (BPC) at the following point’s namely:-
- (i) in case of distribution company,-
 - (a) incoming breaker(s) of 132 kV side of 500/220/132 kV substation; and
 - (b) 132kV outgoing circuit breaker(s) of 500/220/132 kV substation provided that such breaker(s) is (are) rendered out of service due to any outage not attributed to the distribution system downstream of the said breaker as shown in Appendix I; and
 - (ii) in case of bulk power consumers (BPC), loss of supply to BPC at the 220 kV incoming circuit breaker installed at consumer’s own Grid Station as shown in Appendix II.
- (d) “force majeure” means an act of God that is reasonably not foreseeable by a transmission licensee or a fault or cause beyond the reasonable control of a transmission licensee;

Explanation.- Events such as an earthquake, explosion, riot, flood, hurricane that result in exceeding the design parameters of the equipment or other calamity of catastrophic nature whose timing, duration, and extent of the impact can not be reasonably foreseen or quantified by the transmission licensee may be considered as a force majeure condition.

- (e) “interconnection point” means the point of connection of the transmission facilities of a transmission company to the electrical facilities of the distribution company, SPTL or bulk power consumers;
- (f) “kV” means kilo-volts or 1,000 volts;
- (g) “outage” means the period during which the transmission facilities including either electrical circuits, or transformers or sub-stations or all of these remain out of service and causes loss of supply at interconnection point;
- (h) planned non-availability means,-
 - (i) non-availability due to planned outages required for maintenance;
 - (ii) non-availability due to planned outages required for the addition, augmentation of capacity or modification of the transmission system; and
 - (iii)planned outages required to construct or modify the transmission system for the exclusive benefit of specific system users;
- (i) unplanned non-availability means, unplanned non-availability due to a forced or unplanned outage not attributed to the distribution system;
- (j) “tie line” means interconnection facility for the transfer of electric power between the licensee and any other person operating outside the jurisdiction of the Act;
- (k) “year” or “annual” means the period of twelve months beginning on the 1st July of a year and ending on the 30th June of the following year.

- (2) Words and expressions used but not defined in these rules shall have the same meaning as in the Act.

PART II

OPERATIONAL PERFORMANCE CRITERIA

3. System reliability. – The reliability of a transmission system shall be monitored by recording loss of supply incidents. Loss of supply incidents shall be reported individually with details of location, time, duration of incident and maximum demand lost as per the following indices, namely:-

- (a) System Duration of Interruption:

= $\frac{\text{Sum of the total outage hours recorded at all the interconnection points (other than 132kV line trippings) in a period.}}{\text{Number of monitoring points (Interconnection Point).}}$

- (b) System Frequency of Interruption:

= $\frac{\text{Number of outages at all 132kV outgoing circuits (other than 132kV line trippings) in a period.}}{\text{Number of Circuits.}}$

4. Tie lines reliability. – Reliability Indices for Tie Lines shall be the same as that given for System Reliability under rule 3. In order to ensure enhanced Tie Lines reliability outages shall be co-ordinated, as far as practical, between the interconnected parties to allow work to be undertaken by both parties during each outage to minimize the losses of availability on the basis of work being carried out by parties on their assets.

5. System security (energy not served). – For the purpose of system security measurements, the estimates of the total energy not served during the year shall be reported as per the following formula, namely:-

$$\text{Energy not Served (ENS)} = \sum_{i=1}^n P_i \times T$$

Where:

- P_i = MW lost in the i^{th} circuit connected to incoming circuit breaker of relevant substation as identified under clause (e) of section 2 and Appendices I & II to these rules.
 n = Total number of reported circuits.
 T = Duration in hours where T is a real number > 0 .

Explanation.- For the calculation of energy not served (ENS) if T is less than or equal to 1 then P_i will be equal to MW delivered at the time of initiation of the outage. In case T is more than 1, then for every additional hour, P_i will be equal to the average MW (to be taken on ½ hourly basis) recorded during the corresponding hour of the same day of the preceding week immediately prior to the outage. For any fraction of hour, P_i will be equal to MW recorded at the start of the corresponding hour.

Illustration.- The circuit carrying 50 MW connected to 132 kV incoming circuit breaker experiences outage on Monday at 10 AM. Three different scenarios are considered.

Scenario No. 1: Circuit remains out of service for 1 Hour.

Scenario No. 2: Circuit remains out of service for 2 Hours.

Scenario No. 3: Circuit remains out of service for 2.4 Hours.

Under scenario 1 P_i will be 50 MW, T is equal to 1 hour

So $ENS = 50 \times 1 = 50 \text{ MWH}$

For scenario 2 the P_i will be as under:

(i) for 1st hour = 50 MW

(ii) for 2nd hour = Average MW recorded (from 11 AM to 12 Noon) on Monday last (corresponding hour and day)(which was say 40 MW)

$$\begin{aligned} E.N.S &= 50 \times 1 + 40 \times 1 \\ &= 90 \text{ MWH} \end{aligned}$$

For scenario 3 the P_i will be as under:

(i) for 1st hour = 50 MW

(ii) for 2nd hour = 40 MW

(iii) for fraction of time (0.4 hours) the load recorded at the start of corresponding hour (12 Noon) on Monday (which was say 60 MW)

$$\begin{aligned} E.N.S &= 50 \times 1 + 40 \times 1 + 60 \times 0.4 \\ &= 114 \text{ MWH} \end{aligned}$$

Note:

In case of restricted load served to the distribution companies after the incident, the quantum of less energy served will be calculated on the same lines as above for the less load served.

6. Quality of supply. – The quality of supply shall be measured with reference to system voltage and system frequency, as set out in Annexure I to these rules.

7. System voltage.- (1) Under normal conditions the voltage variations of plus or minus $\pm 5\%$ of the nominal voltage for voltages of 132kV (where applicable) and above shall be permitted.

(2) Under (N-1) contingency conditions voltage variations of plus or minus $\pm 10\%$ of the nominal voltage for voltages of the 132kV (where applicable) and above shall be permitted.

(3) The criteria for reporting voltage variations outside the limits specified in sub-rules (2) and (3) only apply when the duration of variation exceeds a continuous period of thirty

minutes.

8. System frequency. – (1) The frequency variations of plus or minus $\pm 1\%$ of the nominal frequency of 50 Hertz shall be permitted, i.e. frequency to remain within the frequency limits of 49.50 to 50.50 Hertz at all times.

- (2). The criteria for reporting frequency variations outside the limits specified in sub-rule (1) only apply when the duration of the variation exceeds a continuous period of five minutes.

PART III

OPERATIONAL PERFORMANCE CRITERIA REPORTING

9. Reporting of performance levels. - The licensee shall submit to the Authority every year, before the 31st of March of the succeeding year, an annual performance report. The annual performance report shall contain all relevant information with respect to compliance with these rules during the year, including a statement of comparison with the compliance reporting achieved during the preceding year.

10. Reporting guidelines. – All transmission licencees shall be required to report to the Authority the performance of their transmission system. The following guidance notes are provided to assist licencees on the presentation of system performance, namely:-

(a) System reliability:

Charts should be prepared for the following:

- System duration of interruption presented monthly for the year.
- System frequency of interruption presented monthly for the year.
- % Planned non-availability presented monthly for the year and including a breakdown of the various categories of planned outages.

Where:

% planned non-availability

= $\frac{\text{total outages time in hours as per Section 2(g)} \times 100}{\text{Number of days of the month} \times 24}$

(b) Tie line reliability:

Charts should be prepared for the following:

- Number and duration of interruption.

(c) System security:

Charts, each giving the annual performance over several years including the reporting year for the following:

- Number of incidents, where there has been a loss of supply.
- Estimated average energy not served.
- average energy not served per incident.
- Average duration of incident.
- % age time (hours) in a year during which load was restricted or generation was rescheduled due to inadequate transmission capacity.
- Maximum demand lost: Demand lost which may be due to inadequacy of transmission capacity resulting in loss or restriction in load to be served.

(d) Quality of supply:

(i) Voltage:

Charts showing the number of incidents, voltage was outside the prescribed limits on an annual basis with the following information. The more years presented the better as a trend in annual performance can then be identified.

- % age of time during which the voltage on 132 kV (where applicable) and above was permitted beyond the maximum and minimum limits as prescribed in these rules.
- The maximum and minimum voltage beyond the permitted limit with time and date.
- The tap position of the interconnecting transformer and load transformer at the time of maximum and minimum voltage beyond permitted value with the name of grid station.

(ii) Frequency:

Charts showing the number of incidents frequency was outside the prescribed limits on an annual basis with the following information. The more years presented the better as a trend in annual performance can then be identified.

- % age of time (hours) of the year the frequency was above or below the permitted limits as prescribed in these rules.
- The maximum continuous period of deviation.
- The maximum and minimum frequency with date and time and Whether it caused any islanding of the network giving details if any.

PART IV

MISCELLANEOUS

11. Data base – The licensee shall maintain a computerized database system covering all transmission power supply outages. The database shall include for each occurrence the following, namely:-

- (i) Date and time of occurrence of an outage (power supply interruption).
- (ii) The point of an outage (power supply interruption).
- (iii) The time at which the service was restored, allowing for staged restoration of a major outage.
- (iv) Total duration of outage for each restoration stage.
- (v) Total number of connected consumers.

12. Monitoring, fines and penalties. – (1) Two years data after the notification of these rules will be used to set benchmarks which would be monitored for the purposes of fines and penalties.

(2) For the purpose of reporting system reliability, the following shall be excluded from calculations of indices, namely:

- (i) Planned outages;
- (ii) outages caused under force majeure (conditions); and
- (iii) outages due to generation deficits or interconnection of a Generation facility.

APPENDIX-1

[See rules 1 (3), 3,5,7 and 8]

Form I

System Reliability

A. System duration of interruption:

Total outages hours recorded at all interconnection points (excluding 132kV line tripping).	Total number of interconnection points.	System duration of interruption.
(1)	(2)	$3 = \frac{1}{2}$ (3)

Form 2

(B) System frequency of interruption:

Total number of outages recorded at all 132kV outgoing circuits (excluding 132 kV line tripping).	Total number of 132kV circuits.	System frequency of interruption. $3 = \frac{1}{2}$
(1)	(2)	(3)

Form 3

System Security

Name of circuit.	Per circuit energy not served. $2 = P \times T$	Total energy not served. $3 = P_1 + P_2 + P_3 + \dots$
(1)	(2)	(3)
1.	P ₁	
2.	P ₂	
3.	P ₃	
4.	P ₄	
5.	P ₅	

Form 4

Quality of Supply Voltage

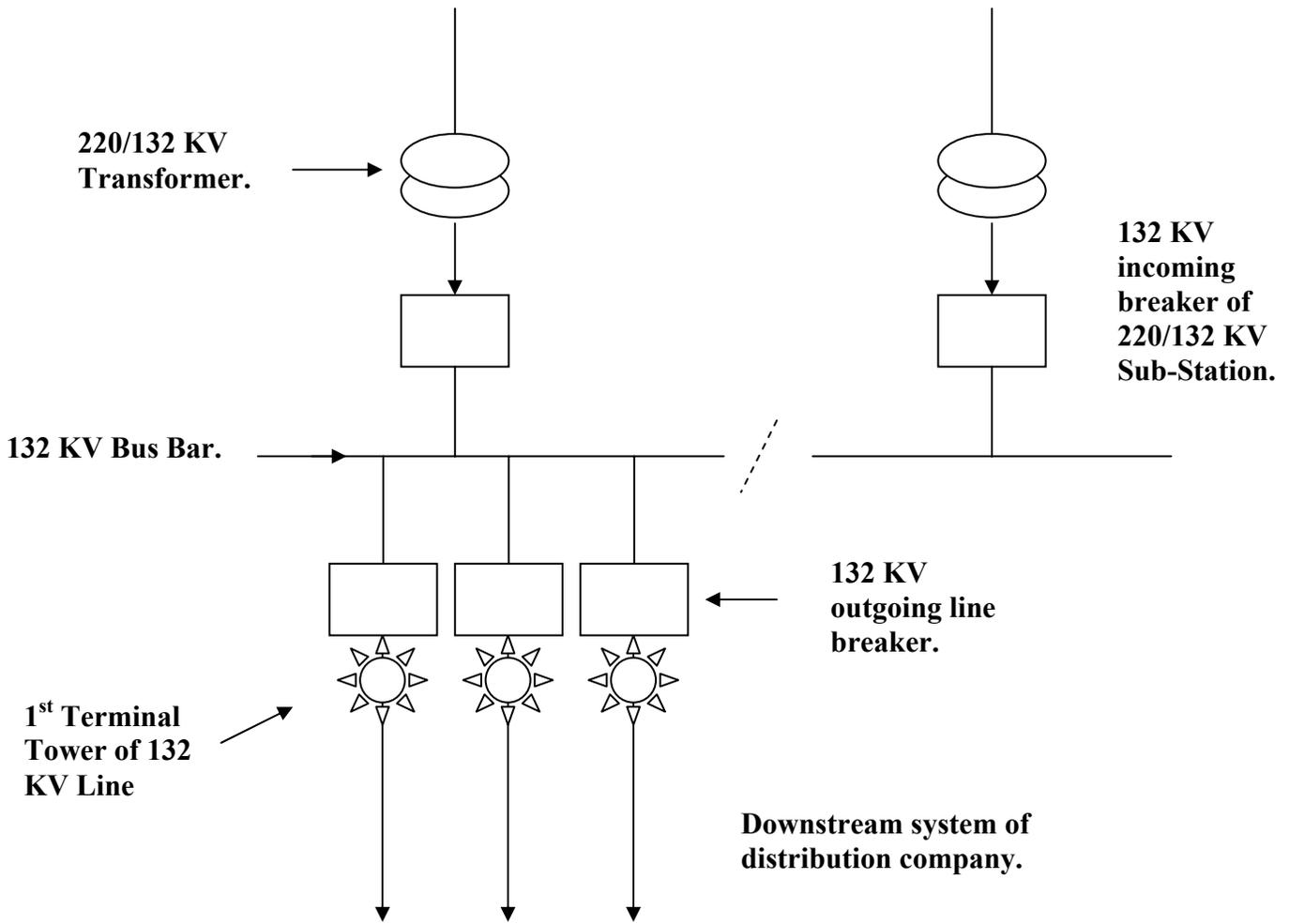
Voltage class.		List of transmission circuits violating the voltage criteria.	Highest/lowest voltage recorded.	Duration of variation (minutes).	%age variation.
132kV (where applicable).	Normal condition.				
	(N-1) condition.				
220 kV	Normal condition.				
	(N-1) condition.				
500 kV	Normal condition.				
	(N-1) condition.				

Form 5

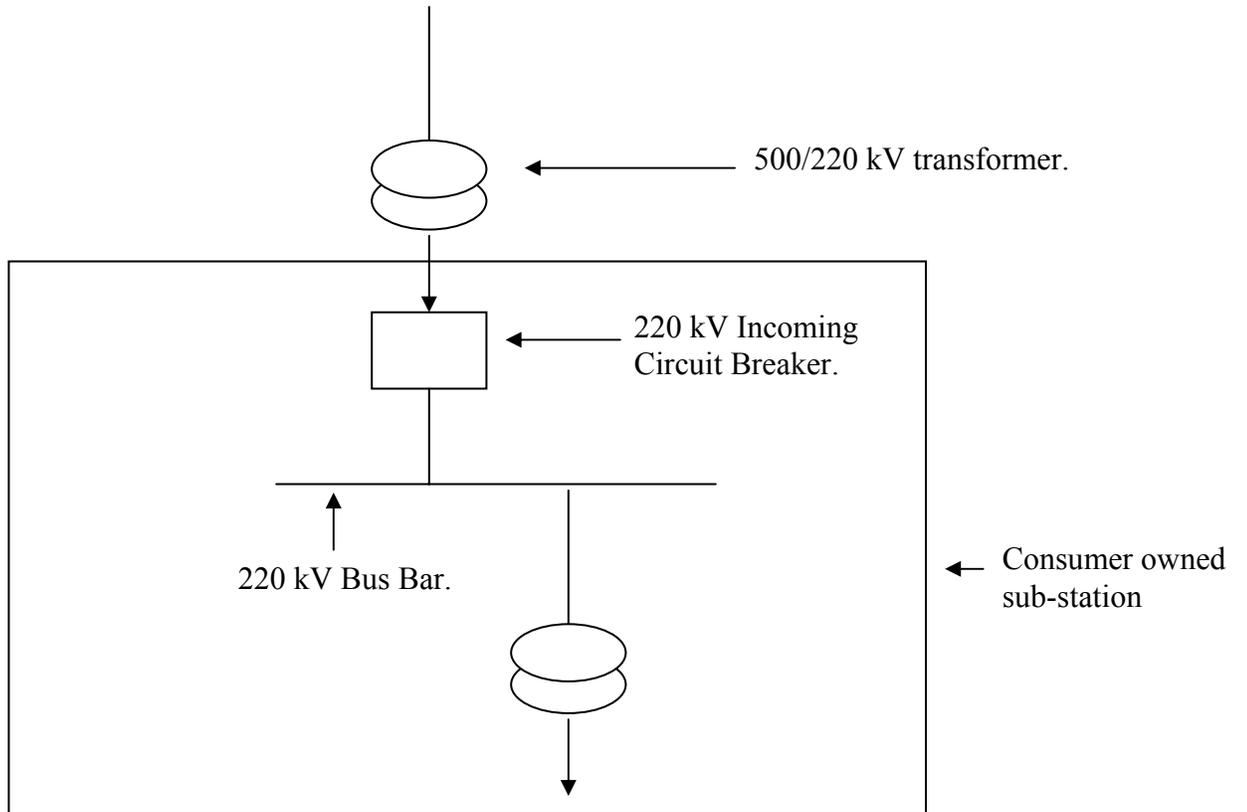
System Frequency

Month.	Number of days/months of measurement over a year.	Measurement interval (minutes).	Highest/lowest frequency recorded/measured.	Duration of variation.	%age variation.
January.					
February.					
March.					
April.					
May.					
June.					
July.					
August.					
September.					
October.					
November.					
December.					

Appendix I
[See rule 5]



Appendix II
[See rule 5]



F.No.

(Mahjoob Ahmed Mirza)
Registrar