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ৰাজপত্ৰ

THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্ৰাপ্ত কৰ্তৃত্বৰ দ্বাৰা প্ৰকাশিত

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GOVERNMENT OF ASSAM
ASSAM ELECTRICITY REGULATORY COMMISSION

NOTIFICATION

The 7th August, 2004

TRANSMISSION LICENSEES' STANDARDS OF PERFORMANCE

No. AERC. /2004/11. -- In exercise of powers conferred under Section 181 (za) and (zb), read with Sections 57, 58,59 and 86 (1) (i) of the Electricity Act, 2003 and all other powers enabling in this behalf, and after previous publication, the Assam Electricity Regulatory Commission hereby makes the following Regulations regarding the Licensees Standards of performance, namely:-

1. Short title, commencement and interpretation:-

- (1) These Regulations may be called the Assam Electricity Regulatory Commission (Transmission Licensees' Standards of Performance) Regulations, 2004.
- (2) These Regulations shall be applicable to all Transmission Licensees authorised to establish or operate transmission lines under a License.
- (3) These Regulations extends to the whole of the State of Assam
- (4) These Regulations shall come into force from the date of their notification in the Assam Gazette

2. Definitions:-

- (1) In this regulation, unless the context otherwise requires "Act" means the Electricity Act 2003 (Central Act No.36 of 2003);

"AERC/Commission" means Assam Electricity Regulatory Commission functioning as State Electricity Regulatory Commission under section 82 of the Act in the State of Assam;

"ASEB" means the Assam State Electricity Board constituted under Section 5 of the Electricity (Supply) Act, 1948 by State Government of Assam and functioning before commencement of the Act. The term ASEB includes any of its successor entities pursuant to Section 131 of the Act;

"Assam GRIDCO" means the company registered under the Companies Act, 1956 and the State Transmission utility notified by the State Govt under Sec.39 of the Act;

"Availability" in relation to a transmission system in a given period means times in hours during the transmission system is capable to transmit electricity at its rated voltage from the supply point to the delivery point and shall be expressed in percentage of total hours in a given period;

"Central Transmission Utility" means the Government Company specified as such by the Central Government under sub-section (1) of the Section 38 of the Act;

"Distribution Code" means the Distribution Code specified by the Commission for Distribution Licensees in the State of Assam;

"Distribution Licensee" means a licensee authorised to operate and maintain a distribution system for supplying electricity to the consumers in his area of supply and includes ASEB and any of its successor entity under the provisions of Section 131 of the Act;

"Distribution System" means the system of wires and associated facilities between the delivery points on the transmission lines or the generating station connection and the point of connection to the installation of the consumers;

"EHV" means Extra High Voltage (voltage level above 33,000 volts);

"Generator" means an organisation that generates electricity and who is subjected to the Grid Code;

"Grid" means the high voltage backbone system of inter-connected transmission lines, sub-stations and generating plants;

"Grid Code" means the Grid code specified by the Commission for Assam State Transmission System;

"Grid Standards" means the standards specified by Central Electricity Authority under clause (d) of section 73 of the Act;

"HV" means High Voltage (voltage level above 650 volts but does not exceed 33,000 volts);

"IEGC" means the Indian Electricity Grid Code approved by Central Electricity Regulatory Commission (CERC) and includes any Grid Code specified by Central Commission under clause (h) of sub-section (1) of Section 79 of the Act;

"Licensee" means a person who has been granted a license by the Commission under the Act and includes ASEB and any of its successor entity under the provisions of Section 131 of the Act;

"NEREB" means North-East Regional Electricity Board under sub-section (1) of section 27 of the Act;

"NERLDC" means North-East Regional Load Despatch Centre;

"**Power System**" means all aspects of generation, transmission, distribution and supply of electricity and includes one or more of the following, namely:

- (a) generating stations;
- (b) transmission or main transmission lines;
- (c) sub-stations;
- (d) tie-lines;
- (e) load despatch activities;
- (f) mains or distribution mains; electric supply lines;
- (g) overhead lines;
- (h) service lines;
- (i) works;

"**PGCIL**" means Power Grid Corporation of India Limited, a Central Transmission Utility;

"**Rules**" means the Indian Electricity Rules, 1956;

"**SLDC**" means State Load Despatch Centre established under sub-section (1) of Section 31 of the Act to ensure integrated operation of power system in the State;

"**State Advisory Committee**" means the State Advisory Committee of Assam Electricity Regulatory Commission established under Section 87 of the Act and includes the State Advisory Committee already functioning in State under repealed Acts;

"**State Transmission Utility**" means the Board or the Government Company specified as such by the State Government under sub-section (1) of the Section 39 of the Act;

"**Transmission Licensee**" means a licensee authorised to establish or operate transmission lines by the Commission and includes ASEB and any of its successor entity under the provisions of section 131 of the Act;

"**Transmission System**" means a line with associated sub-station or a group of lines inter-connected together alongwith associated sub-station.

Words and expressions used but not defined herein shall have meaning assigned to them in Electricity Act, 2003 and Indian Electricity Rules, 1956.

3. Guaranteed and Overall standards of performance:-

- (1) The Standards specified in Schedule-I shall be the Guaranteed Standards of Performance, being the minimum standards of service that a licensee shall achieve and maintain in the discharge of his obligations as a Licensee.
- (2) The Standards specified in the Schedule-II shall be the Overall Standards of Performance, which the Licensee shall seek to achieve in the discharge of his obligations as a Licensee. The Commission may specify different dates for effectiveness of various performance standards specified in Schedule-II by a general or special order
- (3) The Commission may from time to time add, alter, vary, modify or amend the contents of the Schedule I and Schedule-II, by a general or special order passed by the Commission.

4. Compensation:-

- (1) The Licensee from the date as specified by the Commission by an Order issued in this behalf shall be liable to pay to the affected User(s) of State Transmission System, the compensation as may be determined by the Commission by an order for the Licensee's failure to meet the Guaranteed Standards of Performance specified in Schedule – I.
- (2) While determining the compensation to the affected User(s) the Commission shall give a reasonable opportunity to being heard to the concerned Licensee and all affected User(s). The Commission may demand such additional information, evidence and summon records, logged data from the concerned Licensee and/or affected User(s) for determination of compensation.
- (3) The Licensee concerned shall pay the compensation determined as referred in sub-clause (1) above within ninety days of the failure of the Guaranteed Standard of Performance.

5. Information on Standards of Performance

- (1) The Licensee shall furnish to the Commission, in monthly reports and a consolidated annual report for each financial year, the following information as to the Guaranteed Standards of Performance:
 - (a) The levels of performance achieved by the Licensee with reference to those specified in Schedule – I to this regulation;
 - (b) The number of cases in which compensation were payable under clause 4 above, and the aggregate amount of the compensation paid and payable by the Licensee;
 - (c) The number of claims made by the Users against the Licensee for failure to meet the Guaranteed Standards of Performance and the action taken by the Licensee including the reasons as to delay in payment, or non-payment of compensation for such claims; and
 - (d) The measures taken by the licensee to improve performance in the areas covered by Guaranteed Standards and Licensee's assessment of the targets to be imposed for the ensuing year.
- (2) The monthly reports under sub-clause (1) shall be furnished to the Commission within 15 days of the close of the month and the annual report under the said sub-clause (1) shall be furnished to the Commission within 30 days of the close of the financial year.
- (3) The Licensee shall furnish to the Commission, in a report for every quarter and in a consolidated annual report for each financial year, the following information as to the Overall Standards of Performance:
 - (a) The level of performance achieved with reference to those specified in Schedule – II to this regulation; and,
 - (b) The measures taken by the licensee to improve performance in the areas covered by Overall Standards and licensee's assessment of the targets to be imposed for the ensuing year.
- (4) The Quarterly reports under sub-clause (3) shall be furnished to the Commission within 15 days of the close of the quarter and the annual report under the said sub-clause (3) shall be furnished to the Commission within 30 days of the close of the financial year.

- (5) The Commission shall, at such intervals as it may deem fit, direct the Licensee or otherwise to arrange for the publication of the information furnished by licensees under this regulation in such form and manner as the Commission consider it to be appropriate.
- (6) Taking into consideration volume of data to be compile and furnish the Commission at its own discretion allow Licensee to furnish Monthly Report, Quarterly Report and Annual Report on selected specified points instead of entire population.

6. Exemption:-

- (1) The standards of performance specified in this regulation shall remain suspended during Force Majeure condition such as war, mutiny, civil commotion, riot, flood, cyclone, lighting, earthquake or other force and strike, lockout, fire affecting the Licensee's installations and activities.
- (2) The Commission may by a general or special order issued for the purpose, and after hearing the Licensee and such representatives of the affected User(s) as the Commission consider it to be appropriate, release the Licensee from the liability to compensate the consumers for any default in the performance of any standard, if the Commission is satisfied that such default is for reasons other than those attributable to the Licensee and further that the Licensee had otherwise duly made efforts to fulfill his obligations.

7. Issue of orders and practice directions:-

Subject to the provisions of the Electricity Act, 2003 and this regulation, the Commission may, from time to time, issue orders and practice directions in regard to the implementation of this Regulation and procedure to be followed on various matters, which the Commission has been empowered by this regulation to direct, and matters incidental or ancillary thereto.

8. Power to remove difficulties:-

If any difficulty arises in giving effect to any of the provisions of this regulation, the Commission may, by general or special order, do or undertake or direct the Licensee to do or undertake things, which in the opinion of the Commission are necessary or expedient for the purpose of removing the difficulties.

9. Power to Amend:-

The Commission may at any time add, vary, alter, modify or amend any of the provisions of this Regulation or the Schedules attached to this Regulation.

10. Savings:-

- (1) Anything done or any action taken or purported to have been done or taken including any order, direction or notice made or issued before coming into force these regulations shall be valid and binding upon the parties concerned.
- (2) Nothing in this Regulation shall affect the rights and privileges of the consumers under any other law including the Consumer Protection Act, 1986.

GUARANTEED STANDARDS OF PERFORMANCE

(1) Voltage Variation

Voltage Variation is defined as the deviation of the root-mean-square (RMS) value of the voltage from its nominal value, expressed in terms of percent. Voltage Variation may be either of short duration not exceeding one minute or long duration for a time greater than one minute. For the purpose of these standards, the sustained variation in voltage exceeding one-minute duration shall be considered.

ASEB/Transmission Licensee shall ensure that the grid voltage on real time basis remain within the limits specified below at all EHV sub-stations of its Transmission System provided that voltage at inter-connection points of generation and inter-state regional transmission system is within the limits applicable to them:

Nominal	Maximum	Minimum	Reference
400	420 (+5%)	360 (-10%)	IEGC
220	245 (+10%)	200 (-10%)	IEGC
132	145 (+10%)	120 (-10%)	IEGC
66	72.60 (+10%)	59.40 (-10%)	IE Rules, 1956
33	34.98 (+6%)	30.03 (-9%)	IE Rules, 1956
11	11.66 (+6%)	10.01 (-9%)	IE Rules, 1956

(2) Frequency Variation

Assam Transmission System operates as an integral part of the North-Eastern Regional Grid and frequency management is the joint responsibility of all the constituents in the North-Eastern Region.

ASEB/Transmission Licensee shall fulfil its obligation to enable the NERLDC to keep the frequency within specified ranges in accordance with provisions of IEGC:

Target Range (As per IEGC)	Variation (%)	Value (Hz)
Upper Limit	+1%	50.5 Hz

Lower Limit	-2%	49.0 Hz
Statutory Acceptable Limit (As per IE Rules, 1956)	Variation (%)	Value (Hz)
Upper Limit	+3%	51.5 Hz
Lower Limit	-3%	48.5 Hz
Extreme Conditions from System Security point of view	Variation (%)	Value (Hz)
Upper Limit	+ 5%	52.5 Hz
Lower Limit	-5%	47.5 Hz

(3) Safety Standards

The ASEB/Transmission Licensee shall observe measures relating to safety and electricity supply as may be specified by the CEA in consultation with the State Government under section 53 of the Act.

The ASEB/Transmission Licensee shall observe the General Safety Requirements as laid down in IE Rules, 1956 for construction, installation, protection, operation and maintenance of electric supply lines and apparatus. The ASEB/Transmission Licensee shall develop its Safety Manual taking into consideration the safety requirements for the construction, operation and maintenance of electrical plants and electric lines as laid down in IE Rules, 1956. The Safety Manual shall be updated by the Licensee based on the safety requirements for the construction, operation and maintenance of electrical plants and electric lines as may be specified by the Central Electricity Authority under Clause (c) of Section 73 of the Act.

ASEB/Transmission Licensee shall designate suitable control persons as specified in Grid Code for coordination of safety procedures before work is taken up, during work, and after work is completed till the concerned system component is energized, both inside its own Transmission System and across a control boundary between ASEB/Transmission Licensee Transmission System and that of any user.

OVERALL STANDARDS OF PERFORMANCE

(1) System Availability

(a) Feeder Availability

Feeder availability from a sub-station shall be taken in hours during which the feeder was capable to transmit electricity from the supply point of the sub-station. If any feeder of EHV sub-station is kept “OFF” due to SLDC instructions for load shedding or the supply to ASEB/Distribution Licensees is kept “OFF” for not adhering to the Connection Conditions or ASEB/Distribution Licensees system is faulty then such period shall not be considered as non-availability for that feeder.

$$\% \text{ Availability of } n^{\text{th}} \text{ Feeder at a sub-station } (F_{an}) = (a_1 + a_2 + a_3 + \dots + a_n) / N \times 100$$

Where $a_1, a_2, a_3, \dots, a_n$ is the availability in 1st, 2nd, 3rd,nth hour.

N is the number of hours in the period, which for one year shall be equal to 8760

The feeder availability gives the percentage of time during which the feeder remained available for transmission.

(b) Sub-Station Availability

Sub-Station Availability (S_a) is the composite availability of feeders of various voltage classes emanating from a sub-station taken together based on voltage factor. The relative weightage of the feeders will be based on its voltage class of the feeder. Higher voltage feeders have grater voltage factor as compared to lower voltage feeders and represents the extent of power transmission capacity affected due to outage of feeder of that voltage class.

Voltage factor shall be applied to arrive at weightage of feeder of a voltage class in the System Availability:

Voltage of feeder (V)	11 kV	33 kV	66 kV	132 kV	220 kV	400 kV
Voltage factor (Vf)	1	3	6	12	20	36
Nos. of feeders in sub-station (N)	N_a	N_b	N_c	N_d	N_e	N_f

$$\% \text{ Sub-Station Availability } (S_a) = \sum F_{an} \times V_f / \sum (N \times V_f)$$

Where

F_{an} is the availability of n^{th} Feeder at a sub-station

V_f is Voltage factor of the feeder

N is the number of feeder of that voltage class

$\Sigma (N \times V_f)$ is the weightage of sub-station in system availability

The sub-station availability expressed in % is the measure of the extent of power transmission capacity remained available from a substation.

(c) Transmission System Availability

Transmission System Availability shall be worked out for all the sub-stations of the ASEB/Transmission Licensee combined together in a period say for a year.

$$\text{Transmission System Availability (TSA)} = \Sigma S_a / Z$$

Where S_a is the availability of k^{th} sub-station

$Z =$ sum of $(N \times V_f)$ for all the sub-stations combined together for the ASEB/Transmission Licensee

ASEB/Transmission Licensee shall ensure weighted annual average transmission system availability not less than ninety-five percentages.

(2) Voltage Unbalance

Voltage Unbalance is defined as the maximum deviation in voltage between two phases divided by the average of the phase voltages of all three phases, expressed in terms of percent:

$$\text{Voltage Unbalance} = \frac{\text{Deviation between highest and lowest phase voltage}}{\text{Average voltage of three phases}}$$

The phase voltages of a 3-phase supply should be of equal in magnitude and phase angle and the loads on each phase should be balanced. Deviations will result in decreased efficiency, negative torque, vibrations and overheating. Severe unbalance could lead to malfunctioning of some equipment. Some types of loads like X-ray machine, electric traction, induction & arc furnace may induce unbalance in the supply voltages.

The voltage unbalance at the inter-connection point with ASEB/Distribution Licensee shall not exceed the values given below:

Voltage Level	Limit of voltage unbalance
220kV	2%
132kV	3%
66 kV	3%

The Voltage unbalance shall be measured from hourly Log Sheet Data reordered at sub-stations. Voltmeter having accuracy class not more than 1% shall be preferably used for recording hourly readings.

(3) Neutral Voltage Displacement

Unbalance in loads on three phases cause shifting of neutral from earth potential. Neutral displacement is applicable for transformers with 'Star Point' solidly grounded. Under "solidly" grounded conditions, the potential of neutral should be equal to earth i.e. zero. But in actual conditions, the earthing of the star point is imperfect and so the star to ground offers small resistance. This results in flow of negative sequence currents (because $I_R + I_Y + I_B \neq 0$) through neutral to ground. The neutral therefore shifts from earth potential.

Unbalance voltages and displacement of neutral will result in decreased efficiency, negative torque, leakage currents, vibrations and overheating. Severe unbalance and neutral displacement could lead to malfunctioning of some equipment. Some types of loads like X-ray machines; electric traction; induction and arc furnace may induce unbalance in the supply voltages and shift the voltage of neutral from earth potential.

The ASEB/Transmission Licensee shall ensure that the neutral point voltage of the all EHV transformers with respect to earth will not have potential greater than 2% of the no load phase-phase voltage of the transformer.

(4) Voltage Variation Index (VVI)

Voltage Variation Index representing the degree of voltage variation from nominal value over a specified period of time expressed as a standard deviation. The Voltage Variation Index (VVI) shall be computed from hourly Log Sheet Data reordered at sub-stations as per the following formula:

$$VVI = \frac{100}{V_s} \times \text{Square Root of } \frac{\sum_{i=1}^N (V_i - V_s)^2}{N}$$

Where,

V_i = RMS value of hourly measured voltage (in kV) at i^{th} hour in the period for which VVI is computed

V_s = RMS value of the nominal system voltage i.e. 400kV, 220kV, 132 kV and 66kV etc. as may be applicable at the interconnection point

N = Number of hourly measurements over the specified period of time

The data from defective metering or any abnormal data shall be discarded from calculations.

The Commission shall fix benchmark for standards of VVI on the basis of data collected for at least one year and revise the levels to be achieved from time to time for ensuring improvement in the performance of ASEB/Transmission Licensees.

(5) Harmonics in supply voltage

Many loads in power system produce current and voltages at frequencies in multiple of the fundamental frequency. These multiple frequency voltage and currents are called Harmonics and their ratio to the fundamental frequency is called Harmonic Order. Harmonics affects system operation and reduces life of the equipments. Harmonics of odd order are more undesirable especially in Industrial sub-stations, the effect of harmonics are more severe. Some types of loads like Induction & Arc Furnace, electromagnetic equipment such as X-ray machines etc produce harmonics in supply voltages.

Harmonic contents of the supply voltage is indicated by the following indices:

$$V_{\text{THD}} = \sqrt{\sum_{i=1}^{40} \frac{V_i^2}{V_1^2}} \times 100\%$$

$$V_{\text{IHD}} = \frac{V_i}{V_1} \times 100\%$$

Where,

- V_i : i^{th} harmonic of voltage
- V_1 : Fundamental frequency (50 Hz) voltage
- V_{THD} : Voltage total harmonic distortion
- V_{IHD} : Voltage distortion of i^{th} harmonic

The ASEB/Transmission Licensee shall ensure that the individual harmonic voltage order shall not exceed 1%. Harmonic measurement shall confirm to IEC Std. 1000-4-7 or IEEE Std. 519. The measurement of harmonic order in distribution system shall be on sample basis at an interval of 6 months at strategic such inter-connection points which it consider prone to harmonic voltage generation. ASEB/Transmission Licensee will compile a list of all metering points, which are prone to harmonic generation for taking remedial measures and shall furnish the report indicating corrective action. The ASEB/Transmission Licensee shall take adequate measures to prevent harmonics induction in the transmission system from consumer load side equipments like Induction & Arc Furnace, electromagnetic equipment such as X-ray machines etc.

(6) Frequency Variation Index (FVI)

A performance index representing the degree of frequency variation from nominal value of 50.00 Hz over a specified period of time:

$$F V I = 10 X \frac{\sum_{i=1}^N (f_i - 50)^2}{N}$$

Where,

f_i = Actual frequency in Hz at i^{th} time period

N = Number of measurements over the specified period of time

ASEB/Transmission Licensee shall observe the IEGC stipulations for Frequency Variation Index as and when implemented in the North-Eastern Region.

(7) Service Reliability

The points where electric power is supplied from transmission system to the Users (Distribution Companies, another transmission system, EHV consumers) are called delivery points or interface points. Outage at these points directly affects the Users of the Grid. The reliability level at the delivery points is therefore an indication of quality of service provided by ASEB/Transmission Licensee to its Users.

System reliability of the Grid is expressed in terms of:

- System Average Interruption Frequency Index (SAIFI)
- System Average Interruption Duration Index (SAIDI)

(a) System Average Interruption Frequency Index (SAIFI)

This index gives number of interruptions in power supply to loads expressed as per year per EHV Sub-station for a voltage class. All interruptions except due to acts of nature (like earthquake, floods, storms etc.), fire, orders of civil/military authorities, scheduled outage, load shedding to meet capacity shortage, failure of PGCIL transmission system or failure of generating units (leading to grid failure or system islanding) of duration exceeding five (5) minute at a time shall be counted in computing the index.

$$SAIFI = \Sigma I / N$$

Where,

ΣI = Sum of number of interruptions exceeding 5 minutes at a time duration in the year for the given voltage class

N = Number of EHV sub-stations in service at the beginning of year having that class of voltage supply

SAIFI shall be computed for each voltage class separately.

(b) System Average Interruption Duration Index (SAIDI)

This index gives weighted average interruptions in a year with reference to the total connected load on the system. All interrupted loads for duration exceeding five (5) minutes at a time in the year are counted in computing the index. Interruptions due to acts of nature, orders of civil/military authorities, scheduled outage (including three shift operation of agriculture pump sets), load shedding to meet capacity shortage, failure of PGCIL transmission system or failure of generating units (leading to grid failure or system islanding) shall be however excluded in the computation of this index. SAIDI gives the measure of average interruption time per EHV Sub-station on annual basis for a voltage class.

$$SAIDI = \Sigma D / N$$

Where,

ΣD = Sum of duration of all interruptions of exceeding 5 minutes at a time in the year for the given voltage class

N = Number of EHV sub-stations in service at the beginning of year having that class of voltage supply

SAIDI shall be computed for each voltage class separately.

Above data shall be compiled each sub-station for calculating reliability indices. The ASEB/Transmission Licensee shall compile monthly data for each Circle to ascertain Circle wise reliability indices of the system.

The Commission shall fix benchmark for standards of reliability (both SAIFI and SAIDI) on the basis of data collected for at least one year and revise the levels to be achieved from time to time for ensuring improvement in the performance of ASEB/Transmission Licensee.

(8) System Adequacy

System adequacy is the ability of the power system to receive the generated power or supply the aggregate electrical demand and energy requirements at all times, taking into account scheduled and reasonably expected unscheduled outage of system elements.

The ASEB/Transmission Licensee shall observe the Transmission Planning Criteria specified by Central Electricity Authority for designing, developing the transmission network. The ASEB/Transmission Licensee shall observe the operational standards laid down by CEA Manual for Transmission Planning.

The system voltage and frequency shall be close to the nominal values as possible and there shall be no overloading of any system element under normal conditions and different feasible load-generation conditions.

The system voltage and frequency and loading of system elements shall remain within prescribed limits and not necessitate load shedding or generation re-scheduling in the event of outage of any single system element over and above a pre-contingency system depletion of another element in another corridor.

The system shall remain in synchronism without necessitating load shedding or islanding in the event of single-phase-ground fault or three-phase faults assuming successful clearing of fault by isolating/opening of the faulted system elements. The system shall have adequate margins in terms of voltage and steady state oscillatory stability.

The Commission shall review standards with regards to system adequacy and security based on the Grid Standards specified by CEA under section 73 (d) of the Act.

(By Order of the Commission)

**Sd/- ILLEGIBLE
Secretary,
Assam Electricity Regulatory Commission.**