

**BEFORE THE CENTRAL ELECTRICITY REGULATORY COMMISSION  
NEW DELHI****Coram :**

1. Shri S.L. Rao, Chairman
2. Shri D.P. Sinha, Member
3. Shri G.S. Rajamani, Member
4. Shri A.R. Ramanathan, Member

In the matter of

**For seeking provisional approval of incentive based on availability  
of Transmission System for the years 1997-98 and 1998-99**

**Petition No. 12/99**

In the matter of

M/s Power Grid Corporation of India Ltd. ... **Petitioner**

1. Bihar State Electricity Board
2. West Bengal State Electricity Board
3. Grid Corporation of Orissa Ltd.
4. Damodar Valley Corporation
5. Power Department, Gangtok... **Respondents**

**Petition No. 13/99**

In the matter of

M/s Power Grid Corporation of India Ltd. ... **Petitioner**

***Versus***

1. Madhya Pradesh Electricity Board
  2. Maharashtra State Electricity Board
  3. Gujarat Electricity Board
  4. Electricity Department, Goa
  5. Electricity Department, Daman
- 
1. Electricity Department, Silvassa... **Respondents**

**Petition No. 14/99**

In the matter of

M/s Power Grid Corporation of India Ltd. ... **Petitioner**

***Versus***

1. Karnataka Power Transmission Co. Ltd.
2. Transmission Corporation of Andhra Pradesh
3. Kerala State Electricity Board

4. Tamil Nadu Electricity Board
5. Electricity Department of Pondicherry
6. Electricity Department, Goa ... **Respondents**

**Petition No. 16/99**

In the matter of

M/s Power Grid Corporation of India Ltd. ... **Petitioner**

***Versus***

1. Rajasthan State Electricity Board
2. Himachal Pradesh State Electricity Board
3. Punjab State Electricity Board
4. Haryana Vidyut Prasaran Nigam Ltd.
5. Power Development Department, J&K
6. U.P. State Electricity Board
7. Delhi Vidyut Board
8. Chandigarh Administration, Chandigarh ... **Respondents**

## **ORDER**

The Commission vide order dated 31<sup>st</sup> March 2000 had directed CEA to finalise the methodology for determination of availability of the Transmission System. Accordingly, CEA submitted its report on 15<sup>th</sup> May 2000. The matter was heard on 19.06.2000 when Shri Rakesh Nath appearing on behalf of CEA made his presentation. The petitioner, POWERGRID and the respondents present at hearing, made their submissions on CEA's report. POWERGRID, UPPCL, APTRANSCO, PSEB, RSEB, MPEB and TNEB have also filed written submissions. Upon hearing the parties on 19<sup>th</sup> June, 2000, the Commission directed CEA to review the matter in the light of the issues raised by the parties at hearing. CEA has submitted revised report on 14.7.2000. CEA has also submitted its reply to points raised by parties vide letter dated 17/18.07.2000. The issues raised by the parties and the decision of the Commission thereon are discussed in the succeeding paragraphs.

### **Issue-1 : Relevance of Incentives for Transmission System Availability**

It has been pointed out by the respondents that incentive for transmission system based on its availability is not relevant as no extra efforts are required to maintain the system at higher availability. In our order on preliminary legal issues, dated 19<sup>th</sup> June, 2000, we have already held that in exercise of regulatory powers, the Commission is competent to lay down its own norms and principles for tariff determination for inter-state transmission which it is yet to do. In the interest of continuity and to avoid a situation of vacuum, we adopted the norms laid down by the Central Government in its Notification dated 6.12.1997 for the purpose of these petitions. In view of this, we hold that the incentive based on availability shall be paid for the years 1997-98 and 1998-99, the subject matter of these petitions, in accordance with Ministry of Power's Notification dated 16.12.1997.

### **Issue-2 : Target Availability level for recovery of full fixed charges and payment of incentives**

As per Ministry of Power Notification dated 16.12.1997, Target Availability is fixed at 95% for recovery of full fixed charges and incentive becomes payable in case Target Availability is beyond 95%. According to CEA, the Target Availability fixed by Ministry of Power is on the lower side and has recommended that Target Availability should not be less than 98% for the purpose of recovery of fixed charges. These views of CEA find support from the respondents.

As we have already adopted the GOI tariff notification dated 16.12.1997, for the purpose of these petitions, we do not consider it proper to change the Target Availability level from 95% to 98%.

Question of laying down of norms for this purpose is separately under consideration of the Commission. In the meantime, we direct that so far as these petitions are concerned, incentive shall be payable in case availability is certified to be beyond 95% from the years 1997-98 and 1998-99.

**Issue-3 : Use of Surge Impedance Loading (SIL) as weightage factor for determination of availability of AC Transmission lines**

CEA has recommended product of SIL and circuit km as weightage factor for the purpose of availability calculation for AC transmission line. TNEB has contended that actual loading of line may be lower or higher than SIL and hence SIL cannot be an appropriate weightage factor. UPPCL has supported TNEB on this issue. MPEB in its written submissions has stated that each line should be given weightage factor depending on the actual loading, location and importance.

CEA has clarified that permissible loading limit of line depends on a number of factors and may vary during day and night and in various seasons of the year. On the other hand, SIL gives a general idea of the loading capability of the line. For the same type of conductors configuration and line voltage SIL of similar transmission line would be the same. In the light of the clarifications furnished by CEA, the weightage factor recommended by CEA for determination of availability of AC Transmission lines appears to be in order.

**Issue-4 : Exclusion of inter-regional lines while calculating Availability**

During the hearing TNEB, APTRANSCO, PSEB and RSEB expressed that inter-regional lines are used only for short periods and hence no incentives should be paid on inter-regional assets. PSEB has put forth a similar argument so far as Switched Bus Reactor is concerned. CEA has, however, clarified that some inter-regional lines are continuously used for inter-regional power transfers. Even if an inter-regional line is not in continuous use, it has to be kept in readiness for transfer of power at short notice. Therefore, inter-regional links cannot be kept out of the availability calculations. We are in agreement with CEA's views and hence no change in CEA's original proposal on this account is considered necessary.

**Issue-5 : Effect of Outage of some transmission elements**

RSEB had expressed a view that outage of certain elements may lead to non-availability of share from Central Sector Power to a particular State and yet that State would be required to pay transmission tariff based on combined availability of Regional Transmission system. Similarly, TNEB had contended that in case of separation from the Regional Grid due to grid disturbance, the availability of transmission system for that State should be considered as zero. It has, therefore, been pleaded by the respondents that these factors should be taken into account while determining availability.

According to CEA, as per the present methodology, the transmission tariff is calculated based on the gross block of the entire transmission system on regional basis, which in turn is shared by the States in proportion to their respective energy drawal. Accordingly, it is not possible to take care of problems faced by individual States. Further, the outage of elements may not necessarily be attributable to POWERGRID. Even after separation of a State from the grid, the ISTS in rest of the regional grid continues to be functional. CEA has, therefore, not favoured any changes. We are of the view that this issue relates to peculiar feature of pooled transmission tariff which cannot be done away under the present GOI tariff notification.

**Issue-6 : Treatment of outage time due to contingencies not attributable to POWERGRID**

In its original report, CEA had recommended that outage time of transmission elements due to (a) earthquake & cyclone and (b) grid disturbance should be excluded from the total time of the elements under period of consideration. POWERGRID, in its written submissions, has contended that in addition to the earthquake and cyclone, all outages attributable to act of God such as floods, etc. are beyond its control and hence elements under outage on account of these factors should also be considered as natural calamities. POWERGRID has further pleaded for inclusion of other force majeure outages due to militant activities in this category. We are in agreement with the views of

POWERGRID on this account and accordingly direct that the proposal of CEA shall stand modified to the extent that all force majeure factors leading to outages shall be excluded for the purpose of availability. POWERGRID has also prayed for considering deemed availability for such outages. However, in response to para 2.5.3 of CEA's recommendations, POWERGRID has pleaded that reasonable restoration time as estimated by certifying authority may be excluded from the total time in line with CEA's recommendation. It has also stated that Member Secretary, REB may estimate the restoration time in consultation with POWERGRID and any circuit restored through ERS (Emergency Restoration System) may be considered available. We are in agreement with POWERGRID subject to the condition that Member Secretary, REB may consult POWERGRID or any other expert while estimating restoration time.

POWERGRID has also contended that during charging of element(s) after a grid disturbance / grid incident when the line was out of service for long time, technical snag may surface out, causing abnormal delay in charging of the element. On this premise, POWERGRID has pleaded that the outage time should be calculated from the time of unsuccessful attempt to charge and not from the time the element was out of service due to grid disturbance; as recommended by CEA. We feel that it is the responsibility of POWERGRID to take all possible steps so as to avoid technical snags in the equipment and hence recommendation of CEA is considered to be justified.

### **Issue-7: Role of Member Secretary**

CEA in its original proposal had recommended that the decision of Member Secretary as regards the outage time and reasonable restoration time to be allowed after natural calamities, shall be final. However, CEA has now recommended a provision for referring any dispute arising out of Member Secretary's decision to the CEA within a month. POWERGRID has pleaded for review of proposed role of Member Secretary on the premise that the outage data gets recorded in RLDC/SLDC/control rooms of constituents regularly.

As per Government of India's notification, Member Secretary, REB has been assigned the role of certifying availability. Therefore, RLDCs cannot be entrusted with such a function. In accordance with the existing statutory provisions (Section 55(9) of the Electricity (Supply) Act, 1948), only disputes related to system operation can be referred to the Authority. The issue under consideration is primarily related to tariff which falls within the exclusive jurisdiction of the Commission. Accordingly, we direct that any dispute relating to certification by Member Secretary, REB shall be decided by the Commission.

CEA have also recommended that POWERGRID should provide a terminal for real time data to REBs at its own cost. Though the petition pertains to the years 1997-98 and 1998-99, the procedure for certification being prescribed now shall continue to be in force till the Commission notifies the revised procedure. In view of this, we direct that RLDCs shall provide real time data terminals to REB secretariat as early as possible. The cost of such terminals shall be recovered in the form of RLDC charges.

### **Issue-8 : Mis-declaration of data by POWERGRID**

CEA has recommended that in case of submission of incorrect data for availability of POWERGRID's system and outage of elements for reasons not attributable to POWERGRID, as a measure of penalty the outage time shall be taken as twice the actual outage time. POWERGRID has pleaded for removal of this clause as there may be genuine and inadvertent calculation mistakes, which will be rectified during REB review.

We are of the view that the penalty clause recommended by CEA for mis-declaration is redundant since the availability of the transmission system for claiming incentive is to be certified by Member Secretary, REB. Notwithstanding above, POWERGRID shall make all possible efforts to avoid errors in the data and calculations submitted to Member Secretary, REB for certification.

### **Issue-9 : Loss of generation due to outage of transmission elements**

CEA has recommended that if the outage of any element causes loss of generation at central sector

stations then the outage period for that element should be deemed to be twice the actual outage period for the days on which such loss of generation has taken place. POWERGRID has pleaded that loss of generation should not be a criteria for penalty as the transmission constraints may arise due to reactive flows, outage of SEB lines and lack of normal redundancy. It has been further pleaded by POWERGRID that its role is limited to creation of transmission system as per CEA's planning criteria and that such penalty has not been envisaged in the GOI tariff notification. TNEB has expressed that incentive payable to a Central Sector Generating station due to deemed generation on account of backing down of generation due to outage of a transmission line of POWERGRID should be borne by POWERGRID. PSEB, in its written submissions has stated that the penalty recommended by CEA is not commensurate with the loss suffered by the beneficiaries. CEA has clarified that loss on account of backing down of generation can be very high and in the present transmission tariff there is no provision for covering this risk. Accordingly, it has recommended a small penalty in the form of doubling the outage period for outages resulting in loss of generation to give correct signal to POWERGRID to ensure higher availability for such lines.

The penalty is proposed to be applied while calculating the availability of the transmission system, the methodology for which was not stipulated in the GOI tariff notification. As regards TNEB's proposal, we feel that it would be unreasonable to direct POWERGRID to pay for consequential damages on account of incentives due to deemed generation attributable to outage of transmission element. In view of these considerations, penalty proposed by CEA is considered to be in order.

**Issue-10 : All associated equipments along with identified transmission elements should be considered for calculation of Transmission System Availability**

MPEB and UPPCL in their written submissions have expressed that all the transmission elements along with associated equipment at both ends should also be considered for calculation of Transmission System availability. At the hearing, UPPCL emphasised on consideration of protection system for calculation of availability since the protection system is an important part of transmission system. According to CEA, though protection system is an important part of the electrical equipment, yet in case of outage of protection system, the equipment shall have to be taken out of service and outage on this account shall have to be attributable to POWERGRID. As such, CEA has not favoured the proposal of UPPCL.

We are satisfied with the explanation given by CEA. No change is required in the CEA's proposal on this account.

**Issue-11 : Availability of Inter-regional links with HVDC back-to-back stations**

CEA has considered HVDC back-to-back station as one element and the associated AC lines have been put in the general category of AC transmission lines. We are of the view that HVDC back-to-back station and associated AC lines put together serve the purpose of inter-connecting two regions operating at different frequency. This purpose would not be served if associated AC line is not available. However, power can be transmitted through bypass in radial mode from one region to other region even if HVDC back-to-back station is not available. To take care of this aspect, HVDC back-to-back station shall also be considered as unavailable if associated AC line (necessary for transfer of inter-regional power through HVDC back-to-back station) is not available.

In the light of above discussion, the procedure as contained in Appendix "A" to this Order shall be followed for the purpose of calculations of availability of the transmission system. The petitioner is directed to file the amended petition for incentive for the years 1997-98 and 1998-99, based on availability calculations duly certified by Member Secretary, REB, within one month from the date of issue of this order, with copies to the respondents. These petitions be fixed for hearing on 20.11.2000 at 10.30 A.M.

We place on record our appreciation for the assistance rendered by the CEA in finalising the procedure for calculation of Transmission System Availability. Let a copy of this order be sent to all concerned, including Member Secretaries of REBs for necessary action.

Sd/-	Sd/-	Sd/-	Sd/-
(A.R. Ramanathan) Member	(G.S.Rajamani) Member	(D.P. Sinha) Member	(S.L.Rao) Chairman

Dated the 26<sup>th</sup> September, 2000.

**Appendix 'A' to Order dated 26<sup>th</sup> September, 2000**  
**Procedure for calculation of Transmission System Availability**

1. The transmission elements shall be grouped into following categories for the purpose of calculation of availability of Regional Transmission Systems :
  - i. AC transmission lines: Each circuit of AC transmission line shall be considered as one element.
  - ii. Inter-Connecting Transformers (ICTs): Each ICT bank (three single phase transformer together) shall form one element.
  - iii. Static VAR Compensator (SVC): SVC along with SVC transformer shall form one element. However, 50% credit to inductive and 50% to capacitive rating shall be given.
  - iv. Switched Bus Reactor : Each switched Bus Reactor shall be considered as one element.
  - v. HVDC lines: Each pole of HVDC line along with associated equipment at both ends shall be considered as one element.
  - vi. HVDC back-to-back station: Each block of HVDC back-to-back station shall be considered as one element. If associated AC line (necessary for transfer of inter-regional power through HVDC back-to-back station) is not available, the HVDC back-to-back station block shall also be considered as unavailable.
  
2. The Availability of Regional Transmission system shall be calculated as under:

% System Availability

$$= \frac{o \times AV_o + p \times AV_p + q \times AV_q + r \times AV_r + s \times AV_s + t \times AV_t}{o + p + q + r + s + t} \times 100$$

Where

o is Total number of AC lines.

$AV_o$  is Availability of o number of AC lines.

p is Total number of HVDC poles.

$AV_p$  is Availability of p number of HVDC poles.

q is Total number of ICTs.

$AV_q$  is Availability of q number of ICTs.

r is Total number of SVCs.

$AV_r$  is Availability of r number of SVCs.

s is Total number of switched bus reactors

$AV_s$  is Availability of s number switched bus reactors

t is Total number of HVDC back-to-back station blocks.

$AV_t$  is Availability of t number of HVDC back-to-back station blocks

3. The weightage factor for each category of transmission elements shall be as under:

- a. For each circuit of AC line – Surge Impedance Loading for Uncompensated line (SIL) multiplied by Circuit Km.

SIL rating for various voltage level and conductor configuration is given in [Annexure-I](#).

For inter regional AC lines, 50% of the weightage factor shall be allocated to each Region.

- (b) For each HVDC pole – The rated MW capacity x Circuit km.

- (c) For each ICT bank – The rated MVA capacity.

- (d) For SVC – The rated MVAR capacity (inductive & capacitive).

- (e) For switched Bus reactor – The rated MVAR capacity.

- a. For HVDC back-to-back station connecting two Regional grids – 50% of the rated MW capacity of each block to each region.

4 The availability for each category of transmission elements shall be calculated based on the weightage factor, total hours under consideration and non-available hours for each element of that category. The formulae for calculation of Availability of each category of the Transmission elements are enclosed as [Annexure-II](#).

5. The transmission elements under outage due to following reasons not attributable to POWERGRID shall be deemed to be available:

- i. Shut down of POWERGRID transmission elements availed by other agency/agencies for maintenance or construction of their transmission system.
- ii. Manual tripping of POWERGRID line due to over voltage and manual tripping of switched bus reactor as per the directions of RLDC.

6. Outage time of POWERGRID transmission elements for the following contingencies shall be excluded from the total time of the element under period of consideration.

- i. Outage of elements due to acts of God and force majeure events beyond the control of POWERGRID. However, onus of satisfying the Member Secretary, REB that element outage was due to aforesaid events and not due to design failure shall rest on POWERGRID. A reasonable restoration time for the element shall be allowed by Member Secretary, REB and any additional time taken by POWERGRID for restoration of the element beyond the reasonable time shall be treated as outage time attributable to POWERGRID. Member Secretary REB may consult POWERGRID or any expert for estimation of

restoration time. Circuits restored through ERS (Emergency Restoration System) shall be considered as available.

- ii. Outage caused by grid incident/disturbance not attributable to POWERGRID, e.g. faults in substation or bays owned by other agency causing outage of POWERGRID elements, tripping of lines, ICTs, HVDC back-to-back stations etc. due to grid disturbance. However, if the element is not restored on receipt of direction from RLDC while normalising the system following grid incident/disturbance within reasonable time, the element will be considered not available for whole period of outage and outage time shall be attributable to POWERGRID.

7. If the outage of any element causes loss of generation at Central Sector Station(s) then the outage period for that element should be deemed to be twice the actual outage period for the day(s) on which such loss of generation has taken place.

Sd\-

(A.R. Ramanathan)  
Member

Sd\-

(G.S.Rajamani)  
Member

Sd/-

(D.P. Sinha)  
Member

Sd/-

(S.L.Rao)  
Chairman

Dated the 26<sup>th</sup> September, 2000