No.L-7/25(5)/2003-CERC
CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Coram

1. **Shri Bhanu Bhushan, Member**
2. **Shri R. Krishnamoorthy, Member**

In the matter of

Amendment of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2004 – Hydroelectric Generating Stations.

Explanatory Note

Background

Hydro power is a perpetually renewable source of energy. It is non-polluting, with zero emission/effluent, and is thus very environment-friendly. Hydro-electric generating stations have inherent ability for quick starting, stopping and load variations, and thus they help in improving reliability of the power system. Their generation cost is not only inflation free but reduces with time as loans are repaid. Further, storage type hydro-electric generating stations generally form a part of multi-purpose river valley projects with added benefits of irrigation, flood control, drinking water supply, etc. Hydro power should, therefore, be harnessed to the maximum extent possible. To encourage early development of vast untapped hydro potential of the country, in view of the above, the Central Government had specified a number of incentives for hydro power developers in the policy document of August 1998. These included reduction in Plant Availability Factor norm, equating secondary energy rate with primary energy rate, and attributing to the beneficiaries the loss of generation revenue on account of hydrology failure.

2. The Central Electricity Regulatory Commission came into being in July 1998 and was entrusted with the function of regulation of tariff of the generating companies owned or controlled by the Central Government and the generating companies other than those owned or controlled by the Central Government, but having composite scheme of generation and sale of electricity in more than one State, in addition to the function of regulation of tariff for the inter-State transmission. While notifying the terms and conditions of tariff for hydro-electric generating stations under its jurisdiction, the Commission had kept in view the policy directives of the Central Government for the development of hydro sector. In its first order dated 8th December 2000 in Petition No. 17/2000 on the subject (applicable for the tariff period 2001-2004), the Commission had introduced the concept of Capacity Index, in lieu of plant availability factor, for the hydro-electric generating stations and linked the payment of capacity charge and incentive to the Capacity Index achieved by the generating station during the year.

3. Capacity Index is the ratio of Declared Capacity (MW) to the Maximum Available Capacity (MW). Declared Capacity for any day is the maximum MW (ex-bus) which the generating station can generate, as declared by the generating company, taking into account the head and the availability of water and availability of machines on that day. The maximum available capacity in MW (ex-bus) is the maximum MW which the hydro-electric generating station could have generated had all of its installed units been available, under the prevailing conditions of head and the availability of water. Thus, Capacity Index is basically an indicator of machine availability. As a consequence, it is possible for a generating station to achieve a high Capacity Index and thereby claim full capacity charge as well as incentive even when

the actual generation has been low due to low water availability. In effect, the hydrological risk gets passed on to the beneficiaries totally.

4. The above concept of Capacity Index introduced in the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations 2001, applicable during the tariff period 2001-2004, was carried forward in the current tariff period of 2004-2009 also in terms of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff)Regulations, 2004 (the present tariff regulations) since none of the stakeholders, the generating companies or the beneficiaries, raised any apprehension on its continuation. However, based on the performance of central sector hydro-electric generating stations during the period 2001-2004, normative value of Capacity Index was increased from 85% to 90% in case of purely run-of-river generating stations.

Need for Amendments

5. Chairman, Assam SEB, in a representation dated 22.11.2006 to the Commission has pointed out the following aspects of the present tariff regulations, applicable to hydro-electric generating stations of NEEPCO, of which ASEB is one of the beneficiaries.

(i) Two consecutive monsoon failures in North-East India have caused large shortfalls in power generation from the central sector hydro-electric generating stations. As hydro tariff mainly consists of annual fixed charges, which have to be paid even if actual generation is low, due to hydrology failure, the beneficiaries have to pay a higher cost per unit of power

generated by these hydro-electric generating stations (Kopili, Khandong, Ranganadi & Doyang HEPs).

(ii) To meet the power demand caused by shortfall from hydro-electric generating stations, the beneficiaries have to buy substitute power from traders at much higher cost @ Rs. 6.40 per kWh (including transmission charges and open access charges), causing additional financial burden of about Rs. 20 crore per month.

(iii) In a year of more than average rainfall, hydro-electric generating stations have an extra income on account of secondary energy, whereas in a deficient rain situation full annual fixed charges are still payable by the beneficiaries.

(iv) The concept of Capacity Index needs to be reviewed because it only protects the generating company from loss of revenue when energy generated is less due to shortage of water. Consequently, when the water availability is less, the beneficiaries have to pay higher per unit cost. In addition, generating company is entitled to incentive based on Capacity Index, in case it is able to achieve machine availability higher than those specified by the Commission, even when actual generation is low because of reduced inflows of water.

6. ASEB has represented to the Commission to have a mid-term review of the present tariff regulations applicable to hydro-electric generating stations, to have an equitable distribution of risks between the generating company and the beneficiaries, the State utilities. There is considerable weight in ASEB's plea. On a review of the present tariff regulations applicable to the hydro–electric generating stations in totality,

it is noticed that it is definitely tilted in favour of the generating companies. Therefore, we propose to set this right, by passing a part of the hydrological risk to the generating companies.

7. In the course of proceedings for determination of tariff for Nathpa Jhakri HEP and Tehri HEP during the last three years, the Commission has noticed a tendency on the part of generating companies to avoid peaking operation, on one pretext or the other. It is clear that the generating companies prefer operation of their generating stations at a constant MW throughout the day, and are very reluctant to shut off the machines during off-peak hours and to run them up during peak-load hours, which is essential for the required peaking support to the grid. Though their operating pattern has somewhat improved under pressure from NRLDC and the Commission, we feel that if properly incentivised, the generating companies would on their own plan for and endeavour to maximize the peaking support for the grid.

8. Further, in the pleadings of the generating companies concerned and during hearings for approval of tariff for Indira Sagar HEP and Nathpa Jhakri HEP, it has come to the notice of the Commission that when the generating units were commissioned and were sought to be declared under commercial operation, dams for storage of water were incomplete and full reservoir level was yet to be reached. In the former case, the Commission was able to adopt a reasonable compromise wherein the AFC to be recovered in tariff was reduced in proportion to reduction in 'head' due to the dam being incomplete. In the latter case, the Commission had to accept the interim single-part tariff agreed between the parties as the basis for fixing the provisional two-part tariff. The matter is still to be finally settled.

9. In the case of Tehri HEP, although dam works were complete, restrictions were imposed by the Central Water Commission (CWC), a statutory body, on filling up rate of the newly constructed dam on considerations of dam safety. Due to availability of only a partial head and storage, the generating station could not generate energy and peak power commensurate with investment capitalized and installed machine capacity commissioned by that date. However, the generating company has claimed that since restrictions have been imposed by a statutory body on filling of the dam and on account of these constraints it was not able to provide the required peaking power/energy matching with the installed capacity of the generating unit(s), it is not to be faulted and is entitled to recover full AFC. On the other hand, the beneficiaries of the generating station were deprived of precious peaking power they were entitled to. In both these cases, although the hydro-electric generating stations were not able to deliver the required peak power for which the generating stations had been designed, the full cost of dam or the generating station was proposed to be charged to the beneficiaries through tariff.

10. As per clause (ix) of Regulation 31, 'Date of Commercial Operation' or 'COD' in relation to a generating unit means the date declared by the generating company after demonstrating the maximum continuous rating (MCR) or installed capacity through successful trial run, after notice to the beneficiaries, and in relation to the generating station the date of commercial operation means the date of commercial operation of the last unit of the generating station. Thus, in accordance with the above definition, commercial operation of a generating unit or a hydro-electric generating station can strictly be declared only when the generating company has demonstrated the

maximum continuous rating (MCR) or its installed capacity, for which filling up of the dam to provide the requisite head is essential.

11. The Commission has come across serious difficulties in implementation of the above Regulation in the case of Indira Sagar HEP and Tehri HEP, both of which have large reservoirs. It has been found in case of the Indira Sagar HEP that the dam was still under construction when the generating units were commissioned and were otherwise ready for commercial operation declaration. However, due to low head it was not physically possible to demonstrate the MCR of the generating units and commercial operation commencement could not have been declared had the present regulations been strictly applied. On the other hand, the commercial operation declaration was essential for starting the recovery of the huge investment in the generating station, since only infirm energy rate can otherwise be charged for hydro-electric generation up to the date of commercial operation, as per the present regulations. The Commission had to deviate from the regulations and go beyond their provisions to overcome the dilemma, by accepting the date of commercial operation but allowing a lower annual fixed cost, proportionate to available head.

12. In the case of Tehri HEP, the situation was reverse. Here the dam was complete upto FRL. However, due to constraints on filling water as per CWC guidelines for newly constructed dams already mentioned, MCR could not be achieved/demonstrated for the newly commissioned generating units due to low head. To address this problem, the definition of date of commercial operation as given in clause (ix) of Regulation 31 is required to be changed. It is also necessary to specify

how the tariff would be determined for a partially commissioned hydro-electric generating station.

13. Thus, these are three major issues which need to be addressed urgently and these are:

(i) An equitable sharing of hydrological risks and gains,

(ii) Enhanced incentive for providing peaking support, and

(iii) Treatment of a situation where commercial operation is to start but the dam is only partly constructed and/or reservoir is only partially filled, and MCR or installed capacity cannot be demonstrated.

Proposed Amendments

14. The problems described above are arising frequently, and the remedial measures cannot be deferred on the pretext of the present tariff period continuing upto 31.3.2009. In fact, ASEB has already pleaded for a mid-term review. However, the remedy requires significant changes in the present tariff regulations, as applicable to hydro-electric generating station, which can be effected only from a financial year beginning. It is, therefore, proposed to make the amendments in respect of hydro tariff in the present regulations with effect from 1.4.2008 as discussed in the succeeding paras.

15. The date of commercial operation of a generating unit is presently linked to demonstration of maximum continuous rating (MCR) or installed capacity (IC) through a successful trial run. It is now proposed to be linked to the generating unit reaching the stage of stable operation (after successful commissioning and trial operation)

wherein it can operate on a scheduled basis, as per the provisions of Regulation 45. The definition of date of commercial operation specified in clause (ix) of Regulation 31 is, therefore, proposed to be amended as follows :

> "(ix) 'Date of Commercial Operation' or 'COD' in relation to a generating unit means the date declared by the generating company from which, after notice to the beneficiaries, scheduling process in accordance with Regulation 45 shall be fully implemented, and Capacity Charge and Energy Charge would be payable along with adjustment for Unscheduled Interchange, and in relation to a generating station, the date of commercial operation means the date declared by the generating company after demonstrating the peaking capability corresponding to the Installed Capacity (IC) of the generating station through a successful trial run, after notice to the beneficiaries."

16. The annual fixed charges of a hydro-electric generating station are worked out by aggregation of five (5) components listed in clause (ii) of Regulation 37, and as detailed in Regulation 38. No change is proposed in these. The bifurcation of annual fixed charges between capacity charge and energy charge components is presently linked to the primary energy rate, depending on which capacity charge could even be zero. A low or zero capacity charge means that the generating company has little incentive for providing peaking support. To avoid such a situation, the annual fixed charge is now proposed to be bifurcated into two components, respectively termed as Normative Annual Capacity Charge (NACC) and Normative Annual Energy Charge (NAEC) in 50 :50 ratio, unless specified otherwise by the Commission in appropriate

cases, duly considering the proposal and reasoning submitted by the concerned generating company. The objective would be to maintain a balance between the two components, so that every hydro-electric generating station gets a significant revenue under capacity charge head, and is thereby incentivised to provide maximum peaking support.

17. The concept of 'capacity index' is proposed to be replaced by the concept of peaking capability, and payment of capacity charge is proposed to be linked directly to the peaking support provided by the generating station on day-by-day basis. A capacity charge rate in Rupees per MW per day would be specified for each generating station based on its NACC and the Normative Annual Plant Availability Factor (NAPAF), derived from its expected average peaking capability. There would be no separate capacity index-linked element of 'incentive', which is presently provided for in Regulation 40.

18. The Normative Annual Plant Availability Factor (NAPAF) would designate the Average Plant Availability Level on achievement of which the generating company would be paid capacity charge equal to the normative annual capacity charge (NACC). NAPAF is proposed to be specified as follows in clause (i) of Regulation 32 :

" (i) Normative Annual Plant Availability Factor (NAPAF) :

(a) For storage type power stations and run-of-river generating stations with pondage

(i) During first year of commercial operation - 75%

(ii) After first year of commercial operation - 80%

Note: *The Commission may in appropriate cases and after recording reason in support thereof specify a different Normative Annual Plant Availability Factor for a generating station.*

(b) For Purely Run-of-river power stations :

To be specified plant-wise by the Commission, depending on hydrology.

19. In actual operation and scheduling of a hydro-electric generating station, it is impractical to identify primary energy and secondary energy separately. It is, therefore, proposed to remove this differentiation from the present tariff regulations. The payment of energy charge would be directly proportional to the scheduled saleable energy, for which the energy charge rate in Rupees per MWh would be derived from NAEC and the Annual Design Energy of the generating station.

20. In line with the above proposals, present Regulations 37, 39 and 40 are proposed to be amended as follows :

"37. Normative Annual Fixed Charge for a hydro-electric generating station shall be specified year-wise in Rupees, and shall consist of :

a) Interest on loan capital;

b) Depreciation, including Advance Against Depreciation;

c) Return on equity ;

d) Operation and maintenance expenses; and

e) Interest on working capital."

"39. The Normative Annual Fixed Charge determined under these regulations shall be bifurcated into two (2) parts, namely Normative Annual Capacity Charge (NACC) and Normative Annual Energy Charge (NAEC), for notional recovery as the capacity charge and the energy charge respectively, in the ratio of 50 : 50.

Provided that the Commission may in appropriate cases and for reasons to be recorded in writing specify a different ratio for bifurcation of the Normative Annual Fixed Charge."

"40. (1) The capacity charge payable to the generating company for a day shall be :

(Capacity Charge Rate x Declared Capacity in MW for that day x 0.88),

where

Capacity Charge Rate (in Rupees per MW per day) = NACC / (Normative Saleable Capacity in MW x NAPAF x 365).

(2) The energy charge payable to the generating company for a day shall be:

(Energy Charge Rate x Scheduled Energy in MWh for that day x 0.88),

where

Energy Charge Rate (in Rupees per MWh) = NAEC / Normative Annual Saleable Energy in MWh."

21. Following new definitions are proposed to be added in Regulation 31:

(xvii) "Normative Saleable Capacity" means the capacity (MW) available for sale after allowing 12% free power to the home State, when all generating units

are available, and shall be = Installed Capacity x (1 – Normative Auxiliary Energy Consumption – Normative Transformation Loss) x 0.88.

(xvii(a))"Normative Annual Saleable Energy" means the quantum of annual energy available for sale after allowing 12% free energy to home State, corresponding to annual Design Energy, and shall be = Annual Design Energy x (1 – Normative Auxiliary Consumption – Normative Transformation Loss) x 0.88.

22. The present tariff regulations provide for "deemed generation" to protect the generating company from loss of revenue on account of spillage due to reasons beyond his control, such as non-availability of transmission lines and backing down instructions. In line with the new approach of more equitable sharing of risks and gains between the generating company and the beneficiaries, it is proposed to remove the provision of "deemed generation" presently specified in Regulation 41, and substitute it by the following provision to specify the capacity charge rate and energy charge rate prior to the achievement of commercial operation of the generating station as a whole.

"41. During the period between the date of commercial operation of the first unit of the generating station and the date of commercial operation of the generating station, the capacity charge rate and the energy charge rate shall be those arrived at for the whole generating station, based on latest estimate of the completion cost."

23. The following definitions are proposed to be omitted, being no longer relevant:

31. (vi) - 'Capacity Index'

31. (x) - 'Daily Capacity Index'

31 (xii) - 'Deemed Generation'

31 (xvii) - 'Maximum Available Capacity'

31 (xx) - 'Primary Energy'

31 (xxv) - 'Saleable Primary Energy'

31 (xxvi) - 'Secondary Energy'

31 (xxvii) - 'Saleable Secondary Energy'

24. The following changes are consequential to the amendments proposed in the previous paragraphs :

(a) In Regulation 38, "Computation of Annual Fixed Charges: The annual fixed charges shall be computed on the following basis:" is proposed to be substituted by "Computation of Normative Annual Fixed Charge: The normative annual fixed charge (NAFC) shall be computed on the following basis :".

(b) "and calculating capacity index" in the second line of Regulation 45 is proposed to be omitted.

(c) In clause (ii) of Regulation 45, "along with maximum available capacity (MW)" is proposed to be omitted.

(d) Regulations 45(xvii), 45(xviii) and 48(iv) are also proposed to be omitted.

Sd/-
(R. KRISHNAMOORTHY)
MEMBER

Sd/-
(BHANU BHUSHAN)
MEMBER

New Delhi, dated the 8th February 2008