सत्यमेव जयते

भारत सरकार

Government of India

विद्युत मंत्रालय

Ministry of Power

उत्तर क्षेत्रीय विद्युत समिति

Northern Regional Power Committee

सं. उक्षेविस/वाणिज्यिक/210/वाउस(44)/2022/1643-1686 दिनांक: 11.02.2022

सेवा में / To,

Members of Commercial Sub-Committee
वाणिज्यिक उप समिति के सभी सदस्य

विषय**:** वाणिज्यिक उप-समिति की **44**वीं बैठक की अतिरिक्त कार्यसूची ।
Subject: 44th meeting of Commercial Sub-committee – Additional Agenda.

इस कार्यालय के पत्र दिनांक 09.02.2022 के क्रम में उत्तर क्षेत्रीय विद्युत समिति की वाणिज्यिक उप समिति की 44वीं बैठक की अतिरिक्त कार्यसूची आपकी सूचना एवं आवश्यक कार्यवाही हेतु संलग्न है । बैठक का लिंक एंव पासवर्ड नियत समय पर ईमेल द्वारा उपलब्ध करा दिया जायेगा **|**

In continuation of NRPC letter of even no. dated 09.02.2022, additional agenda for the 44th meeting of Commercial Sub-Committee of NRPC is enclosed herewith for your information and necessary action. The link and password for joining the meeting would be send in due course of time to the respective email-ids.

(सौमित्र मज़ूमदार)
अधीक्षण अभियंता

18-ए, शहीद जीत सिंह मार्ग, कटवारिया सराय, नई दिल्ली- 110016 फोन:011-26513265 ई-मेल: seo -nrpc@nic.in वेबसाईट: www.nrpc.gov.in
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ADDITIONAL AGENDA-1

FOR

44th MEETING OF COMMERCIAL SUB-COMMITTEE

ITEM-37 PAF of Bairasiul power station needs to be revised for the period 06.07.2019 to 30.08.2021 based on capacity of 120 MW (excluding capacity of units under R&M) instead of 180 MW (i.e., installed capacity) (Agenda by NHPC)

37.1 The construction of the project was undertaken by Central Government under the erstwhile Ministry of Irrigation and Power in 1970-71. The project was taken over by NHPC Ltd. on 20.01.1978. The unit wise commissioning dates of Bairasiul Power station are as below:

- Unit # 1: 18-May-1980
- Unit #2: 19-May-1980
- Unit #3: 13-Sep-1981

37.2 Bairasiul Power Station completed its useful life of 35 years in the FY 2016-17. CEA guidelines on the "Best Practices & Bench Marking for Hydro" under Chapter 7 – Renovation, Modernization & Up-rating (RM&U) of hydro power plants stipulate that by undertaking timely RM&U & Life extension programme, the generating plant can be made to operate for another extended period of 20-25 years with improved reliability and availability.

37.3 Accordingly, NHPC filed the petition in CERC seeking approval of R&M in respect of Bairasiul Power Station under Regulation 15 (1) of CERC (Terms & Condition of Tariff) Regulation 2014. Vide order dt.03.06.2016 in petition no.76/MP/2015, CERC has accorded in principle approval to the R&M proposal for life extension of Bairasiul Generating Station by 25 yrs. w.e.f. 01.04.2021. After approval of CERC, the R&M work of Bairasiul Power Station was started from October' 2018 and the R&M works got completed in August' 2021. Detailed schedule is given below:

Sl. No.	Description	Unit-I	Unit-II	Unit-III	Remark
1.	Shutdown of units	15.10.2018	15.10.2018	15.10.2018	All three units were under shutdown from 15.10.2018 to 06.07.2019. After charging of HRT,
2.	Synchronized after HRT charging	06.07.2019		07.07.2019	

Sl. No.	Description	Unit-I	Unit-II	Unit-III	Remark
3.	Handed over to M/s BHEL for R&M	13.12.2019	15.10.2018	27.11.2020	Unit-I & Unit-III were synchronized with grid on 06.07.2019 & 07.07.2019 respectively.
4	COD declared	07.11.2020	29.12.2019	31.08.2021	
5.	Completion of R&M works	30.08.2021			28.02.2021 (as per schedule)

During the R&M period not more than 02 nos. of machines were available at a particular instance for operation. Thus, the available capacity for operation at any instance was not more than 120 MW.

37.4 **Billing Methodology:**

CERC in its order dated 03.06.2016 (copy attached as ***Annexure-37.1***) in Petition no 76/MP/2016 (In-principle approval of R&M of Bairasiul Power Station) provided the methodology for recovery of O&M expenses & Interest on loan (IOL) for unit(s) under R&M, but no clarity regarding AFC was provided for running unit(s). As such methodology given by CERC for recovery of AFC in its order dated 24.07.2019 (copy attached as ***Annexure-37.2***) in Petition no 248/MP/2018 (In-principle approval of R&M of Loktak Power Station) has been followed by NHPC in this case also during R&M period. The relevant portion of the order dated 24.07.2019 is as under:

"25……

Considering the fact that R&M activity is implemented concurrently with generation, the recovery of annual fixed charges by the Petitioner shall be governed by the following principles:

(i) The annual fixed charges of 2018-19 is permitted to be provisionally recovered for the period 2019-24 for the number of units in operation and the number of units in shutdown due to R&M as under:

……..

(a) When one unit out of three units is under R&M, 2/3rd of the annual fixed charges for the year 2018-19 i.e. Rs.10018.86 lakh (2/3 x 15028.29) is allowed to be recovered along with 1/3rd of O&M component and Interest on loan i.e. Rs 4170.75 lakh [1/3 x (12512.26 + 0)]. Similarly, when two units are under R&M, 1/3rd of the annual fixed charges for the year 2018-19 i.e. Rs 5009.43 lakh (1/3 x 15028.29) is allowed to be recovered along with 2/3rd of O&M expenses and Interest on loan i.e. Rs 8341.51 lakh [2/3 x (12512.26 + 0)].

(b) When the generating station is under complete shutdown, only O&M and Interest on loan i.e. Rs 12512.26 lakh would be allowed to be recovered.

(ii) During the R&M period, no incentive on capacity declaration of available units above NAPAF as well as secondary energy benefits shall be allowed to the generator.

(iii) The provisional tariff as stated in serial no. (i) above is subject to revision, based on the actual expenditure incurred by the Petitioner, on year to year basis, during the period 2019-24, after completion of R&M.

Thus, the AFC of the Bairasiul Power Station was reduced by 2/3rd to Rs. 92.166 Crs for billing purpose.

37.5 **Calculation of PAFM during R&M Period**

NRPC/NRLDC during the R&M period has calculated PAFM on the basis of 180 MW which is the total capacity of the Power Station, even though one machine was always under R&M and the available capacity during the R&M period was only 120 MW. This has resulted into lower PAFM even though the two machines were available for maximum period.

37.6 **Shortfall in recovery of Capacity Charges during R&M Period:**

As mentioned above, CERC in its order dated 24.07.2019 in Petition No 248/MP/2018 in respect of R&M of Loktak Power Station has allowed recovery of AFC to 2/3rd of AFC if one machine is under R&M. Thus, NHPC during R&M reduced the AFC by 2/3rd for the billing purpose. NRPC/NRLDC while calculating PAFM also reduced the PAFM as the PAFM was calculated based on the total capacity of the plant. NRPC/NRLDC did not reduce the capacity to the available capacity after reducing the capacity of the machine under R&M.

The reducing effect of both the AFC and PAFM resulting in under recovery of Capacity Charges. This has been illustrated as below:

a.	Full AFC of the Power Station for 2018-19	Rs 138.25 Crs.
b.	AFC of the Power Station (Full AFCX2/3)	Rs 92.166 Crs
c.	Capacity charges to be recovered (AFC/2)	Rs 46.083 Crs
d.	Cumulative PAF Calculated by NRPC/NRLDC	52.736
e.	NAPAF (%)	90
f.	Cumulative PAF if PAFM has been calculated on the basis of Capacity of 120 MW	79.104

From the above table, it is clear that though the two machines which could

have been made available during the R&M, were made available, the PAFM was calculated on the basis of the total capacity of 180 MW instead of 120 MW (Capacity excluding the capacity of machine under R&M) which resulted into cumulative PAF of 52.736 and as the AFC was also reduced to 2/3rd as per CERC order, it resulted in shortfall in recovery of Capacity charges during the period of R&M.

37.7 **Proposal:**

In view of above, it is proposed to kindly revise the PAFM of Bairasiul Power Station based on the capacity of 120 MW (Capacity excluding the capacity of unit under R&M) during the period of R&M from 06th July 2019 to 30th August 2021.

Annexure-37.1

CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Petition No. 76/MP/2015

Coram:
Shri Gireesh B.Pradhan, Chairperson
Shri A.K.Singhal, Member
Shri A.S.Bakshi, Member
Dr. M.K.Iyer, Member

Date of Hearing: 23.2.2016
Date of order: 03.6.2016

In the matter of

Petition under Regulation 15 (1) of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014 for approval of Renovation and Modernization proposal in respect of Bairasiul Power Station.

And
In the matter of

NHPC Limited
NHPC Office Complex,
Sector-33,
Faridabad-121 003 , Haryana **….Petitioner**

Vs

1. The Chairman, Punjab State Power Corporation Limited
The Mall, Near Kali Badi Mandir,
Patiala-147 001, Punjab

2. The Chairman, Haryana Power Purchase Center
Shakti Bhawan, Sector-6,
Panchkula-134 109, Haryana.

3. CEO, BSES Rajdhani Power Limited
BSES, Bhawan, Nehru Place,
New Delhi-110 019.

4. CEO, BSES Yamuna Power Limited
Shakti Kiran Building,
Karkardooma, Delhi-110 072.

5. Chief Operating Officer
Tata Power Delhi Distribution Limited
33 kV Sub-station Building
Hudson Lane, Kingsway Camp,

New Delhi110 009.
6. The Chairman
Himachal Pradesh State Electricity Board,
Vidyut Bhawan, Kumar House,
Shimla-171 004 , Himachal Pradesh. **…..Respondents**

The following were present:

Shri A.K. Pandey, NHPC
Ms. Shubhalakshmi Gupta, NHPC

ORDER

The petitioner, NHPC Limited, has filed the present petition seeking approval of Renovation and Modernization (R & M) proposal in respect of Bairasiul Power Station under Regulation 15 (1) of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014.

2. The petitioner has set up a 180 MW (3X60 MW) Bairasiul Hydro Power Station (generating station) in the State of Himachal Pradesh. The generating station had been declared under commercial operation on 1.4.1982. The power generated from the generating station is being supplied to the various beneficiaries in Northern Region in terms of the Power Purchase Agreement entered into between the petitioner and the beneficiaries.

3. The tariff of the generating station for the period from 1.4.2014 to 31.3.2019 was approved by the Commission vide order dated 17.6.2015 in Petition No. 235/GT/2014 with the following annual fixed charges:

(Rs. in lakh)

	2014-15	**2015-16**	**2016-17**	**2017-18**	**2018-19**
Return on Equity	1731.76	1790.25	1816.34	1821.11	1824.87
Interest on Loan	0.00	0.00	0.00	0.00	0.00

Depreciation	947.07	982.59	1036.19	80.28	86.68
Interest on Working Capital	542.07	576.15	612.02	626.43	665.38
O & M Expenses	8696.25	9274.03	9890.19	10547.30	11248.06
Annual Fixed Charges	**11917.15**	**12623.01**	**13354.74**	**13075.12**	**13824.98**

4. The petitioner has submitted that since the useful life of the generating station, namely 35 years is being completed on 31.3.2017, the proposal for Renovation and Modernization has been submitted to the Commission for approval as per Regulation 15 (1) of the 2014 Tariff Regulations for the purpose of further life extension of the generating station. The petitioner has highlighted its proposal with regard to R&M as under:

(a) Need for Renovation and Modernization**:** Although components such as dam toe repairs, spillway repair, repairs of HRT AND Diversion cum desilting tunnel, repair/modification of Bhaledh feeder tunnel, repair in Siul complex, repair/replacement of intake gates, spillway gates, draft tube gates, various hoists, etc. shall also be taken up during R&M. However, predominantly electro-mechanical equipments of the generating station are proposed to be replaced (although certain components like spiral casing, etc. is to be retained and refurbishment is envisaged in no. of components) in "Renovation & Modernization" program of the generating station. The following certain major problems/damages encountered during operation of civil and hydro-mechanical structure:

- Frequent erosion at Dam Toe
- Silting of Baira Reservoir
- Frequent Stuck up of Service Gate of Diversion Tunnel & Intake Gate of HRT
- Damages in Diversion Tunnel

- Frequent Silting of Bhaledh Trench Weir

(b) The following certain major problems/ damages encountered during operation of Electro-mechanical equipment:

- Outage of U # 2 from 6.3.1993 to 10.3.1993 for rectification of stator earth fault and one no. stator bar replaced in slot-2
- Outage of U # 2 from 14.3.1995 to 21.3.1995 for rectification of stator earth fault and one no. stator bar replaced in slot-2.
- Oozing out of bituminous compound in U # 3 in year 2000, 2004 & 2006 and in U # 2 in year 2004.
- Replacement of rotor pole coils of pole no. 10 & 11 of U # 2 during October'2012
- Replacement of pole no. 14 of U # 1 during January 2014.
- Outage of U # 2 from 12.4.2014 to 23.4.2014 for rectification of rotor earth fault and pole coils for pole no. 16 & 1 replaced.
- Outage of Unit# 2 from 23.4.2014 to 4.5.2014 for rectification of Stator earth fault and one no. stator bar replaced in slot no. 1
- Insulation failure of winding of R-phase of U#1 was observed during June 2008.
- Frequent outage (Approx 1373 Hrs since 2008-09 till Sept 2014) of machines due to high vibration and high bearing temperature

(c) Detailed Project Report (DPR) for carrying out R&M of the generating station for its life extension highlights of proposal as under:

(i) The focus of R&M proposal is towards activities which are essential for efficient and sustained performance of the generating station and have direct impact on generation and machine availability including State of the art equipments being used in latest power stations.

(ii) The total work at site would be executed in a phased manner covering four financial years and would be completed by 2020-21.

(iii) The expected life extension of 25 years has been considered after completion of R&M works i.e. from financial year 2021-22 onwards.

(iv) Design energy would be 740 MU against existing design energy of 779 MU due to revised hydrology data.

(v) The estimated cost of R&M works is Rs. 360.79 crore (including IDC and FC amounting to Rs. 79.43 crore) at October 2014 price level.

(d) Scope of R&M and justification**:** The complete scope of R&M works with justification for replacement/refurbishment of each work has been deliberated under various sections of DPR (volume-I) which is summarized as under:

(i) Repair/reconditioning of civil structures at Dam complex (Dam & Plunge Pool, Spillway & drainage gallery, HRT & Diversion cum desilting tunnel), Siul complex (Siul diversion weir and desilting basin and vortex chamber), surge shaft, Bhaledh complex (weir and feeder tunnel), Power House complex (Powerhouse, butterfly valve house, switchyard and tailrace channel) and Infrastructure works.

(ii) R&M of Hydro-mechanical equipments at Baira Dam complex (Diversion cum Desilting tunnel gate hoist, emergency gate hoist, HRT intake gate and hoist, trash rack, trash rack cleaning machine, spillway radial gates, remote control panel, spillway stoplog, lifting beam and gantry crane, etc.), Siul complex (weir

gates and hoist, weir stoplog and monorail hoist, intake gate and hoist, intake stoplog and monorail hoist, Needle stoplog in desilting basin, Silt flushing outlet valve in HRT), Power House complex (Draft tube gate, pressure relief valve gates, tailrace channel outlet gates, penstock) and Bhaledh Weir complex (intake gate & hoist, trench weir trash rack, silt removal gallery).

(iii) R&M of power plant electro-mechanical equipments (i.e. turbine and accessories, digital governing system and accessories, main inlet valve and accessories, butterfly valves & accessories, generator and its components, generator step up transformer, UAT, SST, static excitation system, Bus duct andcabling, switchyard, DC system, control, monitoring & protection system, switchgear, DG set, illumination, PLCC, EOT crane, cooling water system, drainage & dewatering system, HVAC, fire protection system, etc.

(iv) The reports with regard to In-Situ testing of structures at the generating station and thickness testing of Radial gates and penstock were studies by Department of Civil Engg., IIT Roorkee. Based on recommendations of these reports, various civil works are proposed to be carried out at the generating station.

(e) The estimated completion cost of R&M works is Rs. 360.79 crore (including IDC and FC amounting to Rs. 79.43 crore) at October 2014 price level which details are given as under:

Sl. No.	Description	Amount (Rs. crore)

A	**Civil works**	
1	**Direct charge, I- works**	
	C-works & J-power plant civil works	52.32*
	K- Buildings	16.76*
	O-Misc.	2.14
	Establishment, T&P & losses on stock	9.31
	Total Direct charges	80.53
2	Indirect charges	0.36
	Total civil works	**80.89**
B	**Electrical works**	**200.47 @**
	Total cost (Civil + Electrical)	**281.36**
	IDC & FC	**79.43**
	Total cost	**360.79**

Since, there is no foreign financing proposed for R&M activity, FERV is not applicable.

*- Includes civil works of Baira dam, Bhaledh nalla & Siul complex, PH civil works, HRT works & infra-structure works

@- Includes cost in respect of generators, turbine (with enhanced capacity of 61.22 MW with 10% overload capacity) and accessories of 3 generating units, auxiliary equipment for power station, S/S equipment & auxiliary equipment for switchyard, Hard coating of under-water parts, establishment, transportation, taxes, etc.

(f) Cost Benefit Analysis:

(i) As per Chapter 7 (Renovation and Modernisation and Uprating of Hydro Power Stations) of "Best practices in HE Power Generation" published by CEA, the Renovation and Modernization (R&M) of hydro power plants is a cost effective way for capacity addition. It is comparatively easier than constructing new projects and can yield results in about three to four years.

(ii) The cost/MW of R&M works of the generating station is about Rs. 2 crore only as against Rs. 10 crore/MW for new hydroelectric power plant of similar size. The cost benefit analysis of the generating station after the

proposed R&M work is attached in detailed with Chapter-8 of the DPR (Volume-II).

(iii) For a new hydro Project of similar capacity, if we consider the capital cost of Rs. 10 crore/MW and design energy of 740 MUs, the levellised tariff of new project comes out to Rs. 6.37/unit against the levellised tariff of **Rs. 3.96/unit** of the generating station after completion of R&M works. Therefore, R&M of the generating station is overall a cost effective proposal. The approved tariff of the generating station for the year 2013-14 is Rs.1.54 /kWh, post R&M tariff is expected to be Rs. 3.96 /kWh.

(g) Estimated life extension from a reference date: The life of the generating station is estimated to be increased by 25 years after completion of R&M works i.e. from 1.4.2021.

(h) Schedule of completion: The Schedule of completion of R&M works Units, I, II and III would be December 2017 to December 2018, January 2019 to January 2020 and February 2020 to February 2021 respectively. The dismantling/erection work of one unit is proposed to be started from December, 2017 coinciding with lean discharge season and is planned up to December, 2018.

(i) Review of Design Energy on account of hydrology:

(i) Present design energy for the generating station is 779 MUs. However, over the years, the generating station is not able to generate this energy due to hydrology restrictions as explained in Chapter 3 of the enclosed DPR (vol.-I).

(ii) The generating station has achieved the Design Energy of 779 MUs only 9 times since 1982.

(iii) From the year 2006-07, the generating station has never achieved the Design Energy (DE) resulting into consistent under recovery of energy charges and thereby causing short fall in recovery of Annual Fixed Cost (AFC) on account of change in hydrology in the catchment area.

(iv) Due to revised hydrological pattern in the catchment area of the generating station, the energy generation in a 90% dependable year with 95% machine availability works out to 739.96 MUs. Accordingly, the revised Design Energy (DE) of 739.96 MUs has been considered in the proposal for Renovation & Modernization which shall be considered after completion of all R&M works i.e. from 2021-22 onwards.

(j) Consideration during Renovation and Modernization Period:

(i) As per DPR, the generating station would be under Renovation from 2017-18 to 2020-21 in phased manners. During this period, the generating station would under complete or partial shutdown for repair of civil structure and water conductor system and to carry out all HM and E&M works related to R&M.

(ii) The petitioner proposes to implement R&M activity concurrently with generation to the extent possible as per schedule of R&M activities.

(iii) During R&M period, O&M expenditure (e.g. employee cost, administrative expenses, other routine maintenance expenses etc.) shall be required to be incurred by the generating station.

(iv) In this situation i.e. during complete / partial shutdown, the generating station would not be able to recover total AFC during the year on account of reduced generation and reduced availability. This would result in under recovery of legitimate expenses which would be otherwise recovered if no R&M is undertaken.

(v) O&M expenses, as approved by the Commission should be allowed to be recovered from the beneficiaries in the corresponding year so that such essential expenses during R&M activities are not required to be capitalised in R&M cost.

(vi) In case, above (v) is not accepted by the Commission, capitalisation of such expenditure (establishment, security, administrative expenses, etc.) during R&M activities, shall be required.

(vii) The Board of Directors of NHPC in its meeting No. 379 dated 17.1.2014 approved DPR for carrying out R&M of the generating station for its life extension.

5. The matter was heard on 9.4.2015 and notices were issued to the respondents to file their replies. The petitioner was directed to implead Central Electricity Authority

as party to the petition. The petitioner during the course of hearing was directed to take the following actions and submit the documents and clarification in this regard:

(a) The cost of R&M works of Baira Siul hydro electric generating station may be got vetted from the Central Electricity Authority.

(b) The revised design energy of the generating station may be got approved from the Central Electricity Authority.

(c) Certify that additional capital expenditure claimed in respect of works/ assets executed during 2009-14 and those projected to be taken up during 2014- 19 are not included under the proposed R&M works of Baira Siul generating station.

6. The petitioner, vide its affidavit dated 21.4.2015, has submitted the information called for. CEA vide its letter no. 13/2(NHPC)/2015/HE&RM/82 dated 8.2.2016 has submitted report on DPR examination. CEA has vetted the cost of R&M works and has also approved the revised design energy.

7. The respondent, BSES Rajdhani Power Limited (BRPL) vide its affidavit dated 21.7.2015, has filed reply to the petition and the petitioner has filed its rejoinder to the reply of BRPL which have been dealt with in succeeding paragraphs.

8. We have considered the submissions of the petitioner and BRPL. The need for R&M of the generating plants has been stressed by CEA/MOP/Tariff Policy from time to time. CEA considers "Renovation and Modernization of Old Power Plants" as one of the best option to bridge the gap between demand and supply of power. The hydro plants which have completed their useful life shall go in for R&M for extending the life

of the hydro plants especially in view of the fact that newer capacity addition in hydro sector has slowed down in spite of various measures taken by Government of India, Ministry of Power and the Commission to incentivize the hydro power plants. The petitioner has placed on record the Detailed Project Report giving complete scope, justification, cost-benefit analysis, estimated life extension from a reference date, financial package, phasing of expenditure, schedule of completion, reference price level, estimated completion cost including foreign exchange component, if any, and any other information considered to be relevant by the generating company or the transmission licensee.

9. After examining DPR, CEA in its report dated 8.2.2016, in consultation with CWC, has observed as under:

(a)The cost of R&M works at October 2014 Price Level has been assessed as Rs. 273.06 crore as per details given below:

Description	**Cost (excluding IDC and Financing Charges)at Oct'2014 Price Level (Rs. in crore)**
E&M works	201.00
HM & Civil Works	72.06
Total	**273.06**

(b) After taking into consideration the revised hydrology of the site, CEA has approved design energy of 708.59 MU. However, CEA has advised the petitioner to conduct a model study in respect of the losses in water conductor system in the post renovation scenario to take into account any improvement in the lining etc. of the water conductor system and the design energy from the project would be

firmed up based on the same as well as the efficiency of the TG units in the post renovation scenario.

(c) The petitioner, after the approval of hard cost and design energy by CEA, has revised the R&M cost as under:

(Rs. in crore)

Description	**Cost as per DPR**	**Based on hard cost vetted by CEA at October, 2014 PL**
E&M works	200.47	201.00
HM & Civil Works	80.89	72.06
IDC&FC	79.43	68.35*
Total	**360.79**	**341.41**

- Proposed by the petitioner

10. The following issues are for our consideration:

Issue No. 1 : (i) Cost Benefit analysis : BRPL has submitted that the cost benefit analysis on Renovation and Modernization proposals should be carried out on the basis of the capital infused on Renovation and Modernization proposal vis-a-vis no capitalization. Therefore, the petitioner is required to furnish the benefits accrued to the beneficiaries by infusion of Rs. 360.79 crore under the Renovation and Modernization proposal vis-a-vis when no Renovation and Modernization is undertaken. The benefits accrued on account of infusion of Rs. 360.79 crore capital should be clearly brought out by the petitioner besides the increase in the economic life of the generating station by 25 years.

(ii) The petitioner is contemplating head loss in the water conducting system, decrease in the pondage availability and the restriction of total flows to 88 cumec which are likely to be disadvantageous to the electricity generation. Therefore, how the petitioner is expected to garner benefits from such capital

infusion of Rs. 360.79 crore? The petitioner has stated that the design energy on completion of R&M proposal would be 740 MUs as against the existing design energy of 779 MUs owing to the revised hydrology data. All this information creates apprehension that the capital infusion amounting Rs. 360.79 crore would ultimately result disadvantage to the beneficiaries except in-the increase of useful life of the generating station that too is academic as there is clear distinction between the economic life of the plant and the physical or actual life of the plant which is discussed in the succeeding paragraphs.

11. The petitioner has submitted that the cost benefit analysis shall be carried out on the basis of the capital infused on Renovation and Modernization proposal vis-a vis no capital expenditure. The petitioner has submitted that CEA in its report on “Best Practices in HE Power generation" has also compared the cost benefit analysis on the basis of capital infusion on R&M vis-a vis constructing a new hydroelectric project of same size. The petitioner has submitted that India being a power deficient country having peak deficit of 3.3% (Executive Summary of Power Sector for June’2015 by CEA), R&M programs of old hydro projects are essentially required for achieving ideal hydro-thermal mix in the country. By exercising one time capital investment (within a time span of 4 years) for doing major R&M works of the generating station, the beneficiaries are indirectly benefitted by way of reduced add-cap requirement during succeeding years upto the completion of its extended life. The petitioner has stated that the beneficiaries would be entitled for cheaper power throughout the extended life of the generating station. According to the petitioner, it is in the interest of both the petitioner and the beneficiaries that the R&M activities be taken up at this stage and there is no merit/logic in analyzing the cost benefit analysis of capital infusion on R&M

proposal vis-à-vis no capitalization. Accordingly, BRPL`s contention that capital infusion on R&M works would result into disadvantages to the beneficiaries is absolutely wrong.

Analysis and decision:

12. We have considered the submissions of the petitioner and BRPL. In our view, the projects which have outlived their useful life should go in for R&M activities to ensure improved reliability and availability. Allowing operation of the old generating station after achieving its useful life, may hamper reliability and availability of the generating station which in turn may require the beneficiaries to arrange costly power during the prolonged outages and the old generating station may have to face in absence of timely corrective action in terms of R&M activities. In the instant case, the beneficiaries shall be availing the benefit of reliable power with peaking capability for 25 years at expected levellized tariff of around Rs 3.96/kWh which is much less than the tariff of new hydro generating stations commissioned during recent times at capital cost ranging from 6 crore/MW to 12 crore/MW. On one hand, the beneficiaries want to surrender their shares from newly commissioned generating stations and on the other hand, they are objecting to the R&M of the hydro plants which would yield reliable benefits at much lower cost with lower gestation period.

13. BRPL has contended that head losses and restriction on water flow has been considered by CEA in its report. CEA in this regard has advised NHPC to conduct a model study in respect of the losses in water conductor system in the post renovation scenario to take into account any improvement in the lining, etc. of the water conductor system and the design energy from the project would be firmed up based

on the same as well as the efficiency of the TG units in the post renovation scenario. Therefore, the benefits corresponding to the R&M expenditure in terms of improved design energy (based on latest flow series and reduction in head losses) shall be passed on to the beneficiaries based on the model study as advised by the CEA.

Issue No. 2: Economical Life versus physical life and balance capital cost to be considered post R&M and clarity on Regulation 15 (4) of the 2014 Tariff Regulations:

14. BRPL has submitted that the life of a hydro plant is 35 years which means that it is the economic life of the plant and during the economic life, 90% of the capital invested is withdrawn by the owner in the form of depreciation. As against the economic life of the plant, there is also physical or actual life of the plant, namely (i) Economic life of the Plant-35 years-useful life, (ii) Physical or actual life of the plant can go well beyond 35 years depending on the quality of operation as well as maintenance of the plant. BRPL has submitted that the generating plant is capable of operating beyond the economic life of the generating plant as the hydro generating plants have been continuously getting capital infusion under the additional capitalization year after year. However, if the petitioner wishes to take advantage of completing the useful life of 35 years, then just after completion of the useful life, the capital base of such plant should be 10% of its capital base. Therefore, the new capital base of the generating plant on conclusion of the R&M proposal should be 10% of the original project cost base plus the capital infusion amounting Rs. 360.79 crore on account of R&M proposals as may be admitted by the Commission after prudence check.

15. BRPL has submitted that the petitioner is seeking clarification on Regulation 15(4) of the 2014 Tariff Regulations stating that the figures of depreciation recovered is

required to be deducted from the original project cost. However, the petitioner is having a figure of accumulated depreciation till date which includes depreciation on original capital cost and depreciation on additional capitalization. BRPL has stated that these two figures cannot be bifurcated. The petitioner has accordingly suggested some way out of his problems of non-bifurcation of the accumulated depreciation by re-looking and re-placing the 'original project cost' by 'admitted project cost' which is legally not acceptable. BRPL has submitted that the new capital base of the generating plant after the expiry of its useful life of 35 years should be 10% of the original project cost base plus the capital infusion amounting Rs. 360.79 crore on account of R&M proposals as may be admitted by the Commission after prudence "check year on year basis.

16. The petitioner has submitted that BRPL is trying to bifurcate the economic life and physical / actual life of the generating station without any merit. Though the petitioner is entitled for capital infusion under additional capitalization after prudence check by the Commission, R&M is a package (duration of 3-4 years) and the same cannot be implemented in a piecemeal manner due to practical difficulties. The petitioner has submitted that the burden on the beneficiaries by way of additional capitalization would be nominal after completion of R&M activities of the generating station and the cost on R&M works and subsequent additional capitalization would only be allowed after due prudence check by the Commission. With regard to BRPL contention that 90% of the capital invested is withdrawn by the owner in the form of depreciation during useful life of generating station (i.e. 35 years), the petitioner has stated that the 'capital invested' for the purpose of tariff is the total cost infused by the petitioner and admitted by the Commission including additional capitalization till the end of 35 years. The capital cost in case of Bairasiul generating station is inclusive of

cost of free hold land amounting to Rs. 148.22 lakh which is not depreciable. The petitioner has submitted that the assets capitalized during fag end of the useful life of generating station cannot be depreciated fully (90%) and the depreciation during fag end is being allowed by the Commission by spreading the depreciable asset over the extended life of the generating station. The Commission vide order dated 17.6.2015 in Petition No. 235/GT/2015 admitted the capital cost of the generating station as on 31.7.2017 as Rs. 20813.19 lakh. However, the cumulative depreciation allowed by the Commission as on 31.3.2017 is Rs. 17032.18 lakh only which is less than 90% of the admitted capital cost (i.e. Rs.18731.87 lakh). Therefore, the contention of BRPL that the petitioner has withdrawn 90% of capital invested during useful life by way of depreciation is not correct.

Analysis and Decision

16. We have examined the submissions of the petitioner and BRPL. The petitioner has contended that economic life of the generating station is 35 years where as actual life of the plant can go much beyond 35 years. In our view, to start with physical life of various plants are established on the basis of experience gathered worldwide with respect to supply of reliable power and thereafter, the depreciation rates are adjusted for recovery of 90% of the plant cost during the established physical life of the plant. Therefore, economical life is derived to match with the physical life of the plant. It is true that plants may operate beyond their stipulated physical life established on the basis of gathered experience. However, allowing operation of the old plant after useful life may hamper reliability and availability of the generating station which in turn may require the beneficiaries to arrange costly power during the prolonged outages for which old generating station may have to face problems in absence of timely corrective action in

terms of R&M activities. As such, carrying out the R&M after expiry of useful life is considered to be a prudent practice.

17. With regard to balance capital cost to be considered for the purpose of tariff post R&M, Regulation 15 (4) of 2014 Tariff Regulations provides as under:

> "(4) Any expenditure incurred or projected to be incurred and admitted by the Commission after prudence check based on the estimates of renovation and modernization expenditure and life extension, and after deducting the accumulated depreciation already recovered from the original project cost, shall form the basis of determination of tariff."

As per the above provisions, R&M expenditure plus original project cost reduced by accumulated depreciation recovered by the plant, shall form the basis of capital cost for the purpose of tariff post R&M. Therefore, accumulated depreciation by the end of useful life may be almost 90% of the original capital cost. However, the same may not be 90% of the admitted capital cost (which also includes ACE post cut-off date) as the assets capitalized during fag end of the useful life of generating station cannot be depreciated fully (90%) as per 2014 Tariff Regulations during the remaining period of useful life of the generating station. The petitioner has submitted that Regulation 15(4) should be amended to replace the "original project cost" with admitted capital cost (including additional capital expenditure). We find merit in the submission of the petitioner as the intent of the Regulation 15(4) is also the same i.e accumulated depreciation should be reduced from the admitted capital cost (excluding R&M expenditure) till completion of R&M. Therefore, BRPL`s view that balance part of the original capital cost should be considered as a part of capital cost post R&M gets answered suitably in terms of the 2014 Tariff Regulations. We direct the staff to process the case for amendment of the Regulations suitably.

Issue No.3 : Review of Design Energy:

18. BRPL has submitted that the petitioner has claimed revised hydrology pattern in the catchment area of Bairasiul Power Station on the basis of that the generating station has achieved the Design Energy of 779 MUs only 9 times during the last 32 years of its operation. However, it is difficult to presume that not achieving the Design Energy of 779 MU is wholly attributable to the reduction in hydrology flows and reduction could as well be owing to the frequent outages on various counts. As per CEA report on "Energywise-Performance of Central Sector (hydro)", the generating station has generated 796.67 MUs which is more than the Design Energy of 779 MUs. The actual generation available for the generating station during the first two months, namely April to May, shows the actual generation of 230.02 MU as against the last year generation for the same 219.38 MUs when the generation by the generating station was beyond the Design Energy. This clearly indicates that there is upswing in generation and there is no need for further review of Design Energy.

19. The petitioner has submitted that in DPR, the petitioner has requested for review of Design Energy (DE) based on recorded hydrology data for the period 1984-2014 and effective head loss considered in this process. The petitioner has submitted that as design energy is based on 90% dependable year, the increase in generation beyond Design Energy in few years does not negate the necessity of review of design energy on the basis of recorded discharge data. The petitioner has submitted that the matter related to review of Design Energy of the generating station has been examined by CWC/CEA and CEA vide its letter dated 25.8.2015 has approved the

revised Design Energy of 708.59 MUs against the original design energy of 779.28 MUs.

Analysis and Decision:

20. CEA in consultation with CWC has revised the design energy of the project to 708. 59 MUs. The relevant portion of the CEA `s report dated 8.2.2016 examining the installed capacity and design energy is extracted as under:

> "Examination of DPR Proposal
>
> 2.2 Installed capacity and Design Energy:
>
> 2.1.1. With regard to the Installed Capacity and Design Energy of project, the studies have been carried out by NHPC taking into account the following:
>
> (i) The observed 10 days Hydrological flow data for Baira Bhaledh and Siul rivers for the period 1984-85 to 2013 -14 duly vetting and approve by CWC vide their letter no. 1/HP/37/2009/HYD (N)/131-32 dated 9.6.2015. The discharge through Bhaledh has been restricted to 24 cumecs and the discharge through Siul has been restricted to 22.65 cumecs. Keeping in view their respective tunnel capacities.
>
> (ii) Net head of 238.10m based on Head Loss of 41.11m (corresponding to design discharge of 83.8 cumecs) is vetted & approved by CWC vide their letter no. 06/14/2015-HCD (NW&S)/2036 dated 31.7.2015.
>
> (iii) Efficiency of the generating units has been considered as 92% for turbine and 98% for generator in post R&M scenario.
>
> 2.2.2 It is observed that the water conductor system for Bairasiul has been designed for a discharge of 88 cumecs. Considering the revised TG efficiency of 92%, it would have been possible to uprate the existing installed capacity of 180 MW to around 196 MW. However, no uprating has been envisaged by NHPC and NHPC, vide their letter no. NHPC/O&M/BSP/01/1181 dated 2.7.2015 have proposed to retain the Installed Capacity of the project as 180 MW for which the project was originally designed mainly due to comparative reduction in flows as well as negligible incremental energy benefits even beyond 150 MW."

Since the design energy of the project has been revised by CEA to 708.59 MUs, in consultation with CWC, we are in agreement with the same subject to model study as suggested by CEA in its report dated 2.8.2016.

Issue No.4 : Consideration during R&M Period:

21. BRPL has submitted that the petitioner has requested to allow total O&M expenses during the R&M period from 2017-18 to 2021, as approved by the Commission, to be recovered from the beneficiaries in the corresponding year during the complete or partial shutdown during R&M works. BRPL has submitted that in such an event, essential expenses during R&M activities are not required to be capitalized in the R&M cost. However, as per the DPR, the expenses on account of establishment have been incorporated in the R&M works. BRPL has submitted that the petitioner is already getting the benefit of the capital infusion amounting Rs. 360.79 crore to Bairasiul generating station and any other benefits in any kind, if allowed would amount to double benefits to the petitioner which would be unreasonable.

22. *Per contra,* the petitioner in the present petition has requested to allow recovery of full normative O&M expenses already allowed by the Commission from the beneficiaries during complete / partial shutdown of generating station for R&M works. In this regard, certain essential expenses during R&M activities can be met out of the same and need not be capitalized in the R&M cost. However, BRPL has raised objection to the same on the ground that the petitioner is getting double benefits in the form of capital infusion for R&M works and additional recovery of O&M expenses. The petitioner has submitted that it has approached the Commission for in-principle approval for capital infusion on Renovation & Modernization of Bairasiul generating

station and after approval of the Commission, the petitioner will carry out R&M activities and approach the Commission with actual cost of capitalization on completion of R&M works for determination of post R&M tariff. The petitioner has submitted that in the event of complete/ partial shutdown of generating station during R&M period, if the petitioner is allowed to recover the full normative O&M expenses already fixed by the Commission, then the establishment expenditure covered in DPR shall not be considered in the post R&M cost for the purpose of determination of tariff and the same would ultimately reduce the burden on the beneficiaries including BRPL. The petitioner has requested that mechanism for recovery of AFC during shutdown due to R & M of thermal generating station provided in Regulation 30(2) of 2014 Tariff Regulations should be extended in case of Hydro generating stations also.

Analysis and Decision:

23. We have considered the request of the petitioner for allowing O&M expenses and interest on loan during the period of unit/station shut down as provided to thermal stations executing R&M/LE programme. The proviso under Regulation 30 (2) of the 2014 Tariff Regulations reads as under:

> "Provided that in case of generating station or unit thereof or transmission system or an element thereof, as the case may be, under shutdown due to Renovation and Modernisation, the generating company or the transmission licensee shall be allowed to recover part of AFC which shall include O&M expenses and interest on loan only."

Though the proviso is shown under clause (2) of Regulation 30 which pertains to thermal generating station, it is an independent stand alone proviso applicable to generating station or unit thereof or transmission system. This proviso provides that during the period of shutdown of the generating station or transmission system due to

Renovation and Modernization, the generating company or transmission licensee shall be allowed to recover part of AFC which shall include O&M expenses and interest on loan only. Therefore, the O&M expenses of the generating station shall be regulated in terms of the above proviso.

24. CEA in its report dated 8.2.2016 has vetted R&M proposal. Accordingly, we accord in-principle approval to the R&M proposal for life extension of the Bairasiul generating station by 25 years w.e.f 1.4.2021 at capital cost of Rs. **341.41crore including IDC of Rs.68.35 crore** subject to the following conditions:

(a) The petitioner shall engage one of the Independent Agencies designated by the Commission, during execution of the R&M which shall be vetting completion capital expenditure on R&M of the project.

(b) During the period of unit shut down/station shut down for the purpose of carrying out R&M activities, the petitioner shall keep the following two separate records and shall submit the same to the Commission along with the tariff petition for approval of capital cost after R&M of the generating station:

(i) IEDC including man power cost, construction power cost, water charges etc. booked to R&M activities;

(ii) Normal O&M expenses of the generating station (not booked to R&M expenditure) which are not avoidable even when the unit/s/station is under shut down.

(c) As per CEA`s report dated 8.2.2016, the petitioner shall conduct a model study in respect of the losses in water conductor system in the post renovation

scenario to take into account any improvement in the lining etc. of the water conductor system and the design energy from the project would be firmed up based on the same as well as the efficiency of the TG units in the post renovation scenario.

(d) The petitioner shall obtain the investment approval of the Competent Authority. Based on the investment approval and actual expenditure, tariff will be determined in line with provisions of extant Regulations.

(e) The petitioner shall initiate the following action points as suggested by CEA in its report dated 8.2.2016:

(i) Carry out necessary dam break analysis and necessary Emergency Action Plan should be prepared for mitigation of flood hazards in downstream side of the project in consultation with State Disaster management Authority.

(ii) Establishment of necessary hydro-mechanical network to collect the flood discharge and concurrent short interval rain data for revising the studies at later date.

25. Petition No. 76/MP/2015 is disposed of in terms of the above.

Sd/-	Sd/-	Sd/-	Sd/-
(Dr. M.K.Iyer)	**(A.S. Bakshi)**	**(A. K. Singhal)**	**(Gireesh B. Pradhan)**
Member	**Member**	**Member**	**Chairperson**

Annexure-37.2

CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Petition No. 248/MP/2018

Coram:

Shri P.K. Pujari, Chairperson
Dr. M. K. Iyer, Member
Shri I.S.Jha, Member

Date of Order: 24th July, 2019

In the matter of

Petition for approval of Renovation and Modernization of 105 MW Loktak Power Station in the State of Manipur

And

In the matter of

NHPC Limited
NHPC Office Complex, Sector-33,
Faridabad-121003, Haryana .....**Petitioner**

Vs

1. Assam power Distribution Company Limited
4th Floor, Bijulee Bhawan, Paltan Bazar,
Guwahati- 781001

2. Department of Power,
Govt. of Arunachal Pradesh,
Vidyut Bhawan,
Itanagar- 799111

3. Department of Power,
Govt. of Mizoram,
Aizawal- 796001

4. Tripura State Electricity Corporation Ltd.
Bidyut Bhawan, North Banamalipur,
Agartala- 799001

5. Meghalaya Energy Corporation Ltd.
Lum Jinshai, Short round Road,
Shillong- 597001

6. Department of Power,
Government of Manipur,
Keishampat, Imphal- 795001

7. Department of Power,
Government of Nagaland, Kohima-797001

8. Central Electricity Authority
Sewa Bhawan, R.K.Puram,
New Delhi-110066 **…..Respondents**

Parties present:

Shri Piyush Kumar, NHPC
Shri A.K.Pandey, NHPC
Shri Dhanush C.K, NHPC
Shri V.N.Tripathi, NHPC
Shri K.Goswami, APDCL
Shri I.Tahbildar, APDCL

ORDER

The Petitioner, NHPC Limited has filed the present petition seeking the following reliefs:

(a) In-principle approval for Renovation and Modernization (R&M) and life extension proposal of Loktak Power Station at the total cost of ₹273.59 crore (September, 2017 PL);

(b) Allow application of composite tariff of ₹3.85/unit during R&M period of the project;

(c) To allow increased design energy of 562.73 MU against the existing design energy of 448 MU; and

(d) Pass such other and further order/ orders as are deemed fit and proper in the facts and circumstances of the case."

Background

2. The Petitioner has set up a 105 MW (3 x 35 MW) Loktak Hydro Power Station (the generating station) in the State of Manipur, which was declared under commercial operation on 1.6.1983. The power generated from the project is being supplied to the various beneficiaries i.e. the Respondents herein in North Eastern Region in terms of the Power Purchase Agreement entered into between the Petitioner and the beneficiaries.

3. The tariff of the generating station for the period from 1.4.2014 to 31.3.2019 was approved by the Commission vide order dated 18.9.2015 in Petition No. 228/GT/2014.

4. Petition No. 99/MP/2016 was filed by the Petitioner seeking approval of R & M proposal in respect of the generating station and the Commission vide its order dated 2.5.2017 disposed of the same as under:

> *"8. We have considered the submissions of the Petitioner and CEA. Since petition is pending for last one year, and DPR and capital cost are still to be vetted by CEA, no purpose will be served to keep the petition pending. Accordingly, the Petitioner is granted liberty to approach the Commission after vetting of DPR and capital cost by CEA, in accordance with law."*

5. CEA in coordination with Central Water Commission (CWC) had examined the various chapters of DPR and has concurred the Power Potential Study chapter of DPR and vetted the revised annual design energy of the generating station as 562.73 MU and had intimated the same to the Petitioner vide its letter dated 24.11.2016. Thereafter, CEA had assessed the cost of E&M works, HM & civil works and submitted its final report on DPR examination to the Petitioner vide its letter dated 6.4.2018. The final cost (excluding IDC & FC) assessed by CEA for R&M of the generating station is ₹236.07 crore at September, 2017 price level. In this background and based on the liberty granted by the Commission in order dated 2.5.2017, the Petitioner has filed this petition with the prayers as in para 1 above.

6. Regulation 15(1) of the 2014 Tariff Regulations provides as under:

> *"15 Renovation and Modernisation: (1) The generating company or the transmission licensee, as the case may be, for meeting the expenditure on renovation and modernization (R&M) for the purpose of extension of life beyond the originally recognised useful life for the purpose of tariff of the generating station or a unit thereof or the transmission system or an element thereof, shall make an application before the Commission for approval of the proposal with a Detailed Project Report giving complete scope, justification, cost-benefit analysis, estimated life extension from a reference date, financial package, phasing of expenditure, schedule of completion, reference price level, estimated completion cost including foreign exchange component, if any, and any other information considered to be relevant by the generating company or the transmission licensee."*

Submissions by the Petitioner

7. The Petitioner has submitted that since the useful life of the generating station (35 years) is being completed on 31.5.2018, the proposal for R&M is submitted to the Commission in terms of the above regulations.

8. The highlights of the R&M proposal as submitted by the Petitioner are as under:

(A) Need for Renovation and Modernization: There is a need to undertake R&M of the generating station for the following reasons:

(i) Life extension of power plant for further useful life;

(ii) The Loktak Power plant equipment is going to complete its useful life in June 2018 as per the norms defined in the Regulations notified by the Commission;

(iii) Ageing and fatigue and also the de-rating of the components due to continuous running;

(iv) Improvement of generator and Step-Up Transformers efficiency through reduction in iron/ copper/ auxiliary losses by adopting latest technological advancements in design and material;

(v) Technological obsolescence of major components specially so about Stator which use class "F" insulation instead of Class "B" insulation used in erstwhile generators existing in Loktak Power station;

(vi) Generator improvement in mechanical properties of materials due to advancement of material technology;

(vii) Integrated Control, Monitoring & Protection system needed for running modern power plant; and

(viii) Compliance with norms like CEA Technical Standard 2010, CERC Regulation 2014, Fire protection system etc.

(B) Some major problems/ damages of civil structure encountered during the operation of the generating station are as under:

(i) Erosion in Barrage & scoring in downstream area.
(ii) Linking of Loktak & Imphal River through channels.
(iii) Deterioration of Intake structure at Cut & cover section.
(iv) Slope stability problems in byepass tunnel area & penstock area.
(v) Deterioration of various floors of Power House.

(C) Detailed Project Report for carrying out R&M of the project for its life extension: The highlights of proposal are as under:

(i) The focus of R&M proposal is towards activities which are essential for efficient and sustained performance of the generating station and have direct impact on generation and machine availability including State of the art equipment being used in the latest power stations.

(ii) The total work at project site would be executed in a phased manner covering four financial years and would be completed during the year 2024. The R&M of power station and generation of power will be concurrent activities, except for a small period of six months when the entire power station will be under complete shutdown (December, 2021 to May, 2022).

(iii) The expected life extension of the power station has been considered as 25 years after completion of R&M works i.e. from financial year 2024-25 onwards.

(iv) The Design Energy of the Power station after completion of R&M works would be 562.73 MU against the existing Design Energy of 448 MU as vetted by CEA.

(v) As per DPR, the estimated cost of R&M works including IDC & FC of ₹31.80 crore is ₹267.87 crore. However, in the instant petition the IDC & FC charges has been revised from ₹31.80 crore (at Sep 2017 price level) to ₹37.52 crore due to revision in interest rate from 8 % to 9.5 %.

(D) Scope of R&M and justification: The complete scope of R&M works along with justification for replacement/refurbishment of each work has been deliberated under various sections of DPR (Volume-I) and the same has been summarized as under:

(i) Repair/reconditioning of civil structures at Ithai Barrage (Errosion damage on the surface of piers, abutments, gate grooves & other locations), replacement of bamboo trash racks, renovation/ strengthening of off take-intake structure, Repairs at Head Race Tunnel (Zero Gate Shaft and Bypass area), Minor repairs at Power House Complex (Surge Shaft, pipe tunnel and valve house, penstocks, draft tube and PRV piers etc.) & other Infrastructure works.

(ii) R&M of Hydro-mechanical equipment at Ithai-Barrage complex (Spillway Crest vertical gates & rope drum hoists and barrage spillway stoplogs & gantry crane), Power channel/ Bye-pass area (Trash rack panels, emergency gate and rope drum hoist, intake Service gate & rope drum Hoist), Adit Inspection Gate, Penstocks and Power House Complex (Draft tube gates, PRV gates, pressure relief valve gates etc.)

(iii) R&M of power plant for electro-mechanical equipment includes replacement and refurbishment of all the major equipment i.e., turbine & accessories, digital governing system & accessories, main inlet valve & accessories, butterfly valves & accessories, generator & its components, static excitation system, Bus duct &

cabling, GSU Transformer, Switchyard, DC system, control and monitoring system, protection system, cabling system, switchgear, DG set, auxiliary transformer, illumination, Public address and Communication system, PLCC, EOT crane, cooling water system, drainage& dewatering system, HVAC, Grounding System, Compressed Air System, fire protection system, Security and Surveillance system etc.

(E) The estimated Completion cost of R&M works is ₹300.32 crore (including IDC and FC amounting to ₹37.52 crore) at September, 2017 price level as detailed under:

(₹ in crore)

Sl.No	Particulars	Cost (September, 2017 PL)
1.	Cost of E&M works vetted by CEA	124.38
2.	Cost of HM & Civil works vetted by CEA	111.69
3.	Total Hard Cost approved by CEA (1+2)	236.07
4.	IDC & FC	37.52*
5.	Cost of R&M works including IDC & FC (3+4)	273.59
6.	Residual value of Loktak Power Station (i.e. admitted capital cost – accumulated depreciation as on 31.5.2018) as per Commission's order dated 18.9.2015	26.73
7.	Capital cost for post R&M tariff (5+6)	300.32

As per DPR, IDC & FC charge is Rs. 31.80 crore. However, in the instant petition the IDC & FC charges has been revised from Rs. 31.80 crore (at Sep 2017 price level) to Rs. 37.52 crore due to revision in interest rate from 8 % to 9.5 %.

(F) Cost Benefit Analysis

(i) As per Chapter 7 (Renovation and Modernisation and Uprating of Hydro Power Stations) of "Best practices in HE Power Generation" published by CEA, the R&M of hydro power plants is a cost effective way for capacity addition. It is comparatively easier than constructing new projects and can yield results in about three to four years. Clause 7.1 is as follows:

"7.1 – Renovation & Modernization (R&M) of old plants is considered to be the best option to bridge the wide gap between demand and supply of power as R&M programmes are cost effective having much lower gestation period compared to setting up of new plants."

Renovation, modernization and uprating of hydro generating units (RM&U) which have outlived their normative operating life and the relatively new machines with generic problems are recognised to yield considerable additional benefits of energy at minimum cost. RM&U programmes can be expected to yield benefits of energy at minimum cost. RM&U programmes can be expected to yield benefits in about 3 to 4 years as against installation period for new hydro generating capacity of 6 to 7 years.

RM&U programmes may be taken up timely to prevent deterioration in operation of generating units which may lead to their premature retiring. By undertaking timely RM&U & Life extension programme, the generating plant can be made to operate for another extended period of 20 to 25 years with improved reliability and availability.

(ii) The per MW cost of R&M works of Loktak Power Station is about ₹2.60 crore only against ₹10 crore/MW for a new hydroelectric power plant of a similar size. The cost benefit analysis for conducting R&M of the Loktak Power Station is attached in detail with Chapter-8 of the enclosed DPR (Volume-II).

(iii) For a new hydro project of similar capacity, if we consider the capital cost of ₹10 crore/MW & design energy of 562.73 MUs, the levellised tariff works out to ₹4.66/unit against the first year tariff of ₹3.38/unit of Loktak Power Station after completion of R&M works. Further, ₹10 crore/MW taken for new Hydro power station in the State of Manipur for the purpose of comparison is on lower side as compared to a proposed 66 MW Loktak Downstream HE Project in the vicinity of Loktak Power Station which has a similar degree of difficulties and logistics. The estimated project cost of Loktak Downstream HE Project as per TEC is ₹1352.77 crore at Feb 2015 PL, which comes out to ₹20.50 crore/MW (approx).

(G) Estimated life extension from a reference date: The life of the generating station is estimated to be extended by another 25 years after completion of R&M works i.e. from 1st June, 2024 as per Section 1.5.3 of the DPR. This is also in line with the guidelines of CEA.

(H) Schedule of completion: The schedule for completion of R&M works as per DPR submitted earlier to CEA by the Petitioner is as follows:

(i) Considering the Engineering & Manufacturing cycle, the erection work at site is proposed to commence in 2019-20 coinciding with lean discharge season, and likely to be completed during the year 2022.

(ii) The unit-wise dismantling/ installation is being proposed keeping other two units remaining in operation, except for a period of 6 months for which complete shutdown of the power house is required for undertaking the work of common auxiliary systems of power house as well as other works related to water conductor systems of power house and HM works.

(iii) The major milestones of the R&M activity is as follows:-

Award of Works: January, 2017
Dismantling, Erection & Synchronisation:

Unit-I: 01 July, 2020 to 30th April, 2021
Unit-II: 01 May, 2021 to 30th November, 2021
Unit-III: 01 December, 2021 to 30th June, 2022

(iv) However, the above timeline has undergone change as the start year of R&M has been indicated as 2020 and the end year has been indicated as 2024 in the petition.

(v) Accordingly, the major milestones as per revised DPR is as follows:

Dismantling, Erection & Synchronisation:

Unit-I: June, 2022 to March, 2023
Unit-II: April, 2023 to October, 2023
Unit-III: November, 2023 to May, 2024

(I) Review of Design Energy on account of hydrology

(i) The existing Design Energy for the generating station is 448 MU. Loktak Power Station utilizes the water from Loktak Lake, the level of which is maintained by Ithai Barrage on Manipur river.

(ii) The average 10-daily water availability series is developed on the basis of water utilized by the machine for power generation and the water released from the spillway of Ithai Barrage for the period from January, 1991 to December, 2014.

(iii) The power potential study in the 90% dependable year (2006-07) is enclosed in Chapter 2 of DPR, Vol. 1. For an installed capacity of 105 MW, with 95% machine availability, the Design Energy works out to 562.73 MU at net head of 277.60 m, considering overall efficiency of 92% (Turbine efficiency 94% and Generator efficiency 98%).

(J) Consideration during R&M period

(i) As per the revised DPR, the generating station would be under Renovation from June, 2020 to May, 2024 in a phased manner. During this period, the generating station would be under complete or partial shutdown for repair of civil structure and water conductor system and to carry out all HM and E&M works related to R&M.

(ii) The Petitioner proposes to implement R&M activity concurrently with generation to the extent possible as per schedule of R&M activities, except for a small period of six months when the entire power station will be under complete shutdown.

(iii) Based on the annual fixed charges approved by the Commission for 2018-19, the composite tariff of generating station works out to ₹3.85/unit. As the plant availability & generation beyond the period 2014-19 cannot be guaranteed due to R&M works, the Petitioner intends to raise energy bills to the existing beneficiaries based on the approved composite tariff of the year 2018-19 during the tariff period 2019-24.

(iv) The Petitioner will submit tariff petition after completion of R&M works for the period 2024-29. In view of this, Petitioner has requested the Commission to allow composite tariff of ₹3.85/ unit during the R&M period.

(v) **O&M expenses for post R&M tariff**: The tariff proposal in DPR for projections for first year tariff is ₹3.38/unit and the levellised tariff is ₹4.78/unit. The above calculation is based on O&M expenses for 2015-16 as approved by the Commission with the escalation rate of 6.64% for deriving first year O&M expenses post R&M period. This methodology has been adopted as Loktak Power Station is an existing project and the Petitioner is doing R&M works only. Therefore the R&M cost of ₹2.60 crore/MW will not reflect the actual capital cost of the project and calculation of O&M as per Regulation 29(3)(d) of the 2014 Tariff Regulations (i.e. 4% of Capital cost excluding cost of R&R works) will be highly unreasonable and hence this method has not been adopted in the tariff calculations.

(vi) Thus, the Petitioner has requested the Commission to consider the renovated power station as an existing power station for the purpose of allowing O&M expenses post R&M period.

(vii) The Commission vide its order dated 30.11.2016 in Petition No. 99/MP/2016, the earlier submitted petition for approval R&M of Loktak Power Station had directed to submit certificate stating that additional capitalization claimed during the periods 2009-14 & 2014-19 are not included under the scope of R&M works to be carried during the period 2020-24. This requirement of the Commission has been fulfilled by the Petitioner vide additional submissions dated 16.12.2016.

(viii) The Board of Directors of NHPC in its meeting No. 391 dated 10.2.2016 had approved DPR for carrying out R&M of the generating station for its life extension.

9. After examining the DPR, the CEA, in consultation with the CWC has vetted the cost of R&M in its report dated 6.4.2018 as under:

a) The cost of E&M works for R&M at September 2017 price level is as under:

Description	Submitted by Petitioner	Vetted by CEA
Generating Plant and equipment	94.61	94.61
Substation Equipment and Auxiliary Equipment and Services of Switchyard	5.64	5.64
Taxes and duties	18.31	18.69
Overheads	12.21	7.24
Total (E&M works)	**130.77**	**124.38**

b) The cost of Civil & HM works for R&M at September 2017 price level is as under:

Description	Submitted by Petitioner	Vetted by CEA
Total Direct Charges	111.32	111.20
Total Indirect Charges	0.50	0.49
Total (HM & Civil Works)	**111.82**	**111.69**

10. Accordingly, the total cost of R&M works at September 2017 price level as vetted by CEA is as under:

Description	Vetted by CEA
E&M Works	124.38
HM & Civil Works	111.69
Total	**236.07**

11. The Petition was admitted on 11.12.2018 and the Commission issued notice to the Respondents with direction to complete pleadings. Reply has been filed by the Respondent No. 1 APDCL and the Petitioner has filed its rejoinder to the said reply.

Reply of Respondent, APDCL

12. The Respondent APDCL vide its affidavit dated 27.12.2018 has submitted that though the CEA is stated to have assessed the cost of E&M works, HM & civil works amounting to ₹236.07 crore (excluding IDC & FC) and submitted its final report on DPR vide letter dated 6.4.2018, CEA in another letter dated 12.7.2016 had opined that the Petitioner has proposed replacement of majority of E&M equipment like Turbine Runners, Excitation system, Governors, SF_6 Circular breakers, Flood dewatering pumps etc. under this proposal which were replaced earlier during 2008-13. The Respondent has further submitted that CEA has opined that useful life of hydro power plant of 35 years is only on commercial aspect particularly on tariff components and therefore the Commission may examine the claims of the Petitioner with prudence check so that items necessary for proposed R&M works are ensured and no double claim made. The respondent has stated that CEA has suggested that the extend life of the plant may be considered as 35 years instead of the proposed 20-25 years and hence the Commission may look into the suggestion of CEA and decide the same. As regards Design Energy, the Respondent has stated that the revised design energy vetted by the CEA is yet to be demonstrated and availed practically.

Additional submissions of the Petitioner

13. The Petitioner vide its affidavit dated 29.1.2019 has clarified that during the process of approval of DPR, CEA had raised certain queries vide letter dated 12.7.2016 which were suitably replied by the Petitioner vide its letter dated

1.9.2018 and while approving DPR, the life and depreciated value of such equipment have been suitably taken care of in the DPR cost. The Petitioner has submitted that as per Regulation 3(67)(d) of the 2014 tariff Regulations, the useful life of hydro projects is 35 years only, whereas the estimated life of the generating station after completion of R&M as per CEA guidelines is 25 years. The Petitioner has added that in spite of minor renovation of the Project, it needs major R&M activity including repair works in its civil structure and power tunnel for extension of life of the Project by another 25 years. As regards Design Energy, the Petitioner has clarified that based on discharge in last 35 years, the design energy has been reviewed as 562.73 MU on the basis of water availability series for the period January, 1991 to December, 2014. The Petitioner has stated that considering the generated energy in the generating station during the period 2013-18, the increased design energy stands demonstrated and the same is based on 90% dependable year with 95% machine availability. Accordingly, the Petitioner has submitted that in-principle approval of R&M and life extension of the generating station may be allowed as prayed for in the Petition.

14. During the hearing on 27.2.2019, the representative of the Petitioner reiterated that the R&M work of the power station and generation will be concurrent activities, except for a period of six months (December 2021 to May, 2022) when the whole station will be under shut down. The representative also submitted that the expected life extension of the generating station has been considered as 25 years from 2024-25 after completion of R&M works. The representative of the Respondent APDCL while stating that it has no objection to the R&M works being allowed on prudence check has prayed that the Commission may consider the life extension of the Project as 35 years instead of 25 years.

Issues for consideration

15. Based on the submissions of the parties and the documents available on record, the issues which emerge for consideration are examined hereunder:

Issue No. (A): Capital cost and Increase in IDC & FC Charges

16. The Petitioner has submitted that CEA has approved the hard cost of ₹236.07 crore at September 2017 price level. The Petitioner has further submitted that IDC & FC amounting to ₹31.80 crore in the DPR and submitted to the CEA & CWC, is at an interest rate of 8% which was prevalent in September 2017. It has stated that the rate of interest has been revised from 8% to 9.5% and hence the revised IDC & FC for R&M works out to be ₹37.52 crore. Accordingly, the Petitioner has submitted that the revised estimated cost of R&M works is ₹273.59 crore (236.07 +37.52) including IDC & FC.

Analysis & decision

17. The submissions have been considered. It is observed that the requirement for R&M of generating plants have been stressed by the CEA, the Ministry of Power, GOI and in the Tariff Policy prescribed by the Central Government from time to time. CEA has considered the "Renovation and Modernization of Old Power Plants" as one of the best options to bridge the gap between demand and supply of power. It has also been stressed that the hydro plants which have completed their useful life shall undertake R&M for extending the life of the hydro plants, specially in view of the fact that newer capacity additions in hydro sector has slowed down in spite of various measures taken by MOP, GOI and this Commission to incentivize the hydro power plants. The Petitioner has also placed on record the DPR which provide the complete scope, justification, cost-benefit analysis, estimated life extension from a reference date, financial package, phasing of expenditure, schedule of completion and reference price level etc. In this background and

considering the fact that CEA, after detailed analysis of the DPR has approved the hard cost of ₹236.07 crore at September, 2017 price level for R&M of the generating station, we are inclined to approve the same, subject to revision based on prudence check of the actual expenditure incurred by the Petitioner. The Petitioner is directed to file petition for determination of tariff of the generating station post R&M based on the actual expenses incurred. The IDC and FC charges incurred by the Petitioner shall be governed by the provisions of the regulations applicable during the relevant period. The Petitioner is also directed to submit bank documents in respect of interest rates in support of the said claim.

Issue No. (B): Design Energy (DE)

18. As regards DE, the Respondent has pointed out that the revised DE of 562.73 MU as vetted by CEA against the existing DE of 448 MU has not been demonstrated and availed practically. Per contra, the Petitioner has clarified that based on the discharge in last 35 years, the DE of the station has been revised to 562.73 MU on the basis of water availability for the period from January, 1991 to December, 2014 which has been vetted by CEA. In this regard, the Petitioner has furnished the generated energy of the station during the period 2013-18 as under:

Years	Generated energy (in MU)
2013-14	640
2014-15	372 (less generation due to less inflow)
2015-16	537
2016-17	741
2017-18	838

Accordingly, the Petitioner has stated that the increased DE stands demonstrated in the project and the same is based on 90% dependable year with 95% machine availability.

Analysis & decision

19. The matter has been considered. It is noticed that CEA in consultation with CWC has revised the DE of the generating station to 562.73 MU from 448 MU. The relevant portion of the CEA report dated 24.11.2016 is extracted below:

> *"Examination of DPR Proposal"*
>
> *2.2 Installed Capacity and Design Energy*
>
> *2.2.1 With regard to the Installed Capacity and Design Energy of project, the studies have been carried out by NHPC taking into account the following:*
>
> *(i) The observed 10-daily Hydrological flow data for Power House release and Ithai Barrage spill data for the period 1991 to 2014 duly vetted & approved by CWC vide their letter no. 4/424/2015-HYD (NE)/460 dated 02.12.2015.*
>
> *(ii) Net Head of 277.6m based on Head Loss of 31.34m is vetted & approved by CWC vide their letter no. 22/1/2016-HCD (NW&S)/1581-82 dated 28.10.2016.*
>
> *(iii) Efficiency of the generating units has been considered as 94% for Turbine & 98% for Generator in post R&M scenario.*
>
> *2.2.2 In view of above, design energy benefits for the above mentioned installed capacity of 105 MW have been worked out by NHPC as 562.73 MU, which are considered to be in order.*
>
> *2.2.3 Further, NHPC is advised to conduct a model study in respect of the losses in water conductor system in the post renovation scenario to take into account any improvement in the lining etc. of the water conductor system and the design energy from the project would be firmed up based on the same as well as the efficiency of the TG units in the post renovation scenario."*

20. Considering the fact that the DE of the generating station has been revised by CEA to 562.73 MUs, in consultation with CWC, we approve the same. This is however subject to model study post R&M as suggested by CEA in its report dated 24.11.2016.

Issue No. (C): Recovery of Annual Fixed Charges beyond the period 2014-19

21. The Petitioner in this Petition has prayed that a composite tariff of ₹3.85/unit may be allowed for the generating station during the period of R&M, based on the annual fixed charges approved for the period 2018-19 in Commission's order dated 18.9.2015 in Petition No. 228/GT/2014. The Petitioner has submitted that it has proposed to implement R&M activity concurrently with generation to the extent possible as per schedule of R&M works. It has further submitted that during the

R&M period, the station would be under partial/complete shutdown for repair of civil structure and water conductor system and to carry out all HM and E&M works related to R&M. The Petitioner has stated that the power station will be under complete shutdown for a period of six months from December, 2021 to May, 2022. The Petitioner has further stated that since the plant availability & generation beyond the period 2014-19 cannot be guaranteed due to R&M works, it intends to raise energy bills during the period 2019-24 on the existing beneficiaries based on the tariff approved for the year 2018-19 in terms of the Commission's order dated 18.9.2015. The Petitioner has stated that petition for determination of tariff shall be filed for the period 2024-29 after completion of R&M. Accordingly the Petitioner has prayed that the Commission may allow the composite tariff of ₹3.85/unit during the R&M period.

Analysis & decision

22. The matter has been considered. The Commission vide order dated 18.09.2015 in Petition No. 228/GT/2014 had approved annual fixed charges of the generating station for the period 2014-19 as under:

(₹in lakh)

	2014-15	**2015-16**	**2016-17**	**2017-18**	**2018-19**
Return on Equity	1581.42	1611.02	1622.94	1627.30	1627.30
Interest on Loan	0.00	0.00	0.00	0.00	0.00
Depreciation	918.85	945.86	956.21	952.23	156.45
Interest on Working Capital	591.95	628.76	667.14	707.53	732.27
O & M Expenses	9673.64	10316.36	11001.78	11732.74	12512.26
Annual Fixed Charges	**12765.86**	**13502.00**	**14248.06**	**15019.81**	**15028.29**

23. The Petitioner has prayed that the tariff for the period 2018-19 as approved above may be permitted to be recovered from the beneficiaries during the R&M period.

24. It is observed that the Commission vide order dated 3.6.2016 in Petition No. 76/MP/2015 while approving the R&M proposal in respect of Bairasiul Power

Station of the Petitioner had allowed the recovery of only two components of tariff namely, the O&M expenses and Interest on Loan during the period when the unit/station was under shut down, as provided to thermal generating stations executing R&M/LE programme. Though the above proviso relates to thermal generating stations, the same is applicable to all generating stations /units thereof or the transmission system. In terms of the said proviso, during the period of shutdown of the generating station or transmission system, as the case may be, due to R&M, the generating company or transmission licensee shall be allowed to recover part tariff which shall include only O&M expenses and interest on loan. Accordingly, we direct that the Petitioner is entitled to recover tariff comprising only of O&M and interest on loan during the R&M period. However, in line with the above decision and for the purpose of billing for the period 2019-24, the principles laid down in the para below would be applicable based on the annual fixed charges for the year 2018-19. We however direct that (i) the units shall be taken out for R&M during low inflow periods so as to minimize the loss of energy and (ii) the existing procedure of declaring capacity and energy generation based on water availability and number of units not in R&M shall be followed.

25. As regards the prayer of the Petitioner for composite tariff of ₹3.85/unit based on annual fixed charges of 2018-19 during R&M period, we are of the view that recovery of composite tariff as above during the R&M period would not be prudent as the same would disturb the procedure for recovery of annual fixed charges, based on Plant Availability Factor and energy generation achieved by the generating station. Considering the fact that R&M activity is implemented concurrently with generation, the recovery of annual fixed charges by the Petitioner shall be governed by the following principles:

(i) The annual fixed charges of 2018-19 is permitted to be provisionally recovered for the period 2019-24 for the number of units in operation and the number of units in shutdown due to R&M as under:

(a) When one unit out of three units is under R&M, 2/3rd of the annual fixed charges for the year 2018-19 i.e. ₹10018.86 lakh (2/3 x 15028.29) is allowed to be recovered along with 1/3rd of O&M component and Interest on loan i.e. ₹4170.75 lakh [1/3 x (12512.26 + 0)]. Similarly, when two units are under R&M, 1/3rd of the annual fixed charges for the year 2018-19 i.e. ₹5009.43 lakh (1/3 x 15028.29) is allowed to be recovered along with 2/3rd of O&M expenses and Interest on loan i.e. ₹8341.51 lakh [2/3 x (12512.26 + 0)].

(b) When the generating station is under complete shutdown, only O&M and Interest on loan i.e. ₹12512.26 lakh would be allowed to be recovered.

(ii) During the R&M period, no incentive on capacity declaration of available units above NAPAF as well as secondary energy benefits shall be allowed to the generator.

(iii) The provisional tariff as stated in serial no. (i) above is subject to revision, based on the actual expenditure incurred by the Petitioner, on year to year basis, during the period 2019-24, after completion of R&M.

Issue No. (D): O&M expenses post R&M period

26. The Petitioner has submitted tariff proposal in DPR for projection of first year tariff (₹3.38/unit) and levellised tariff (₹4.78/unit). The Petitioner has stated that the calculation for tariff is based on O&M expenses for the year 2015-16 as approved by the Commission with escalation rate of 6.64% for computing O&M expenses post R&M period. The Petitioner has clarified that this methodology has been used as Loktak is an existing project and is undertaking R&M works only. The Petitioner has further stated that since the R&M cost of ₹2.60 crore/MW does not reflect the actual cost of the project and the O&M expenses permitted as per Regulation 29(3)(d) of the 2014 Tariff Regulations is highly unreasonable. Accordingly, the Petitioner has prayed that the Commission may consider the renovated power station as an existing station for the period post R&M.

Analysis & decision

27. The expected date of completion of R&M works of the generating station is May, 2024 and the Petitioner has been directed to file petition for determination of tariff after completion of R&M work. Accordingly, the O&M expenses to be allowed post R&M shall be based on the provisions of the tariff regulations applicable during the relevant period (i.e. tariff period 2024-29).

Issue No. 5: Prudence check of Assets/works for R&M

28. The Respondent APDCL has submitted that CEA has assessed the cost of E&M works, HM & civil works as ₹236.07 crore (excluding IDC & FC) and submitted its final report on DPR vide letter dated 6.4.2018. However, it has submitted that CEA vide letter dated 12.7.2016 has opined that the Petitioner has proposed replacement of majority of E&M equipment's like Turbine Runners, Excitation system, Governors, SF_6 Circuit Breakers, Flood dewatering Pumps etc. under this proposal which were replaced earlier during 2008-13. It has further submitted that CEA had specifically mentioned that the Petitioner has said proposed replacements of these E&M equipment under R&M citing useful life of the project being 35 years as per regulations of the Commission, for undertaking such works. The Respondent has also submitted that CEA had opined that the useful life of hydro power plant of 35 years is only on commercial aspect particularly on tariff components. It has submitted that the actual remaining technically useful life may be more than that which varies on case to case basis depending on operating conditions of generating unit, actual running period, design margin & practices considered by the manufacturer of the unit, quality assurance/ practice followed at manufacturing and erection site, O&M practices followed by the project authority etc. Moreover, the mechanical component of hydro plants are designed with high factor of safety ensuring enhanced life cycle of hydro plants.

29. The Respondent has stated that based on the submissions of the Petitioner, the Commission had allowed vide its order dated 14.6.2011 in Petition No. 108/2010 inter alia certain expenditure on R&M needed to increase efficiency of the plant and the same is submitted below for the purpose of reference and prudence check:

(₹ in lakh)

2009-10	2010-11	2011-12	2012-13	2013-14
867.13	963.96	924.76	237.50	5.50

30. The Respondent has further submitted that CEA had pointed out that the planned and forced outages of the generating station are comparatively less with respect to all India average. It has stated that the physical or actual life of the plant may go well beyond 35 years, depending on the quality of operation and timely maintenance of the plant & equipment. The Respondent has added that such generating plant becomes capable of operating beyond the economic life of 35 years as the hydro generating plants continuously get capital infusion under the additional capitalization year after year. Accordingly, the Respondent has submitted that the R&M claim of the Petitioner may be examined and allowed on prudence check.

Analysis and Decision

31. The Commission in Petition No. 99/MP/2016 pertaining to approval of R&M of this generating station had directed the Petitioner to furnish certificate confirming that the additional capitalization claimed during the periods 2009-14 & 2014-19 have not been included under R&M works. In response to this, the Petitioner vide affidavit dated 16.12.2016 had certified that the additional capital expenditure claimed in respect of works/assets executed during 2009-14 and those which have been projected to be taken up during the period 2014-19 (in Petition Nos. 155/GT/2013 & 228/GT/2014) have not been included under the proposed R&M works of this generating station. We therefore direct the Petitioner to furnish complete details of

the assets/works including expenditure claimed and allowed during the periods 2009-14 & 2014-19 with proper justifications/reasons for the R&M expenditure, if any, on the same assets in the petition to be filed for claiming R&M expenditure for the period 2019-24.

Issue No. 6: Extension of life beyond 25 years post R&M

32. The Respondent APDCL has highlighted Para 4 of CEA letter dated 12.07.2018 regarding extension of life of hydro plants beyond 25 years after R&M. It has pointed out to clauses 1.2 & 8.1 of DPR citing CEA guidelines on the "Best Practices and Benchmarking for Hydro" under Chapter 7 as under:

> *"by undertaking RMU&LE timely, the generating plant can be made to operate for another extended period of 20-25 years with improved reliability and availability."*

33. The Respondent has referred to the letter of CEA dated 12.7.2016 which states as under:

> *"The above cited guideline is a general guideline for R&M works without distinguishing the type of works undertaken under it. However, as observed from DPR, NHPC has proposed replacement of majority of E&M equipments along with some civil works (i.e. all necessary repair works on major civil infrastructure and substantial new building works for the housing colony) and have stated that it is comparable to a new power plant.*
>
> *In view of above and the CEA regulations providing useful life for civil works & E&M works as 100 years and 35 years respectively, the extended life of plant may be considered as 35 years instead of currently proposed 20-25 years"*

34. Per contra, the Petitioner has stated that it has replied to the observations raised by CEA in its letter dated 12.7.2016 and subsequently CEA has cleared the DPR for useful life of 25 years of the generating station.

Analysis and Decision

35. Keeping in view that CEA had cleared the DPR for useful life of 25 years of the generating station, we are inclined to allow the life extension of the generating station by 25 years.

Recommendations

36. Based on the above discussions, the prayer of the Petitioner for in-principle approval of R&M of the generating station based on the hard cost of ₹236.07 crore with IDC & FC of ₹37.52 crore is allowed along with life extension of the generating station by 25 years. The DE of the generating station post R&M shall be 562.73 MUs as against DE of 448 MUs. Pursuant to the completion of R&M, the Petitioner shall file tariff petition based on the actual expenditure incurred for the same. During the period of unit/ station shut down for the purpose of carrying out R&M activities, the Petitioner shall maintain two separate records as under and shall submit the same along with the tariff petition for approval of cost post R&M of the generating station:

(i) IEDC including man power cost, Construction power cost, Water charges etc. booked under R&M expenses; and

(ii) Normal O&M expenses of the generating station (not booked under R&M expenses) which were unavoidable even when the unit/s/station is under shut down.

37. Petition No. 248/MP/2018 is disposed of in terms of above.

Sd/-	***Sd/-***	***Sd/-***
(I.S.Jha)	**(Dr.M.K.Iyer)**	**(P.K.Pujari)**
Member	**Member**	**Chairperson**