

Before

UTTARAKHAND ELECTRICITY REGULATORY COMMISSION

Petition No. 20 of 2016

In the matter of:

Petition for seeking prior approval of "Capital Investment for Renovation & Modernisation" of Dhakrani HEP (3 X 11.25 MW) of UJVN Ltd.

And

In the matter of:

UJVN Ltd.,
"UJJWAL", Maharani Bag, GMS Road,
Dehradun.

...Petitioner

Coram

Shri Subhash Kumar Chairman

Date of Order: June 27th, 2017

ORDER

This Order relates to the Petition filed by UJVN Ltd. (hereinafter referred to as "UJVN Ltd" or "the Petitioner") under Section 61 and 86 of the Electricity Act, 2003 read with the relevant Regulations and Guidelines of the Commission for seeking prior approval of "Capital Investment for Renovation & Modernisation" of 3x11.25 MW Dhakrani HEP.

Background

2. UJVN Ltd. vide its letter No. 181/UJVNL/04/D(F)/UERC dated 13.05.2016 filed an Application under Section 61 and 86 of the Electricity Act, 2003 read with the relevant Regulations for seeking prior approval in the matter of Capital Investment for Renovation & Modernisation of 3 X 11.25 MW Dhakrani HEP.
3. UJVN Ltd. in its Petition has submitted that:-
 - (1) The Dhakrani HEP is a run-of-river scheme having an installed capacity of 3X11.25 MW (33.75 MW) and situated approx. 8 Kms downstream of the

Dakpathar Barrage. The project was implemented under the Yamuna Hydel Scheme Stage-I. The generating Units were commissioned between November 1965 to January 1970.

- (2) Dhakrani HEP has been in operation for over 46 years. Whereas, normal life of hydro power plant is 30-35 years after which it requires renovation and modernization.
- (3) The governors, excitation system, generators and turbines including auxiliaries, protection system & control equipments have become very old & obsolete. Due to obsolescence of equipments and non-availability of spares, the day to day problems are arising. The underwater parts have deteriorated substantially due to wear & tear and erosion/damages and profiles of the blades have been changed by various in-situ repairs and thus require complete replacement.
- (4) For Renovation & Modernisation of Dhakrani Power House, comprehensive studies for E&M, Hydro Mechanical Systems and Civil Works were carried out by M/s Lahmeyer International. M/s Lahmeyer International prepared a Detailed Project Report (DPR) which was approved in 56th BOD meeting held on 15.09.2010. The aforesaid DPR envisaged enhancing efficiency and reliability of generating units to an acceptable level for another 35 years of operation by complete replacement of vital parts of the generating units such as turbine runners, Guide vanes, Governors and the excitation systems and to ensure safety of the plant.
- (5) Bids for RMU works of Dhakrani HEP were invited through International Competitive Bidding (ICB) route. However, due to cancellation of KfW loan, Board of Directors, UJVN Ltd in their 68th meeting held on 27.09.2013 accorded approval to cancel the NIBs floated for RMU works of Dhakrani HEP through ICB route and directed to re-invite fresh bids through National Competitive Bidding (NCB) route. Thereafter, a revised DPR of Sept 2015 for RMU of Dhakrani HEP was prepared considering following three Options for RMU:-

Option 1: Replacement of the station auxiliary systems as far as required and refurbishment of the other parts of the equipment. This option shall comprise the replacement of all equipment, whose maintenance cost are extraordinary high.

Option 2: Same as option 1 plus replacement of vital parts of the generating Units such as turbine runners, guide vanes, governors and excitation system. This option aims at enhancing the efficiency of the generating Units up to an acceptable level at moderate cost.

Option 3: Full replacement of the generating Units with all station auxiliaries. This option aims at the achievement of the maximum power generation of the Plant.

The revised DPR September, 2015 for RM&U of 3 X 11.25 MW Dhakrani Hydro Electric Project was approved in 76th BOD meeting held on 30.09.2015.

- (6) The head-wise expenditure proposed under RMU of Dhakrani HEP in the revised DPR is as follows:-

S. No.	Item	Estimated Cost (Rs. in Lakh)
A	Works	
1	Preliminary	35.90
2	Civil & Hydro Mechanical Works	2247.38
3	Maintenance @ 1% of Civil Works & Hydro Mechanical Works	22.47
4	Power Plant & Accessories (E&M)	8369.75
	Total A- Works	10675.51
B	Establishment @ 4 % of Civil Works & E&M (being an RMU Project)	424.69
C	Ordinary T&P @ 1% of A-Works	106.76
D	Losses on stocks @ 0.25% of Civil Works & Hydro Mechanical Works	5.62
E	Receipt & Recoveries	-30.00
	Total Direct Charges	11182.57
F	Indirect Charges (Audit & Account @1% of A-Works)	106.76
	Grand Total	11289.33
5	IDC	2442.41
	Total Cost Including IDC	13731.74

Thus, a proposal of Rs. 137.32 Crore including IDC has been submitted by UJVN Ltd. which includes the works of (a) Hydro-Mechanical Works at Dakpathar Barrage, (b) Electrical Works at Dakpathar Barrage, (c) Civil Works at Dakpathar & (d) Civil Works at Power Channel amounting to Rs

16.88 Crore (excluding IDC). These works have now been considered under DRIP after revision of their cost at the price level of Jan 2016. The total cost of RMU Works including works of E&M and Civil works considered in the Revised DPR (excluding works covered under DRIP scheme) would be 89.29 Crore (Rs. 106.75 Cr.- Rs. 16.88 Cr.=Rs. 89.29 Cr.).

- (7) The summarized list of works proposed under RMU (excluding the works covered under DRIP) are given below:-

S. No.	Name of Item/ Work (excluding the works covered under DRIP)
A- Hydro-Mechanical Works at Power Station	
1	Intake Trash Racks (Refurbishment/Replacement) and TRCM (Replacement)
2	Intake Emergency Gate (Replacement/Refurbishment)
3	Intake Gates (Refurbishment/Replacement)
4	Bypass Gates (Refurbishment/Replacement)
5	Penstocks (Refurbishment)
6	Draft Tube Gates and Gantry Crane (Replacement/Refurbishment)
7	Power house EOT crane (Refurbishment/Replacement)
B- Mechanical Work at Power Station	
1	Turbines
1.1	Spiral Cases and Draft Tubes (Replacement/Refurbishment)
1.2	Runner Throat Rings (Refurbishment)
1.3	Top Covers (Replacement)
1.4	Guide Vanes (new) and Regulating (Replacement)
1.5	Runners (new) (Replacement)
1.6	Shaft glands (Replacement)
1.7	Turbine guide bearings and thrust (Replacement)
1.8	Pit ventilation (Refurbishment/Replacement)
1.9	Monitoring systems (Replacement)
1.1	Turbine-generator shafts (Replacement)
2	Governors (Replacement)
3	Auxiliary Systems
3.1	Compressed Air Systems (Replacement/Refurbishment)
3.2	Draft Tube Stabilisation Air System (Replacement)
3.3	Cooling water system (Replacement)
3.4	Drainage & Dewatering Systems (Replacement/Refurbishment)
3.5	Clean Water System (Replacement)
3.6	Oil Handling System (Refurbishment)
C- Electrical Work at Power Station	
1	Generators and Excitation Systems (Replacement/Refurbishment)
2	Generator Termination Equipment (Replacement/Refurbishment)
3	Main Step-up Transformers (Replacement)
4	HV Switchyard 132 kV (Replacement/Refurbishment)
5	MV Switchyard 33 kV (Refurbishment)

6	MV Switchgear 11 kV (Replacement)
7	MV/LV Auxiliary Transformers (SST & UAT) (Replacement)
8	LV Auxiliary Supply Systems 0.4 kV (Replacement)
9	Emergency Diesel Generating Units (New)
10	DC Auxiliary Supply Systems (Replacement)
11	Electrical Protection Systems (Replacement)
12	Fire Protection Systems (Refurbishment)
13	HVAC Systems (Refurbishment)
14	Ancillary Installations (Replacement)
D- Automation & Control System (Replacement)	
E. Other Works	
(a)	Hydro-Mechanical Works at Dakpathar Barrage (Refurbishment)
(b)	Electrical Works at Dakpathar Barrage (Replacement/Refurbishment)
(c)	Civil Works at Dhakrani Power Station
1	Forebay (Refurbishment)
2	Intake (New)
3	Bypass Channel (Refurbishment)
4	Penstocks (Refurbishment)
5	Power House Complex (Refurbishment)
6	Tail Race Canal (Refurbishment)
7	Civil Works for E&M Equipment (Refurbishment/New)

- (8) The Petitioner has submitted that the Project will be financed with the debt-equity ratio of 70:30 and equity will be provided from budgetary support of GoU, while debt to be arranged from Financial Institutions/Banks. The salient features of the Project (as per revised DPR) are as follows:

S. No.	Description	As per Revised DPR
1	Anticipated average annual generation (in MU) after RMU	183.67
2	Design Energy after RMU (in MU) (90% dependable year 2006)	145.16
3	Average annual generation (in MU) (FY 2010-11 to FY 2014-15)	152.93
4	Incremental generation (in MU) (4=1-3)	30.74
5	Levelized tariff for 35 years (Rs / kWh)	3.17
6	Internal Rate of Return (IRR)	13.90%
7	Benefit to Cost Ratio (BCR)	1.08
8	Net Present Value (NPV) (in Crore)	32.14
9	Time taken in execution of RMU	52 months
10	Project Life Enhancement	35 years

4. The Commission heard the matter for admissibility on 07.06.2016 and admitted the Petition with a direction to the Petitioner to hold consultation with the beneficiaries namely UPCL & HPSEB Ltd. and submit the record of consultation to the Commission within 2 months of date of the Order.
5. In compliance to the above direction, the Petitioner vide its letter No. 308/UJVNL/04/D(F)/UERC dated 02.08.2016 and letter No. 1080/UJVNL/02/D(O)/B-8 dated 16.08.2016 submitted the consent of the

beneficiaries namely HPSEB Ltd. and UPCL respectively.

6. The Commission vide its letter No. 1230 dated 03.11.2016 directed the Petitioner to submit clarifications/additional information/documents/data on the following observations of the Commission for further scrutiny/analysis of the Petition:-

“

A. UJVN Ltd. is required to furnish:

1. *Details/status of Sanctions and Statutory Clearances required for execution of the Project.*
 2. *Details of accumulated depreciation already recovered from the original project cost.*
[Ref:- Clause 23 (3), Part-III, UERC (Terms and Conditions for Determination of Multi Year Tariff) Regulations, 2015]
 3. *Details of present flow capacity of the Power Channel and when it was last desilted (Upstream & Downstream)?*
 4. *Evidence of financial support by Govt. of Uttarakhand for funding the equity portion (30%) of estimated cost for Renovation & Modernization.*
 5. *Evidence of financial support by Financial Institutions (PFC or any other) for funding the Debt portion (70%) of the Estimated Cost for Renovation & Modernization.*
 6. *Inspection Reports of Underwater parts after most recent dewatering of the Power Channel.*
 7. *Daily & Month-wise Data of Water released to Dhakrani HEP for last 10 years.*
 8. *Machine-wise Maintenance Cost for last five (5) years.*
 9. *History of unit-wise major repairs/replacements of major equipment/parts and their costs.*
 10. *It has been observed that works covered under DRIP Scheme have already been sanctioned by the Commission through its Order dated 29.04.2016 whereas, UJVN Ltd. in its Petition has included some of the works covered under DRIP Scheme in Renovation & Modernisation of Dhakrani HEP. UJVN Ltd. is required to submit justification for the same.*
Further, UJVN Ltd. is required to furnish Scope of Work, Cost Estimate and Economic & Financial Analysis as per revised DPR Sept, 2015 excluding the works covered under DRIP scheme.
 11. *Unit-wise machine outage Plan for RMU of Dhalipur and Dhakrani HEP.*
 12. *Machine-wise daily generation and corresponding average discharge data from April 2015 to Oct 2016.*
 13. *Details of major trippings in machine/equipments such as Generator & its Auxiliaries, Turbine, Transformers and Protection System in last 5 years.*
 14. *Methodology for computation of discharge through turbines.*
 15. *Project Completion Schedule for Execution of Dhakrani HEP on colored A3 sheet.*
- B. UJVN Ltd. is required to clarify:-**
1. *It has been observed that in table 'Cost Estimate for RMU of Dhakrani HEP' provided at page no. 107 of revised DPR, 'Amount already considered in revised DPR of Dhalipur HEP' has been added to 'Total amount for tender purpose'. UJVN Ltd. is required to provide justification for the same."*

7. In compliance to the aforesaid letter, UJVN Ltd. vide its letter No. 323 dated 01.12.2016 submitted that:-

“

1. This is RMU of existing old project, works are to be carried out in the existing premises only. As such no statutory clearance etc. are required.
2. The project is very old (approx. 46 years) and has already completed its operating useful life. The project has depreciated completely. Ninety (90%) accumulated depreciation has already been recovered.
3. The present flow capacity of Power Channel is 7000 cusecs without freeboard and 8000 cusecs with freeboard. The Power Channel was cleaned/repaired from 15.01.2005 to 06.03.2005.
4. The Equity component of RMU of Dhakrani HEP is proposed to be deployed by GoU as budgetary support through annual plan as is being done for other projects of UJVN Ltd. Required equity component shall be requisitioned from GoU.
5. Financial tie up for 70% of the estimated cost for RMU shall be made with the financial institutions/Banks after receipt of formal approval for the RMU works of Dhakrani HEP by Hon'ble UERC.
6. Inspection report of underwater parts after dewatering is enclosed.
7. Daily and month wise data of water released to Dhakrani HEP for last 10 years are enclosed.
8. Machine-wise maintenance cost of last five years calculated from records is as below:-

(All figures in Rs. Crore)

FY	Unit-A	Unit-B	Unit-C	Total
2011-12	1.11	1.22	1.12	3.45
2012-13	2.11	0.48	0.46	3.05
2013-14	1.43	2.88	1.47	5.78
2014-15	1.26	1.28	2.68	5.22
2015-16	2.29	2.12	2.13	6.54
Total	8.20	7.98	7.86	24.04

9. History of unit-wise major repairs/replacement cost of major equipments/parts and their cost are enclosed.
10. As cost of work of Dakpathar Barrage and power Channel under DRIP Scheme is to be distributed on the head of Dhalipur HEP & Dhakrani HEP into ratio of their installed capacity. Therefore, cost component of Dhakrani HEP under DRIP Scheme is added in revised DPR of Dhakrani HEP for economic & financial analysis only.
However the scope of work, cost estimate and Economic & Financial Analysis after excluding works covered under DRIP is enclosed.
11. The proposed time schedule of Dhalipur HEP is as below:

Unit	Shut down period
I	November 2018 to May 19
II	November 2019 to May 20
III	November 2020 to May 21

Tentative schedule for RMU of Dhakrani HEP is as below:

Unit	Shut down period
I	November 2018 to May 19
II	November 2019 to May 20
III	November 2020 to May 21

However, actual Schedule for Dhakrani HEP shall be intimated after receiving Capital Investment approval from Hon'ble Commission.

12. *Machine wise daily generation and corresponding average discharge data from April 2015 to Oct 2016 is enclosed.*
13. *Details of trippings/ (start/stop statement) of last five years of machines of Dhakrani HEP is enclosed.*
14. *Discharge from turbine is not calculated separately. However, discharge through power channel is calculated by staff gauge installed at Dakpathar Barrage. The Chart, showing the level of feet corresponding to discharge in Cusec, is enclosed for ready references.*
15. *Project completion schedule for execution of Dhakrani HEP is enclosed on A3 sheet.*
- B. 1. *Before approval of DRIP, it was planned that RMU of Dakpathar Barrage and Civil work of Power Channel shall be carried out alongwith RMU works of Dhakrani HEP. Therefore, cost component for RMU of Dakpathar Barrage and Civil works of power channel already considered in the revised DPR of Dhalipur HEP has been added to reach total price of these works."*

8. A visit to Dhakrani HEP was conducted by officers of the Commission on 21.02.2017 for discussing various issues in the matter. Based on the observations during the site visit, the Commission vide its letter No. 1790 dated 23.02.2017 directed UJVN Ltd. to furnish following clarifications/additional information latest by 15.03.2017:-

"

1. *Unit-wise scope of work of last renovation/major overhauling activity carried in Dhakrani HEP.*
2. *Detailed description of Unit-wise faults/break-downs related to Generator in last 10 years.*
3. *Unit-wise monthly maximum generation in MW for last 10 years.*
4. *UJVN Ltd. in its Petition at S.No. 15 has mentioned that "...revised DPR for RMU of Dhakrani Power Station has prepared for extensive RMU of units i.e., Full replacement of the generating units with all station auxiliaries to achieve maximum power generation of the plant."*
Whereas, on examination of revised DPR Page No. 5-1 to 5-25 and during discussion it was informed by UJVN Ltd. that the scope of Renovation & Modernization shall be a mix of Option 2 & Option 3.
UJVN Ltd. is required to clarify the same.
5. *UJVN Ltd. is required to submit copy of GoI Policy referred by the Utility in Section 5 (page 67) of revised DPR (September 2015).*
6. *UJVN Ltd. is required to furnish the details of major overhauling, if any, pertaining to GTs alongwith latest test reports.*
7. *UJVN Ltd. is required to furnish metering & protection SLD of Dhakrani HEP in A3 sheet (2 copies)*
8. *It has been observed that UJVN Ltd. has proposed certain works pertaining to protection of 132/33 kV power transformer which belongs to PTCUL. UJVN Ltd. is required to clarify the inclusion of expenditure on power transformer in Renovation & Modernization of Dhakrani HEP."*

9. In compliance to the above, UJVN Ltd. vide its letter no. 19/UJVNL/01/MD/ED(O&M)/ dated 10.03.2017 submitted its reply as follows:-

“

1. *The unit-wise scope of work of last major maintenance carried out in Dhakrani HEP is enclosed Annexure-I.*
2. *Details of unit wise faults/break-downs related to Generators in last 10 years along with generation loss are enclosed at Annexure-II.*
3. *Unit-wise Maximum generation in MW for last 10 years as per available records is enclosed Annexure-III.*
4. *In option 2 some of the parts are to be replaced whereas others are to be refurbished, in option 3 maximum replacement is involved, however in view of cost the project and technical requirements, all the works envisaged in option 2 are to be carried out along with replacement of some additional part given in option 3.*
5. *Copy of relevant extract of Hydro Policy of GoI referred by the Utility in section 5 of revised DPR is enclosed at Annexure- IV.*
6. *Details of major overhauling pertaining to Generator Transformers and Latest test report, as available, are enclosed Annexure-V.*
7. *Desirable Single Line Diagram of metering and protection of Dhakrani HEP is enclosed at Annexure-VI.*
8. *The Operation & Maintenance of 132 kV and 33 kV switchyards at Dhakrani HEP is done by UJVN Ltd. Therefore, UJVN Ltd. has proposed expenditure of certain works pertaining to protection of 132/33 kV Power Transformers in the proposal of R&M of Dhakrani HEP.”*

10. Further, during a visit to Dhakrani HEP, it has also been observed that:

- (1) The Governors are obsolete, there are no operating manuals and spares are not readily available.
- (2) Dewatering system is in dilapidated condition.
- (3) More quantity of water is required for generating the rated capacity of each unit.
- (4) Transformers are of 12.5 MVA capacity which is just equal to serve the MCR rating of the generator.
- (5) In the Control Room, many switches and instruments were found to be non-functional/removed.
- (6) There is no system of measurement of flow in the Power Channel and through the turbines. Quantity of discharge through the turbines is recorded by reverse calculations. Gauge marked in the Power Channel to quantify the flow and free board levels were not clearly distinguished.
- (7) On perusal of the inspection reports of underwater parts of Dhakrani HEP, it has been observed that the major works carried by the Petitioner from time

to time through external agencies are as follows:-

- (a) Repair of Shaft Journal of all the 3 Units as they were eroded.
- (b) Repair of Runner blades of all the 3 Units as they were eroded and were having cavities.
- (c) Chamber Plate of Runner Chamber of Unit A was broken and was repaired.
- (d) A noticeable gap between the Guide vanes of all the 3 Units were repaired.

Commission's observations, views and decision

11. On examination/scrutiny of the Petition and subsequent submissions made by UJVN Ltd. from time to time and observations made during site visit, the Commission has observed that:

- (1) Comprehensive studies for E&M, Hydro Mechanical Systems and Civil Works were carried out by M/s Lahmeyer International (LMI). Thereafter, the Petitioner prepared a revised DPR wherein the extensive RMU of Dhakrani HEP was proposed i.e. full replacement of the generating Units with all station auxiliaries to achieve maximum power generation of the Plant as per Options 2 & 3 given in the revised DPR of September, 2015. However, in the proposal of the Petitioner, it was not clear whether the Petitioner is proposing the Option 2 or Option 3 exclusively or combination of both.

On a clarification sought by the Commission, UJVN Ltd. vide its submission dated 10.03.2017 clarified that in view of cost of the project & technical requirements, all the works envisaged in Option 2 are proposed to be carried out alongwith replacement of some additional parts given in Option 3. The Commission observed that in absence of clarity with regard to the exact scope of works, the process of scrutiny got delayed thus the delaying disposal of the Petition.

- (2) The estimated cost proposed for RMU was Rs. 112.89 Crore without IDC and Rs. 137.31 Crore including IDC. However, the Commission observed that works amounting to Rs. 16.88 Crore were included on account of works

related to Dam Rehabilitation and Improvement Program (DRIP). In response to a query of the Commission, UJVN Ltd. clarified that the said cost has been taken for economic & financial analysis only. Thus, the final proposal w.r.t. the estimated cost of UJVN Ltd. against the Renovation & Modernization works of Dhakrani HEP [excluding the works covered under DRIP Scheme] comes out to be:-

S. No.	Item	Estimated Cost (Rs. in Lakh)
A	Works	
1	Preliminary	35.90
2	Civil & Hydro Mechanical Works	707.78
3	Maintenance @ 1% of Civil Works & Hydro Mechanical Works	7.08
4	Power Plant & Accessories (E&M)	8221.24
	Total A- Works	8971.99
B	Establishment @ 4 % of Civil Works & E&M (being an RMU Project)	357.16
C	Ordinary T&P @ 1% of A-Works	89.72
D	Losses on stocks @ 0.25% of Civil Works & Hydro Mechanical Works	1.77
E	Receipt & Recoveries	-30.00
	Total Direct Charges	9390.64
F	Indirect Charges (Audit & Account @1% of A-Works)	89.72
	Grand Total	9480.36
5	IDC	2146.97
	Total Cost Including IDC	11627.33

- (3) UJVN Ltd. has proposed some of the works pertaining to 132/33 kV Transformer placed in the Switchyard which should ideally not be included in the scope of RMU. On enquiring, UJVN Ltd. vide its reply dated 10.03.2017 submitted that operation & maintenance of 132 kV & 33 kV switchyard at Dhakrani HEP is being carried out by UJVN Ltd.

In this regard, the Commission is of the view that 132/33 kV Transformer & its outgoing feeders should be under the purview of PTCUL and not UJVN Ltd. Therefore, the cost of such works should not be included in the proposal.

- (4) The Commission has further observed that the machine-wise maintenance cost has almost doubled in FY 2015-16 in comparison to FY 2011-12 and generation of the Units has reduced in past years due to occurrence of frequent faults/breakdowns.

- (5) For calculation of post RMU generation enhancement, UJVN Ltd., in its Revised DPR of Sept 2015, has considered average generation of FY 2010-11 to FY 2014-15 i.e., 152.94 MUs.

UJVN Ltd. in its revised DPR for post RMU scenario has calculated Design energy as 145.16 MUs (considering generator efficiency- 97%, Turbine efficiency- 93% and design head- 19.8 M) based on the discharge in dependable year 2006, which is not only less than the original design energy but also less than the primary energy considered by the Commission for the First & Second MYT Control period.

While analyzing the same, the Commission took note of the generation achieved by the Plant since its commissioning, which is tabulated below:

Actual Generation since 1965-66 to 2015-16			
Financial Year	Generation (MU)	Financial Year	Generation (MU)
1965-66	24.32	1991-92	164.934
1966-67	114.18	1992-93	162.200
1967-68	157.05	1993-94	167.090
1968-69	139.09	1994-95	148.778
1969-70	139.17	1995-96	153.656
1970-71	153.394	1996-97	145.375
1971-72	152.691	1997-98	163.826
1972-73	180.887	1998-99	159.385
1973-74	186.083	1999-20	107.766
1974-75	158.251	2000-01	143.180
1975-76	199.025	2001-02	115.453
1976-77	167.103	2002-03	173.779
1977-78	150.696	2003-04	160.312
1978-79	190.624	2004-05	125.895
1979-80	158.858	2005-06	164.631
1980-81	153.299	2006-07	147.347
1981-82	177.592	2007-08	148.923
1982-83	187.867	2008-09	146.518
1983-84	173.191	2009-10	105.083
1984-85	154.873	2010-11	143.015
1985-86	168.499	2011-12	152.748
1986-87	172.568	2012-13	148.775
1987-88	150.530	2013-14	170.642
1988-89	181.813	2014-15	149.514
1989-90	181.772	2015-16	137.379
1990-91	203.740	2016-17	120.202

Decade-wise Average/Max. generation

Particulars	Average Generation in MUs	Max. Generation in MUs
FY 1965-66 to FY 1969-70	114.76	157.05

FY 1970-71 to FY 1979-80	169.76	199.03
FY 1980-81 to FY 1989-90	170.20	187.87
FY 1990-91 to FY 1999-2000	157.68	203.74
FY 2000-01 to FY 2009-10	143.11	173.78
FY 2010-11 to 2016-17	146.04	170.64

From the tables above, it is clear that the maximum annual generation in any decade during past five decades is more than 170 MU and decade-wise average generation during these years varied from 143.11 to 170.20 MU.

Further, the average generation of Dhakrani HEP in past 52 years is 153.91 MUs and as per the information available with the Commission the original Design Energy of the Dhakrani HEP is 169 MUs. However, due to non-availability of reliable information on the design water discharges, the Commission in its Tariff Orders has considered the lower of 15 years average annual generation or the plant-wise Design Energy (as mutually agreed between UPJVNL and UPPCL) as the projected primary energy generation for tariff purposes which is 156.88 MUs.

Since, R&M of the Plant is proposed for increasing the efficiency alongwith the life extension. Therefore, the Commission firmly opines that post RMU, Annual average generation from the Plant should certainly be more than the current average, else the whole exercise of carrying out the Renovation & Modernisation would become futile.

Furthermore, with regard to the design energy, the Commission is not deviating from its earlier approach stated in its Tariff Orders issued for UJVNL Ltd. and in-line with the same, the Commission shall take a fresh view on the design energy of Dhakrani HEP as and when the RMU of the Plant gets completed. However, till such time the design energy for Dhakrani HEP shall remain as 156.88 MUs.

12. The proposal has further been analysed vis-à-vis guidelines issued by CEA with regard to the 'Best practices and Benchmarking' of RMU of HEPs. The relevant portion of the guidelines is being reproduced below:-

"7.2 NEED FOR RENOVATION, MODERNISATION & UPRATING OF HYDRO POWER PLANTS

-The normative operative life of hydro electric power plant is 30 to 35 years after

which it normally requires Life extension through renovation.

-By undertaking activities involving replacement of worn out or damaged components the availability of the generating unit and to some extent its life would be increased but no improvement in output or efficiency can be expected.

-The output and efficiency of generating units can be increased by replacing old or damaged components by redesigned components using State of the art materials. Especially in old equipment a significant increase in output and/or efficiency can be achieved by the use of new materials and advanced engineering methods. In addition, the overall life expectancy of the equipment will also be increased.

-By undertaking uprating programmes it is possible to uprate the generating capacity of existing units by 10 to 30% based on the water availability, operating margin and technological upgradation. This programme may be involving rewinding of stator from Class B to Class F, restoring stator core, improving air gap, replacing turbine runner with advanced blade profile and material while carrying out uprating of the plant, modernization by replacing conventional excitation system with static excitation system, replacing conventional governing system with micro processor based electro hydraulic governing system, retrofitting existing control and protection system to modern state of the art system etc. may also be undertaken for improvement of reliability in operation of the plant. However, uprating of generating capacity may be taken up after detailed investigations and studies.

7.3 APPROACH FOR SELECTING R&M ACTIVITIES

The performance of the generating units should be the guiding factor in selection of R&M activities rather than the period of their operation. The following aspects/requirements to be kept in view while selecting R&M activities:-

-Activities covering main equipment i.e. turbine, generator and C&I equipment and other plant equipment essential for efficient and sustained performance of the units as well as station be identified.

-Activities which have direct impact on improvement of generation, efficiency, machine availability etc. be assigned higher priority.

-Activities which yield uprating benefits because of rewinding with Class F insulation, runner with improved profile be given priority.

-For silt prone hydro power stations, R&D activities on advanced techniques like plasma coating on under water parts of turbine, and development of new materials may be given priority. Adoption of closed circuit cooling system, Cu-Ni tubes for coolers etc. may also be considered.

-Activities which include state of the art equipment such as electronic governors, static excitation system, micro processor based controlled high speed static relays, on line monitoring devices and silt content in water.

-Activities like augmentation of water conductor system which may increase the discharge/head & hence the peaking capacity & additional generation of the generation station."

13. Based on the above guidelines with respect to the need and selection of activities to be included in RMU for the life extension and restoration of capacity of

Dhakrani HEP, the Commission has considered UJVN Ltd.'s proposal which covers works under Option 2 alongwith some additional works given in Option 3. Further, in accordance with the CEA guidelines in the matter, RMU works should yield considerable additional generation at minimum cost. Hence, selection of the activities to be covered under RMU by a generation utility should be based on least cost principle without compromising on the quality and guaranteed desired performance post RMU. RMU of old Plants is considered to be the cost effective option due to its short gestation period besides resulting in augmentation of generation and life extension at minimum cost. Thus, replacement of existing equipment should only be proposed for those vital equipments which have direct bearing on the generation loss or where the repair and maintenance cost works out to be extraordinarily high.

14. As per revised DPR, the Petitioner has planned to complete Renovation & Modernisation works in 52 months in a phased manner which is excessively high. To this the Commission is of the view that UJVN Ltd. should make its all efforts to optimize the project schedule for least generation loss during the project execution.
15. Further, the Commission has observed that:-
 - (1) Besides wear and tear of the underwater parts, the main reason for loss of generation is due to frequent breakdown/slow response of old control systems and non-availability of spares.
 - (2) The prime objective of the Petitioner for carrying out RMU of Dhakrani HEP is not only to restore the generation from de-rated capacity i.e. 33 MW to the rated capacity level of 33.75 MW but also to make its machines capable of operating at 10% overload capacity so that full utilisation of available water potential can be done alongwith life extension of the Plant further up to next 35 years. For achieving the said objective and maximise the benefits of RMU, the generators, generator transformers alongwith other components should be capable of operating at least 10 % overload capacity as and when required.

- (3) From the various submission of the Petitioner, the Commission took note of the following post-RMU benefits expected to be achieved:
- (a) The Power Station will regain its original capacity of 3X11.25 MW (33.75 MW) which has been de-rated to 33 MW since last more than 5 years alongwith extended life of approximately 35 years.
 - (b) The reliability of the Plant will increase due to replacement of worn out components and installation of new state of the art technologically advanced equipments.
 - (c) Down time will be reduced due to (i) replacement of vital equipment and refurbishment of other equipment/components and (ii) availability of spare parts of newly installed equipments, which in turn will increase the generation.

16. Notwithstanding the above observations, the Commission also analysed the proposed RMU activities namely replacement/refurbishment of Turbine, Generator, Generating Transformers, underwater parts, station auxiliaries with respect to performance of these equipments over its past period of operations. In this regard, the Commission is of the view that since the Plant is in operation for more than 47 years and in addition to fall in power output and efficiency of turbines, number of other problems namely un-reliable/non-functioning of instruments including control & protection equipment, unreliable functioning of Hydro-mechanical (HM) equipment, non-availability of spares of outdated systems and obsolete equipment are being encountered while operating the Plant.

With regard to the repeated in-situ/general repairing of runners and other underwater parts, the Commission is of the view that it would not serve the purpose as over a period of time with such repairing, runner profile changes cannot be brought to the original profile.

Therefore, with a view to regain the original rated capacity and maximum generation from the available water discharge and also to enable life extension of the Plant, the Commission finds the proposal for RMU of Dhakrani HEP (3x11.25 MW) to be a fit case for carrying out Renovation & Modernization.

17. Considering the age of the Plant, condition of the machines/equipments, reduction in generation, increasing maintenance cost and reasonable benefit to cost ratio of the proposed investment, the Commission is of the view that Renovation & Modernisation of Dhakrani HEP is justified.
18. Based on the submission made in the Petition, subsequent clarifications/submissions, the Commission grants in-principle approval for RMU of Dhakrani HEP excluding the works covered under DRIP Scheme and works pertaining to the 132/33 kV transformers and its outgoing feeders as per the above observations/views and subject to the following conditions:-
 - (1) Sequence of taking up the RMU of different Units should be decided on the basis of lean discharge periods, condition and availability of each machine and other field parameters.
 - (2) The Petitioner is directed to obtain the prices through competitive bidding for the works allowed by the Commission under the prevailing Rules & Regulations. Prudence of the prices will be scrutinized by the Commission at the time of fixation of tariff after completion of the RMU works.
 - (3) All the loan conditions as may be laid down by the funding agency in their detailed sanction letter are strictly complied with. However, the Petitioner is directed to explore the possibility of swapping the loan with cheaper debt option available in the market.
 - (4) The Petitioner shall, within one month of the Order, submit letter from the State Government or any such documentary evidence in support of its claim for equity funding agreed by the State Government or any other source in respect of the proposed RMU works.
 - (5) The Petitioner shall plan the RMU activities to be carried out for different Units of Dhakrani HEP in such a manner that the outage schedule for RMU of other Plants viz. Chilla, Dhalipur & MB-I should not create power shortage condition in the State. Further, the Petitioner is directed to optimize the time period scheduled for execution of RMU.
 - (6) The Petitioner shall inform the outage schedule for execution of RMU activities to the beneficiaries at least 3 months prior to the date of start of the

works.

- (7) After completion of the aforesaid RMU works, the Petitioner shall submit the completed cost and financing of the project.
- (8) The Petitioner shall approach the Commission for approval of the Revised Design Energy as and when the RMU works of Dhakrani HEP are completed.
- (9) The cost of servicing the project cost shall be allowed in the Annual Revenue Requirement of the Petitioner after the assets are capitalized and subject to prudence check of cost incurred.

Ordered accordingly.

(Subhash Kumar)
Chairman