**Before**

# UTTARAKHAND ELECTRICITY REGULATORY COMMISSION

**In the matter of:**

Petition for prior approval of "Capital Investment for Renovation & Modernization" of Kulhal (3x10 MW) HEP of UJVN Ltd.

## And

**In the matter of:**

UJVN Ltd., Dehradun ....Petitioner

## Coram

**Shri Subhash Kumar** **Chairman**
**Shri C.S. Sharma** **Member**
**Shri K.P. Singh** **Member**

## Date of Order: March 13, 2015

## ORDER

This Order relates to the Petition filed by UJVN Ltd. (hereinafter referred to as "UJVN Ltd." or "the Petitioner") under Regulation 25 of UERC (Terms and Conditions for Determination of Tariff) Regulation, 2011 for seeking approval regarding Capital Investment for Renovation & Modernization of 3 x 10 MW Kulhal HEP.

2. UJVN Ltd. vide letter No. 160/D(P)/UJVNL/U-6 dated 22.03.2014 had filed an Application under Regulation 25 of UERC (Terms and Conditions for Determination of Tariff) Regulation, 2011 for seeking prior approval in the matter of Capital Investment for Renovation & Modernization of 3 x 10 MW Kulhal HEP.

3. On examination of the Application, preliminary deficiencies were sent to UJVN Ltd., for submitting the desired information/justification vide letter No. 590 dated 24.06.2014. In response, UJVN Ltd. submitted its reply vide letter No. 6086 dated 26.06.2014. The reply of UJVN Ltd. was examined. The Commission took cognizance

of the submission of the Petitioner and decided to hear the matter for admissibility on 01.07.2014. After hearing the Petitioner in the matter on the scheduled date, the Commission issued an Order dated 01.07.2014 directing the Petitioner that:

*"1. The Petitioner is directed to justify need for the proposed RMU of Kulhal HEP.*

*2. Hold consultation with the beneficiaries namely UPCL and HPSEB and submit the minutes of these consultations to the Commission by 15.07.2014.*

*3. A copy of this order be also served on UPCL & HPSEB."*

4. Copy of the said Order was forwarded to the Petitioner and the beneficiaries namely UPCL & HPSEB Ltd. vide letters dated 02.07.2014 for compliance. Meanwhile, in addition to its earlier reply dated 26.06.2014, UJVN Ltd. submitted a letter No. 6148 dated 01.07.2014 justifying the necessity of R&M in Kulhal HEP.

5. Further, incompliance to the direction issued in the aforesaid Order dated 01.07.2014, UJVN Ltd. vide its letter No. 6305 dated 07.07.2014, had submitted that:

*"Kulhal HEP has out-lived its normative operating life of 35 years & various components have deteriorated due to ageing.*

*The efficiency of existing units at the time of commissioning in 1975 was given as 91% and 96.8% for turbine and generator respectively. These efficiencies have deteriorated since then as it has been observed that guide vane opening for getting the designed output at the design head has increased. The turbine and generator of efficiencies 92.5 % and 97% are being proposed to be installed during RMU.*

*That plant availability of last 6 years ranges from 85 to 90 per cent. After RMU, the availability of plant shall be of the order of 90-95%*

*Extensive abrasion has been observed on runner blades and guide vanes due to silt. Weld mass is applied on the worn-out and damaged parts followed by grinding during the annual maintenance. In this way it is difficult to achieve original profile of these parts. Improved profile of runner blades and guide vanes is proposed during RMU."*

5.1. Besides above, UJVN Ltd., submitted that the poor condition of various parts/components of the plant require immediate replacement due to ageing or continuous operation of the plant for last more than 35 years, viz.:

*"*

- *The spiral casing and draft tube are in poor condition and may lead to flooding.*

- *The gaps between throat ring and runner have increased from 2mm to 15 mm due to silt erosion.*
- *The internal surfaces of top cover show various degree of corrosion and erosion. The external surfaces show signs of corrosion as well. In RMU the healthiness of top cover shall be ensured for further ensuring safety of machines.*
- *The high pressure air system is in poor condition. The governor air system shall be replaced by installing new compressor and suitably interconnected appurtenances.*
- *The governor system is electro mechanical type and not integrated into an automatic start/stop sequence. The electrical governor heads shall be replaced by new digital governor controllers. The governor shall be automatic start/stop sequences which shall be useful for grid stability.*
- *Generator shall be upgraded from class B to class F insulation ensuring safety Generator.*
- *Installation of static excitation system in place of conventional rotary excitation system which will increase reliability of the system*
- *The steel structural parts of the intake emergency gate are in poor condition. The sliding blocks, seal clamping bars, springs, nuts and bolts are heavily corroded. The seals are deteriorated.*
- *The cooling water system is in poor condition. Strainer cleaning operations regularly flood the penstock gallery. Silt deposit is taken away by manual action. The cooling water system shall be redesigned and upgraded for automatic operation with pressure regulating valves, self-cleaning strainers, realignment of piping etc.*
- *The drainage and dewatering system (DDS) are in poor condition. All level switches are out of order. The DDS shall be completely redesigned to meet modern practice, which includes automatic operation of the system. The service hours of each pump shall be indicated on the control boards of the system, the safety of plant shall be ensured."*

5.2. UJVN Ltd. also submitted that the electro mechanical type protection devices are obsolete and the spare parts of the same are not available and after carrying out all the proposed works and replacements, the life of the plant shall be extended by 30-35 years after RMU.

5.3. In addition, to the above submissions, UJVN Ltd., also referred the Tariff Order

dated 21.10.2009 issued by the Commission to UJVN Ltd. for FY 2009-10 and quoted that:

*"A lot of concern has been expressed by the Stakeholders on need for improvement in performance of these nine plants of the Petitioner which are more than 25 years old. As brought out in earlier portion of this Order, there is scope of improvement in generation from these plants by raising their existing capacities, which have been stated to have reduced due to wear and tear during past many years, to at least their original design values.*

*Accordingly, the Commission is of the view that these plants urgently need Renovation, Modernization and Up-gradation (RMU) for both improvement in generation capacity and life extension. This is widely accepted option of maintaining generating capacity rather than going in for installation of a new plant, which is both very costly and requires long gestation of a new plant, which is both very costly and requires long gestation periods.*

*The Commission, therefore, directs the Petitioner to make comprehensive RMU schemes for efficiency improvement and life extension of these plants and submit the DPRs for the same to the Commission within a period of six months giving roadmap for implementation of these schemes."*

5.4. Further, in support of justifying the need of RMU for the said plant, UJVN Ltd. referred a document of CEA which specifies the best practices and benchmarking for renovation and modernization of hydro projects. In chapter 7 of the above referred document, following has been specified with regard to RMU:

***"7.1** -Renovation & Modernisation (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 recognized to yield considerable additional 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.*

### *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 whole 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."*

5.5. In the mean time, the Commission also received the minutes/documents from both the beneficiaries namely UPCL and HPSEB Ltd. in which they had agreed to buy the power after R&M on the approved rates of the Commission. Thereafter, the Commission decided to admit the Petition on 24.09.2014.

## Commission's view

6. On examination of the proposal and subsequent submissions of UJVN Ltd., the Commission is of the view that before submitting a proposal for Renovation & Modernisation (R&M), UJVN Ltd. should have checked the need of R&M and should have analysed various data/documents pertaining to the Kulhal HEP.

6.1. Based on the analysis of the submissions made by the Petitioner, it is noted that the generation data of the Plant for last 08 years (Table-1), depicts that the performance of Plant is consistent as far as generation is concerned except FY 2009-10, which was the drought year. When compared to the original design energy of 164 MU and design energy approved by the Commission of 153.91 MU. The generation data of the preceding three Financial Years shows that actual generation of the Plant exceeded the design energy approved by the Commission in each year and was also close to the original design energy. Moreover, the

generation from the Plant since FY 2005-06 has been consistently close to the design energy approved by the Commission.

**Table-1**

**Generation of Kulhal HEP**

| FY | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 |
|---|---|---|---|---|---|---|---|---|---|
| Generation in MU | 160.94 | 148.68 | 149.76 | 143.68 | 112.62 | 142.62 | 157.83 | 158.15 | 178.52 |

6.2. It is also noted that there has not been any substantial increase in repair & maintenance expenses during the last 5 years and the amount incurred towards the same has been in the range of 2 to 3 Crores per annum (Table-2). Further, the amount incurred towards additional capitalization in the Plant during the last 5 years has been negligible (Table-3) and the maximum amount incurred was Rs. 0.57 Crore in FY 2010-11. Thus, co-relating the amount incurred towards repair & maintenance and additional capitalization in the last 5 years, it is evident that the output of Plant was quite close to the design energy approved by the Commission and infact in the three preceding Financial Years the generation exceeded the design energy. Thus, despite nominal expenses incurred in the Plant, the Plant was able to generate the energy close to the design energy approved by the Commission. Both consistent generation output and lack of marked increase in maintenance cost do not support the need of R&M of the Plant.

**Table-2**

**Repair & Maintenance**

| R&M Expenses | FY 2008-09 | FY 2009-10 | FY 2010-11 | FY 2011-12 | FY 2012-13 | FY 2013-14 |
|---|---|---|---|---|---|---|
| Kulhal | 1.05 | 2.00 | 2.18 | 2.99 | 2.58 | 2.74 |

**Table-3**

**Additional Capitalization**

| Components | FY 2008-09 | FY 2009-10 | FY 2010-11 | FY 2011-12 | FY 2012-13 | FY 2013-14 |
|---|---|---|---|---|---|---|
| Additional Capitalization | 0.19 | 0.09 | 0.57 | 0.02 | 0.10 | 0.03 |

6.3. With regard to the submission of UJVN Ltd. that Kulhal HEP has outlived its normative operating life of 35 years and various components have deteriorated due to ageing and RMU is required for life extension of the Plant, the Commission observed that since all the Units of the Plant are being operated at rated capacity with reasonable annual repair and maintenance expenses and the power station has been giving sustained generation subject to availability of water without any loss of generation due to frequent breakdowns, the requirement of R&M of the Plant as proposed by UJVN Ltd. is not justifiable.

6.4. The Commission in this connection also looks in to the guidelines of CEA wherein, interalia, para 7.2 of the guidelines prescribes that for indentifying any Station for Renovation and Modernization activities, the performance of the generating units needs to be a guiding factor and Age of the Stations alone can not a basis for conducting R&M. Further, on examining these guidelines vis-a-vis Kulhal HEP, it is seen that the need and/or necessity of R&M work in terms of prerequisite conditions namely (1) Generating station not able to achieve maximum capacity rating (MCR) (2) Station not able to achieve annual energy generation equivalent to annual design energy due to frequent outages on account of equipment ageing worn out etc. (3) Requirement of up-rating, do not seem to be applicable in Kulhal HEP as the Plant has been consistently generating energy more than approved annual design energy of 153.91 MU for the past 3 years.

6.5. The Commission has also observed that the gross primary energy projected by UJVN Ltd. for the Plant after Renovation & Modernization has not been shown to increase substantially, the projected generation for the Plant at 152.87 MU is actually lesser than the design energy approved by the Commission at 153.91 MU. Further, the Plant availability prior to and after R&M activity has not been shown to increase significantly, the availability has been submitted to increase from 85-90% to 90-95% after carrying out R&M activity of the Plant.

6.6. Based on the above, the Commission is of the view that since the Plant is capable of operating at rated capacity and has been generating up to the approved design energy for past 3 years, shows that the Plant does not encounter frequent breakdowns and with reasonable repair and maintenance expenditures on the

Plant, UJVN Ltd. has been successful in extracting desired output from the Plant. Therefore, the Commission feels that as of now the proposed Renovation & Modernization works are not economically prudent, which would rather put unwarranted brakes on the continuing operations of the Plant generating normally. In the absence of any generation loss with respect to design energy or the Plant requiring any abnormally high repair and maintenance expenditure for its optimal operation such RMU activity is not justified as of now and operation of this Plant can be continued with repair and maintenance as and when required.

As regards obsolescence of protection equipment suitable proposal be mooted for their replacement and those would be considered by the Commission.

The Petition is hereby disposed of, accordingly.

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| **(K.P. Singh)** | **(C.S. Sharma)** | **(Subhash Kumar)** |
| **Member** | **Member** | **Chairman** |