### Before

### UTTARAKHAND ELECTRICITY REGULATORY COMMISSION

#### Petition No. 06 of 2023

In the Matter of:

### <u>Petition seeking approval of capital investment for procurement of one</u> number 132/11 kV 20 MVA Generator Transformer for Dhalipur Powerhouse.

#### And

<u>In the Matter of:</u> Managing Director, UJVN Limited, "UJJWAL", Maharani Bagh, GMS Road, Dehradun.

...Petitioner

#### <u>Coram</u>

Shri D.P. GairolaMember (Law) /Chairman (I/c)Shri M.K. JainMember (Technical)

### Date of Order: April 12, 2023

#### <u>ORDER</u>

This Order relates to the Petition filed by Uttarakhand Jal Vidyut Nigam Limited (UJVN Ltd.) (hereinafter referred to as "UJVN Ltd." or "the Petitioner" or "the licensee") seeking prior approval of the Commission for 'Capital investment for procurement of one number 132/11 kV 20 MVA Generator Transformer for Dhalipur Powerhouse under Regulation 22 of Uttarakhand Electricity Regulatory Commission (Terms and Conditions for Determination of Multi Year Tariff) Regulations, 2021'.

#### Background

- The Petitioner vide its letter No. M-1283/UJVNL/02/D(O)/B-8 dated 30.12.2022 submitted a Petition for 'Capital investment for procurement of one number 132/11 kV 20 MVA Generator Transformer for Dhalipur Powerhouse'.
- 3. The Petitioner under the facts of the case has submitted that :
  - "…
  - 3.4 That Dhalipur power Station, constructed under Hydel Yamuna Stage-I, is situated at the border of Uttarakhand near to HP about 6 Kms downstream of Dhakrani Powerhouse and is about 40 Kms from Dehradun. Power Station has

three units of 17 MW capacity each and thus the total capacity of the power station is 51 MW. Here, three nos. Generator Transformer of 20 MVA are utilized for stepping up generated voltage at 11 KV to 132 KV for synchronization with the grid.

- 3.5 Generator Transformers (GT) were installed during commissioning (1965) of the Dhalipur Power Station for the purpose of power evacuation by stepping up the generated voltage at 11kV to 132kV.
- 3.6 All GTs are HEL Bhopal make. These transformers have already completed more than 50 years in continuous service. As per the CERC norms expected life of transformers are 40 years only.
- 3.7 CPRI had conducted various tests on GTs and submitted the report in Jan-2016. As per their report, some values are critical. The PI values are less than normally permissible limits and Tan- Delta values are also poor. The relevant portion of the report is provided in the DPR enclosed at Appendix-1.
- 3.8 The refurbishment/ replacement of Generator Transformers is not included in ongoing work of RMU of Dhalipur Power Station. The replacement of Generator Transformers is overdue as per the test results and very long length of service. In case of major breakdown in any of the Generator Transformers, it may result in huge financial loss in recovery of energy charges and capacity charges due to loss in generation and non-availability of machine, respectively.
- 3.9 In view of above at least one number transformer is required to be procured as spare in order to avoid huge Generation Loss at Dhalipur Power Station. So that major refurbishment of the generator transformer may be carried out in a phased manner.
- 3.10 As per Regulation 22 (4) of UERC Tariff Regulations, 2021, a generating company is required to get prior approval for the additional capitalization works exceeding ₹ 5 Crore. The Regulation 22 (4) of UERC Tariff Regulations, 2021 states that: -

"Any addition/modification to the existing assets exceeding Rs. 2.50 Crore in case of distribution licensees and Rs. 5 Crore in case of generating companies/transmission licensees shall be taken up only after prior approval of the Commission. The investment approval applications covered under this sub-regulation are excluded from the application of proviso to Sub-regulation (2) of

Regulation 10 of UERC (Conduct of Business) Regulations, 2014 in so far as the requirement of submission of documentary evidence with respect to the approval of BoD is concerned."

- 3.11 Therefore, a DPR amounting to ₹ 6.55 Crore including taxes has been prepared in-house and is approved by the Competent Authority for procurement of one number 132/11 kV 20 MVA Generator Transformer for Dhalipur Powerhouse. The works proposed in the DPR will be carried out during the financial year 2023-24 (The copy of the DPR is enclosed at Appendix-1).
- 3.12 The estimated cost for carrying out the capital investment for procurement of one number 132/11 kV 20 MVA Generator Transformer for Dhalipur Powerhouse is summarized as under -

S. No	Description	Rates	Remark
1.	Supply of ABB make, 3-phase, 132/11 kV, 20 MVA Generator Transformer as per the GTP enclosed.	3,10,30,000/-	Excluding F&I
2.	Dismantling of existing transformer and ETC of new transformer with price escalation of 5% annually on Rs 12,95,600/-	15,00,000/-	
3.	<i>Price variation on Rs 3,10,30,000/- (Calculation as per Annexure No-V</i>	1,93,58,543/-	
4.	Total (of serial no 1 and 3)	5,03,88,543/-	
5.	Cost of other items		
	1. Nitrogen Injection Fire Protection System	24,00,000/-	Rates are based on market survey
	2. F&I (At the rate of 2.5%) on serial no 4	12,50,000/-	
6.	Total (of serial no. 2, 4 and 5)	Rs 5,55,38,543/-	
	Say	Rs 5.55 Crore	
7.	Taxes	Rs 0.999 Crore	
	Total With Taxes	Rs 6.55 Crore	

4. On examination of the Petition & DPR certain deficiencies/infirmities were identified and accordingly, the Commission vide its letter No. 1428 dated 17.02.2023 directed the Petitioner to submit/furnish its compliance on the following latest by 24.03.2023:-

...

1. UJVN Ltd. has submitted that the RMU of two units (Unit#A & Unit#B) have been completed and RMU works in Unit#C is under progress wherein with regard to GT the provision of replacement of Heat Exchanger/Coolers and associated valves, pressure gauges, buchloz relay, winding temperature meters etc. are included in RMU except replacement of HV bushing, winding and core. In this regard UJVN Ltd. is required to submit the cost of replacement HV bushing, winding and core in its existing 20 MVA Transformer alongwith its cost benefit analysis with new 20 MVA Transformer. Further, UJVN Ltd. is required to provide the details of work executed in the GTs of Unit#A & Unit#B under the RMU alongwith its cost.

- 2. UJVN Ltd. is required to submit that whether the procured new transformer would be put in spare or would replace the existing transformer. Further, if the new transformer would replace the existing old transformer then UJVN Ltd. is required to submit the Unit of the existing transformer which would be replaced by new transformer along with the justification for choosing the same from other Units duly considering the technical as well as financial aspects.
- 3. UJVN Ltd. vide its letter dated 28.01.2023 has requested the Commission for early approval of the aforesaid petition as it has planned to execute the work in next 3-4 months. Further, UJVN Ltd. in the proposed schedule of works has submitted that the manufacturer will take 8 months to supply the transformer and another 2 months are required for erection, testing & commissioning work. In this regard, UJVN Ltd. is required to provide the rationale that how the work proposed in the aforesaid Petition will be executed in 3-4 months as submitted in its aforesaid letter dated 28.01.2023.
- 4. UJVN Ltd. is required to submit unit-wise transformer failure duration records for last 5 years alongwith the details of faults recorded (protection, core, insulation, breaker etc) and corresponding generation losses in MUs.
- 5. UJVN Ltd. has proposed the installation of Nitrogen Injection Fire Protection System. In this regard, UJVN Ltd. is required to furnish the details of existing fire protection system & its current working status and its comparison with the proposed system.
- 6. It appears that the proposed GT is not designed to leverage the 10% overload capacity of the Generator of 17 MW. UJVN Ltd. is required to clarify in this regard. Further, UJVN Ltd. is required to confirm that 20 MVA capacity of GT is corresponding to ONAN/ONAF etc.

- 7. UJVN Ltd. is required to confirm that all the requirement for parallel operation of the old GTs with proposed GT have been duly considered."
- 5. In compliance to the deficiencies, UJVN Ltd. vide its letter dated 18.03.2023 submitted its point-wise compliance as mentioned below:-
  - 11
  - 1.

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Cost of replacement of HV Bushing, winding and Core will be approximately Rs 3.5 Crores if scrap will be property of Nigam. Basis of rate calculation is budgetary offer given by M/s Shree Abirami Engineering Works (Budgetary offer enclosed) amounting to Rs 2,57,30,000/- (if scrap will be the property of Contactor) without WTI/OTI/MOG/Gasket/sundry items, Aircell, Breather, nut bolts. Adding tentative scrap cost, the Cost of replacement of HV Bushing, winding and Core will be approximately Rs 3.5 Crores.

# Cost Benefit Analysis:

Many benefits shall be achieved from these proposed capital works: -

- 1. The existing old Generator transformers at Dhalipur have already completed more than 57 years in continuous service. As per the CERC norms expected life of transformers are 40 years only. Moreover, reason for procurement of Generator Transformer is to increase life expectancy and reliability of the plant. The overall safety of complete Power house including men and material will be enhanced by procurement of GT.
- 2. Considering ageing factor of Transformer and CPRI Report, Generator Transformers 20 MVA, 11/132KV needs to be replaced so that Generation loss may be avoided for at-least a period of eight to ten months in case of major breakdown/ failure of Generator Transformer.
- 3. The availability and reliability of the plants will substantially increase after replacement of the generator transformers.
- 4. Down time of Unit will be reduced and better efficiency for generation shall be achieved after procurement of generator transformer in case of major breakdown in transformer.
- 5. Chances of unforeseen and very huge generation loss and long shutdown shall be minimized.

6. In case of the failure/ major breakdown of Generator transformer, minimum loss of approx. 50MU will be incurred during monsoon period (considering 123 days of generation loss due to available of sufficient discharge for running a 17 MW unit round the clock from 16th of May to 15th of September i.e., 17 x 24x 123 MWh). Apart from Generation loss (Loss of Energy Charges ), there will also be loss of Capacity Charges.

Month	Actual	Loss of Generation/	Loss of Capacity Charges
	Generation	<b>Energy</b> Charges	
January	15.35	No Generation Loss	No Capacity Loss
February	14.84	No Generation Loss	No Capacity Loss
March	18.90	No Generation Loss	Capacity Loss
April	8.58	No Generation Loss	Capacity Loss
May	17.96	Generation Loss	Capacity Loss
June	26.52	Generation Loss	Capacity Loss
July	24.11	Generation Loss	Capacity Loss
August	31.07	Generation Loss	Capacity Loss
September	31.70	Generation Loss	Capacity Loss
October	19.18	No Generation Loss	Capacity Loss
November	16.31	No Generation Loss	Capacity Loss in half month
December	10.92	No Generation Loss	No Capacity Loss

7. It will incur cost of approximately Rs 9.5 crores as tariff of Dhalipur Power Station is Rs 1.86 per unit.

- 8. Post RMU when tariff will increase due to Capital Cost of RMU work losses in terms of money will be increased substantially.
- 9. Apart from the generation loss of UJVN Ltd, Uttarakhand Power Corporation Limited the sole distribution agency of Uttarakhand state shall also bear an additional expenditure on procurement of electricity from grid on higher tariff of Rs 4.29/ unit (Average power purchase cost of UPCL for 2021-22 (Annexure No-VI) in comparison to the current tariff Rs 1.86/ unit (Pre RMU) of Dhalipur Power Station. A tentative loss of Rs 11.95 Crore extra (corresponding to 50MU approximately generation loss) will be incurred to Uttarakhand state in case of major failure of generator transformer.

Details of Works executed in the GTs of Unit-A & Unit-B under the RMU along-with their cost:

S. No	Name Of Work	Expenditure on Unit # A GT under RMU (Rs)	Expenditure on Unit # B GT under RMU (Rs)	Total (Rs)
1	Replacement of transformer oil	10,00,000	10,00,000	20,00,000.00
	coolers along with all			
	accessories such as motor,			
	cooler control valves, flow			
	relays & pressure gauges etc.			
2	Control cubicles of both	20,00,000	20,00,000	40,00,000.00
	transformers including all the			
	instrument and controls for			
	local and remote operation.			
3	Instruments of winding, all	5,00,000	5,00,000	10,00,000.00
	temperature indicators and			
	Buchholz relays.			
4	Pressure release device with	2,00,000	2,00,000	4,00,000.00
	interface to the ACS.			
5	Breathers including Silica gel.	2,000	2,000	4,000.00
	Total (Rs)	37,02,000	37,02,000	74,04,000.00
	GST 18% (Rs)	6,66,360	6,66,360	13,32,720.00
	G. Total (Rs)	43,68,360	43,68,360	87,36,720.00

2.

It is to kindly submit to the Hon'ble Commission that out of the three number Generator Transformers (GTs) at Dhalipur Power Station, the condition of GT of Unit B is most critical and it has a loud humming sound. Thus, the procured new Transformer will be put in place of Generator Transformer of Unit B. After commissioning of new GT, Refurbishment of the old GT of Unit B will be carried out and the same will be kept as a spare. The spare GT will be back charged by construction of a bay and will function as an alternate and reliable source of Station supply for Dhalipur Power Station. In the eventuality of failure of GT of any of the Unit, the spare GT will be used to replace the same in the minimum possible time, thereby minimising the probable generation loss for atleast eight to ten months. Since the GTs are more than 58 years in service and the test conducted by CPRI also shows that the GTs are not in good condition and in RMU replacement of GTs have not been proposed. Considering the age and condition of GTs, it will be better to replace the existing GTs with new GTs in phased manner. The first unit whose RMU has been completed is Unit B in June, 2021. Thereafter, RMU works of Unit A were completed in October, 2022. Currently, RMU works of Unit C are in progress.

Apart from the above technical reason for replacement of the old GT of Unit B, the reason for replacing old GT of Unit B from financial perspective is that the post RMU tariff of Unit B will be higher than that of the other Units. Thus, in case of failure of GT of Unit B, there will be considerable revenue loss to UJVNL.

3.

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Tender for procurement of new GT was invited in the month July-22 and order for the same was expected to be placed in the month of September-22. But due to higher rate in comparison to the estimate (more than 50%), tender was scrapped by the Central Purchase Committee and fresh tenders was invited in the month of December-22 with estimated value of more than Rs 5.55 Crore. Due to nonparticipation of the bidders, the tender was again scrapped and again fresh tenders were invited. Thus, in letter dated 28.01.2023, it was stated that the tender will be executed in next 3-4 months. Here, the intent was that the tender will be finalized and order will be placed in next 3-4 months.

Manufacturer will take about 8 months for supply of the transformer and approximately 2 months for erection, testing & commissioning work.

4.

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There has been no Unit wise failure of GT in last 5 years at Dhalipur Power Station. However, there has been a failure of GT of Kulhal Power station in the year 2019, wherein the Unit remained under breakdown for a period of around Nine months, causing substantial generation loss.

The case for procurement of new GT for Dhalipur Power Station is being processed in view of the vulnerable situation of the existing GT of Unit B and the fact that all the GTs are very old (approx. 57 years old). Thus, to avoid any generation loss in case of GT failure and to enhance redundancy in the system, the procurement of new GT has been proposed.

5.

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Existing system for protection from fire is Mulsi-fire system which is only used for protection fromfire outside of the transformer. Mulsi-fire system is in working condition. Proposed Nitrogen Injection Fire Protection System will used with existing mulsi-fire protection system. Nitrogen Injection Fire Protection System is used to quench the fire within the tank of the transformer by draining the complete oil and filling the tank with Nitrogen Gas.

6.

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Dhalipur Power House has 3 Units of 17 MW each. Hydro Plants are normally operated at 0.95 to 0.99 laggingpf in normal conditions. If plant operates at 0.95 power factor then Generator Transformer have 11.76% overload capacity. If Power Plant operates at 0.99 power factor then overload capacity of Generator Transformer will be 16.5%. Thus, the proposed new GT of 20 MVA capacity will be sufficient to transform the peak output from the Generator. Due to space constraint at site, previous design of cooling (OFW) has been adopted instead of ONAN/ONAF.

7. ...

Yes, all requirements for interchangeability and parallel operation of old GTs with proposed GT have been fully considered."

## Commission's Observations, Views & Directions:-

- 6. On examination of the Petition and subsequent submissions made by the Petitioner before the Commission, the observation, views and decision of the Commission are mentioned hereunder: -
  - (1)The Petitioner Petition has submitted that the in its refurbishment/replacement of Generator Transformers is not included in ongoing work of RMU of Dhalipur Power Plant. The replacement of Generator Transformers is overdue as per the test results and very long length of service. In case of major breakdown in any one of the Generator Transformers, generation loss for more than 08 months along with loss of NAPAF would occur. Accordingly, the Petitioner has proposed that atleast 01 no. Generator Transformer be procured as spare in order to avoid huge generation loss at Dhalipur Power Plant and so that major refurbishment of the Generator Transformer may be carried out in a phased manner.

Further in response to the Commissions query regarding cost of replacement of HV bushing, winding and core, the Petitioner vide its letter dated 18.03.2023 submitted that the cost of replacement of aforesaid works would be approximately Rs. 3.5 Crores, if scrap cost is property of the Petitioner. Further, the Petitioner submitted that the proposed new Generator Transformer (GT) would replace the old existing GT of Unit#B which is more than 57 years old and is also experiencing loud humming noise.

In this regard, the Commission observed that the Petitioner has planned to replace its existing old GT of Unit#B with new GT alongwith nitrogen injection fire protection system in its instant Petition. The Petitioner is also planning to refurbish existing GT of Unit#B, so that the same can be utilized as spare transformer for meeting the eventuality of any GT failure in future, however, cost of the aforesaid refurbishment etc. has not been brought before the Commission in the instant Petition.

- (2) The Petitioner in its Petition has submitted that it shall arrange the proposed expenditure of Rs. 6.55 Crore from its internal resources and the said expenditure would be incurred in FY 2023-24.
- (3) With regard to the Commission's query to submit the Unit# of existing transformer which would be replaced by new transformer alongwith the justification for choosing the same from the other Units duly considering the technical as well as financial aspects, the Petitioner in its reply dated 18.03.2023 submitted that the new GT would replace the existing GT of Unit#B, which is experiencing loud humming noise and having poor test parameters.
- (4) With regard to post RMU generation of Dhalipur Power Plant, the Unitwise generation of Dhalipur Power Plant would be replenished/restored upto its installed capacity of 17 MW and the Petitioner is proposing to install a Generator Transformer having 20 MVA capacity. In this regard, the Commission is of the view that the GT to be procured must be sufficient to leverage the 10% overload capacity of the generator including the condition of voltage variations.

- (5) With regard to the submission made by the Petitioner in its Petition on general performance/failure rate of GTs, it has been submitted that 24 Nos. transformers failure cases have been reported to CEA during the period of Oct, 2011 to Aug, 2015 by 14 Utilities across the Country, out of which 50% of transformers i.e., 12 Nos. of transformers have failed within 10 years of operation. In this regard, in response to the Commission's specific query pertaining to transformer failure rate in past years, the Petitioner vide its submission dated 18.03.2023 submitted that none of the Unit of Dhalipur Power Plant has been reported failure in last 05 years. The Commission opines that all the technical parameters of the GTs is ensured and any untoward event can be speculated and pre-emptive steps be taken for avoiding any generation loss due to GT failure.
- (6) With regard to the Petitioner's submission pertaining to dilapidated condition of Generator Transformer of Unit#B, the Commission has observed that the existing GT have outlived their lives and is more than 57 years old. It is known fact that the age of an asset does not substantiate its requirement of replacement. Further, in the instant matter, the test parameters of GTs of Unit#B are not within the permissible limits as per test conducted by CPRI and also experiencing loud humming noise. Which indicates that the existing transformer design, assembly and installation needs to be revisited and requires a major overhauling/major maintenance. Considering the above submissions, the proposal of Petitioner seems to be prudent to replace the GT of Unit#B which is in a dilapidated condition and has outlived its life.
- (7) With regard to Petitioner's submission "...After commissioning of new GT, Refurbishment of the old GT of Unit B will be carried out and the same will be kept as a spare. The spare GT will be back charged by construction of a bay and will function as an alternate and reliable source of Station supply for Dhalipur Power Station." the Commission would like to remind the Petitioner about its observations made in its Tariff Order dated 27.02.2019 in the matter of

132/33/11 kV Substation at Dhalipur Power Plant, wherein it had been held that:-

"…

the Petitioner vide its letter dated 18.01.2019 submitted that the necessity for the construction of 132/33/11 kV Sub-station at Dhalipur Power Station arises to fulfil the requirement of auxiliary supply to Dhalipur LHP, to cater the load of Dhalipur colony and to evacuate the solar power generation from 15.5 MW canal bank scheme.

The Commission has observed that the aforesaid Sub-station is being utilized majorly (18.23 MVA out of 25 MVA installed capacity) for evacuation of solar power which is a new vertical of business for UJVN Ltd. Further, it has also been observed that a 5 MVA, 33/11 kV Transformer has also been installed to cater the colony consumption and plant auxiliary consumption of Dhalipur LHP, which is fed from the above 132/33 kV, 25 MVA Transformer."

From the above, it is amply clear that 5 MVA, 33/11 transformers has already been installed for catering the colony consumption and plant auxiliary consumption of Dhalipur Power Plant, which is being fed from the 132/33 kV, 25 MVA transformer. Therefore, already 132/33 kVA transformer exists at Dhalipur Power Plant which further provides power to the 5 MVA 33/11 kV transformer which acts as a station auxiliary transformer. The rational put forward by the Petitioner in its submission for creating a separate bay and placing of the existing Unit#B GT there do not appear to be a prudent step as already the switchyard of Dhalipur Power Plant is grappling with space constraints. In this regard, the Commission is of the view that providing another transformer serving the same purpose of station auxiliary transformer do not appear to be justified.

(8) With regard to the Petitioner's prospective planning of keeping a spare GT for meeting the future eventuality of transformer failure, the Regulation 21(3) d) & Regulation 21 (11) (ii) of UERC (Terms & Conditions for determination of Multi Year Tariff) Regulations, 2021 limits the cost of spares to a certain percent of cost of Plant and Machinery for Hydro Generating Stations. Further, the Commission is of the view that placing a 20 MVA transformer as spare would result in increasing transformation losses/auxiliary consumption in the system. Moreover, installation of such assets would add to various initial as well as recurring associated costs. Therefore, post replacements/refurbishment of all the three Nos. GTs, the Petitioner is advised to re-visit its prospective planning of keeping the GT as spare.

- (9) With regard to the proposed Nitrogen Fire Protection System (NFPS), the Commission is of the view that all the necessary arrangements for creation of transformer oil soak pit be made in the existing setup, if not available.
- (10) The Commission cautions the Petitioner that it should take utmost care while procurement, installation, testing & commissioning of the new GT particularly due examination of the desired Specifications/Guaranteed Technical Parameters (GTP) w.r.t. parallel operation of GTs, load sharing and circulating currents etc.
- 7. Based on the above discussions, the Commission grants in-principle approval for the proposed works. The in-principle approval is being granted subject to the following:
  - (1) The Petitioner should go for the competitive bidding for obtaining the most economical prices from the bidders and should also compare the same with similar procurements done within the organization/other generating companies. Further, the price variation should strictly be computed as per methodology/formula specified by IEEMA.
  - (2) The Commission may verify/check the proposed works to be executed by the Petitioner at any point of time during/post execution of the works from the perspective of Quality, Optimum utilization of resources, Benefits accrued from the proposed investments etc.
  - (3) The Petitioner must submit the detailed sanctioned letter from the Financial Institution, if any, to the Commission as soon as they get approval from the Financial Institution. All the loan conditions as may be laid down by the funding agency, if any, in their detailed sanction letter should be strictly complied. However, the Petitioner is directed to explore

the possibility of swapping the loan with cheaper debt option if any, available in the market etc.

- (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, if any, agreed by the State Government or any other source in respect of the said works.
- (5) On completion of the project, the Petitioner shall submit the completed cost and financing of the project.
- (6) The cost of the project and servicing on the same shall be allowed in the Annual Fixed Cost of the Petitioner after the assets are capitalized and subject to prudence check of the cost incurred.

Ordered accordingly.

(M.K. Jain) Member (Technical) (D.P. Gairola) Member (Law) /Chairman (I/c)