Before

UTTARAKHAND ELECTRICITY REGULATORY COMMISSION Petition No. 18 of 2024

In the Matter of:

Application seeking approval for the investment on the project covering the "Construction of New 33 kV line from 132 kV Chudiyala Substation to 33/11 kV Devbhoomi under EDC, Roorkee."

And

In the Matter of:

Uttarakhand Power Corporation Ltd., Victoria Cross Vijeta Gabar Singh Urja Bhawan, Kanwali Road, Dehradun.

...Petitioner

Coram

Shri M.L. Prasad Member (Technical)/Chairman (I/c)

Date of Order: April 30, 2024

<u>ORDER</u>

This Order relates to the Petition filed by Uttarakhand Power Corporation Limited (UPCL) (hereinafter referred to as "UPCL" or "the Petitioner" or "the licensee") seeking prior approval of the Commission for 'Investment on the project covering the Construction of New 33 kV line from 132 kV Chudiyala Substation to 33/11 kV Devbhoomi under EDC, Roorkee'.

Background

2. The Petitioner vide its letter No. 972/UPCL/D(O)/C-4 dated 02.03.2024 submitted its Petition for investment approval under the provisions of the Clause 11 of Distribution and Retail Supply Licence and Clause 40 of UERC (Conduct of Business) Regulations, 2014 read with relevant provision of the Electricity Act, 2003, and the Rules and Regulations made thereunder.

- 3. The Petitioner under 'Facts of the case' has submitted that:
 - 11
 - (i) With a view to ensure reliable power supply, improved voltage profile and to meet future load growth, the applicant company has proposed the Construction of New 33 kV line from 132 kV Chudiyala Substation to 33/11 kV Devbhoomi in the State of Uttarakhand. The estimated cost of the project is Rs. 995.22 Lakhs., which will be met through loan (70%) from M/s REC/PFC/HUDCO and Equity (30%) from State Government. The project is proposed to be implemented on turnkey basis. The duration of the project is 06 months. The details of substations and lines are as follows:

S. No.	Name of the Project	District	Fund Resources	BoD Approval	Length of 33 kV Line (km.)	Total Cost
1	Construction of New 33 kV line from 132 kV Chudiyala Substation to 33/11 kV Devbhoomi (Roorkee (Rural) Division)	Haridwar	70% Loan from financial institutions & 30% State Govt. Equity	Approved in 116 th BoD	6.901 Km. (Re-conductoring) & 9.41 Km. (New Line) (approx)	995.22 Lakhs

- (ii) The detailed project report showing examination of an economic technical system together with the outline of the work to be undertaken, the salient features and particulars demonstrating the need for investment alongwith relevant cost benefit analysis is enclosed herewith at Annexure-A. The work to be undertaken does not have any adverse environmental effect. The proposed investment will be met through loan (70%) from M/s REC/PFC/HUDCO and Equity (30%) from State Government. Further, a request letter to M/s REC/PFC/HUDCO for sanction of the loan has been sent and is enclosed herewith as Annexure-B. The approval from BoD is enclosed herewith at Annexure-C for your kind perusal."
- 4. The Petitioner under the Scope of Works in its application has proposed for "Construction of new 9.41 Km. 33 kV line for 33/11 kV substation Devbhoomi by tapping 33 kV Bhalswagaj line and reconductoring of 6.901 Km. 33 kV Bhalswagaj line from 132 kV Substation Chudiyala to tapping point."
- 5. The Petitioner in its DPR has mentioned that Devbhoomi Industrial area is one of the oldest and rapid growing industrial areas under the jurisdiction of EDD, Roorkee(Rural). This Industrial area is being fed through 33/11 kV substation Devbhoomi (5+8 MVA). The load (136 Amp.) being catered by 33/11 kV S/s

Devbhoomi is purely industrial load, so it is crucial from revenue point of view. This 33/11 kV substation Devbhoomi is connected through 132 kV S/s Ramnagar whose capacity is fully exhausted and the associated 33 kV line is also very old due to which there are issues of quality and reliable of power supply and availability of load for upcoming industries/load enhancement of existing industries. 33/11 kV S/s Devbhoomi has no other alternate source of supply.

6. Further, the Petitioner has submitted that a new 33 kV line is being proposed by tapping 33 kV Bhalswagaj line of 33/11 kV S/s Bhalswagaj, which is fed from 132 kV S/s Chudiyala. This would provide an alternative source of power supply to 33/11 kV S/s Devbhoomi Substation resulting in enhanced quality and reliability of power supply to Dev Bhoomi Industrial area. To achieve this, it is proposed to carryout re-conductoring (from dog conductor to ACS Al-59 Covered conductor) of 33 kV Bhalswagaj line (Approx 6.901 Km.) from 132 kV S/s Chudiyala to tapping point and construction of 9.41 Km. new 33 kV line on ACS Al-59 Covered conductor from tapping point(at 33 kV Bhalswagaj Line) to 33/11 kV S/s Dev Bhoomi. The same 33 kV line is also proposed to be connected to 33/11 kV S/s Behedki Saidabad(2x5 MVA).

Sl. No.	33 kV Line	Length (km)	Estimated Cost (Rs. in Lakh)
1.	Re-conductoring (from dog conductor to ACS Al-	Approx	
	59 Covered conductor) of 33 kV Bhalswagaj line	6.901 Km.	
	from 132 kV S/s Chudiyala to tapping point		063 07
2.	Construction of new 33 kV line on ACS A1-59		903.97
	Covered conductor from tapping point(at 33 kV	9.41 Km.	
	Bhalswagaj Line) to 33/11 kV S/s Dev Bhoomi.		
	31.25		
	Total Project Cost (incl	luding IDC)	995.22

The Petitioner has submitted that the project is proposed to be funded through a loan from M/s REC/any other financial institution (70%) and equity from GoU (30%).

*	Project Cost	-	963.97 Lakh
*	IDC	-	31.25 Lakh
*	Total Cost of Project(Including IDC)	-	995.22 Lakh

✤ Loan from REC/Any other financial institution (70%)

		-	696.65 Lakh
*	Equity From State (30%)	-	298.57 Lakh

- 8. The Petitioner under Justification in its DPR has mentioned that Devbhoomi Industrial area is a rapidly growing industrial area and therefore is crucial from revenue perspective. This industrial area is being fed through 33/11 kV substation Devbhoomi (5+8 MVA) which is connected through 132 kV S/s Ramnagar whose capacity is fully exhausted and the associated 33 kV line is also very old due to which there are issues of quality and reliability of power supply and availability of load for upcoming industries/load enhancement of existing industries. Also, 33/11 kV S/s Devbhoomi has no other alternate source of supply. Therefore, a new 33 kV line is being proposed by tapping 33 kV Bhalswagaj line of 33/11 kV S/s Bhalswagaj, which is fed from 132 kV S/s Chudiyala. This would provide an alternative source of power supply to 33/11 kV S/s Devbhoomi Substation resulting in enhanced quality and reliability of power supply to Dev Bhoomi Industrial area.
- 9. With regard to the payback calculation the Petitioner has considered 10% load growth while computing the payback period of 10 years & 09 months. The anticipated RoI and IRR for the proposed project are 12.66% and 16.51% respectively.
- 10. The Petitioner in its Petition has enclosed a copy of 116th Board of Directors Meeting held on 15.02.2024 vide which the BoD accorded its approval for construction of new 33 kV line from 132 kV Chudiyala Substation to 33/11 kV Devbhoomi Substation in Roorkee (Rural) under EDC, Roorkee (total approximate 16.5 km) having total projected cost of Rs. 9.95 Crores.
- 11. On examination of the submissions made in the Petition & DPRs certain deficiencies/infirmities were identified and accordingly, the Commission vide its letter No. 1335 dated 15.03.2024 directed the Petitioner to furnish its reply on the following latest by 25.04.2024: -
 - "

<u>'Investment on the project covering the construction of new 33 kV line from 132</u> <u>kV S/s Chudiyala to 33/11 kV Devbhoomi under EDC, Roorkee Feeders".</u>

- 1. UPCL is required to confirm regarding forest clearances/ railway crossing approval requirement, if any, for the proposed 33 kV line from 132 kV S/s Chudiyala to 33/11 kV S/s Devbhoomi.
- 2. UPCL is required to furnish a General Arrangement drawing of proposed 33 kV line depicting pole (height), span, insulators, sag, earthing provisions etc. for the overhead portion. Further, UPCL is required to submit a typical cross section drawing of underground cabling arrangement with details of safety clearances/ Standards which would be adopted at site [within the Sub-station and outside the Sub-station with clearance from municipal/ civic facilities namely telephone, sewer, drainage etc] for safe underground cable laying.
- 3. UPCL is required to furnish schematic drawings for the earthing mechanism for the underground section of 33 kV line.
- 4. UPCL is required to furnish Pole/ Section-wise drawing for:
 - *a.* Proposed 33 kV line from 132 kV S/s Chudiyala to 33/11 kV S/s Devbhoomi.
 - b. Existing 33 kV line emanating from 132 kV S/s Chudiyala to 33/11 kV S/s Bhalswagaaj depicting span length, pole height etc.
 - c. Existing 33 kV line emanating from 132 kV S/s Ramnagar to 33/11 kV S/s Devbhoomi depicting span length, pole height etc.
- 5. On examination of the line chart, following has been observed: -
 - (1) Regulation 3.6 (4) of UERC (Distribution Code) Regulations, 2018 provides that: -

"(4) In every Sub-Station of capacity 10 MVA and above there shall be a provision for obtaining alternate 33 kV supply to the Sub-Station in case of a failure in the incoming supply."

However, from the line chart it appears that (5+8 MVA), 33/ 11 kV S/ s Devbhoomi, 2x5 MVA 33/11 kV S/s Bhalswagaaj, 33/11 kV S/s Lathardeva, 2x5 MVA 33/11 kV S/s Bhedi Saidabad are proposed to be fed through the proposed new 33 kV line from 132 kV S/s Chudiyala to 33/11 kV S/s Devbhoomi.

In this regard, UPCL is required to furnish:-

- a. No. of 33/11 kV Substations amongst the above having 'N-1' line contingency provision.
- b. Furnish pre & post project scenarios for all of the above mentioned Substations along with details of the source 132 kV Substations (Chudiyala S/ s and 132 kV S/s Ramnagar) under pre & post project scenarios.

- (2) From the line chart, it is observed that UPCL is planning to make a tapping point on the existing 33 kV line. In this regard, UPCL is required to :
 - a. Provide a schematic drawing with details of the tapping arrangement including details of metering, breaker & protections.
- (3) From the line chart, it is observed that UPCL is planning to feed multiple 33/11 kV Substations from the proposed 33 kV line emanating from 132 kV S/s Chudiyala. In this regard, UPCL is required to confirm how the proposal would ensure the quality, availability and reliability of power for the consumers connected to it.
- 6. UPCL is required to furnish the details of total number of 33 kV bays in 132 kV Chudiyala S/s and 132 kV S/s Ramnagar providing information regarding the name of 33 kV feeders, Substation/ Industry being fed and status of 33 kV bay whether occupied/spare.
- 7. UPCL is required to furnish single line diagram of 33/11 kV S/s Devbhoomi depicting all the 11 kV outgoing feeders and feeder-wise industries being fed along with contracted load.
- 8. UPCL is required to furnish the rationale for proposing 'ACS AL-59 covered conductor' for the proposed project instead of panther conductor. Further, UPCL is required to furnish the data sheet of proposed 'ACS •AL-59 covered conductor'.
- 9. UPCL is required to furnish the basis of cost estimates of the proposed 33 kV ACS AL59 covered conductor and furnish copy of the supporting document. Further, UPCL is required to furnish the copy of purchase orders depicting the procurement of aforesaid 33 kV ACS AL-59 covered conductor in past 5 years.
- 10. Furthermore, UPCL is required to confirm why the said item is not included in its weighted average rates of stock material and not being procured as Centralized material as 86% of the total supply item for the proposed project is constituted of 33 kV ACS AL59 covered conductor and confirm how quality and reliability of the procured item shall be ensured as per the organizations quality standards.
- 11. UPCL in its submission has mentioned that Devbhoomi Industrial area is one of the oldest and rapid growing industrial areas. In this regard, UPCL is required to substantiate that the said substation is one of the oldest substation.
- 12. UPCL is required to furnish the details of 33/11 kV S/s Devbhoomi as per following format for FY 2021-22, FY 2022-23 & FY 2023-24 (upto February, 2024 (upto February, 2024):-

Sl. No.	Month	Maximum load for the month at 33 kV incomer emanating from 132kV Ramnagar (in Amperes)

13. UPCL is required to furnish the details of existing industries being fed through 33/11 kV S/s Devbhoomi as per the following format for FY 2021-22, FY 2022-23 & FY 202324 (upto February, 2024):-

Sl. No.	Name of Industry	Contracted load in MVA	Peak Demand in MVA	Energy supplied in kWh	Revenue in Rs. Lakh	Avg. Billing Rate

- 14. UPCL has submitted letters of 3 financial institutions requesting for loan for the proposed project namely HUDCO, REC & PFC. UPCL is required to furnish the status of accord received in this regard from the financial institution and confirm the name of financial institution from whom the loan would be taken. Further, UPCL is required to furnish the consent received from the GOU for the equity infusion on the project.
- 15. In Cost Benefit Analysis (CBA) calculation, it is observed that UPCL has not accounted for any AT&C losses while computing the total revenue generated by UPCL. UPCL is required to clarify this regard and revise the CBA calculation sheet.
- 16. UPCL in CBA calculation has considered benefit on account of outages. UPCL is required to furnish 11 kV feeder-wise monthly outages for last 03 years with duration in minutes.
- 17. UPCL is required to furnish details of new HT applications received for releasing new connection from 33/11 kV S/s Devbhoomi for last 12 months including details of contracted load."
- In compliance to the above observations of the Commission, UPCL vide its letter No. 1516/UPCL/D(O)/C-4 dated 05.04.2024 submitted its reply as mentioned below:-

"

1. ...

The proposed route of 33 kV line is passing through mostly agricultural and residential areas along the road. There are mainly Poplar and Eucalyptus trees along the route of proposed line. Being agricultural area forest clearance for cutting of some trees if required will be obtained very easily from Forest Department.

There are two locations where clearances from Railway department are required which will be sought from respective department after grant of investment approval from Hon'ble Commission.

2.

. . .

Since we have taken 33 kV ACS AL-59, 232.5 sq mm Covered conductor for the construction of line so we have taken ample quantity of 11 mtr. long STP410 SP-55

and more than 45 nos. 13 mtr long STP 410 SP-72 poles for meeting out the norms as per the safety regulation.

General arrangement drawing of proposed 33 kV line is being annexed as Annexure-"A(1)".

Since undergrounding work will be carried out mainly at railway crossings so there will be not much interruption with municipal/civil facilities, however the appropriate safety clearance will be adopted as per site conditions during laying.

Typical cross-section drawing of trench is being annexed as Annexure-"A(2)"

3. ...

The schematic drawing of the earthing mechanism for the underground section of 33 kV line is being annexed as Annexure-"B"

- 4. ...
 - a. ...

Drawing for proposed 33 kV line from 132 kV S/s Chudiyla to 33/11 kV S/s Devbhoomi is being annexed as Annexure-"C"

- *b.* ...
- с.

Drawing for existing 33 kV line from 132 kV Ramnagar to 33/11 kV Devbhoomi and 33 kV line from 132 kV S/s Chudiyla to 33/11 kV S/s Bhalswagaaj is being annexed as Annexure-"D"

- 5. ...
 - (1) ...
 - a.) Apart from this proposal we are presently constructing new 33 kV covered conductor line from 33/11 kV S/s Jhabreda to 33/11 kV S/s Behdki Saidabad and after the execution/completion of the current proposal (i.e. 33 kV Chudiyala-Devbhoomi line), we will be able to interconnect 33/11 kV S/s Bhalswagaj, 33/11 kV S/s Behdki Saidabad, 33/11 kV S/s Devbhoomi, 33/11 kV S/s Latherdeva and 33/11 kV S/s Jhabreda as well. By doing so we may flow power from 132/33 kV S/s Chudiyala, 220/33 kV S/s Ramnagar and 132/33 kV S/s Ramnagar to the mentioned 33/11 kV substations as per the requirement. By executing the proposal, we will fulfill 'N-1' line contingency provision for each and every substation as mentioned above.

b.) <u>Pre-project scenarios: -</u>

At present our 33/11 kV S/s Devbhoomi, 33/11 kV S/s Behdki Saidabad, 33/11 kV S/s Latherdeva, 33/11 kV S/s Jhabreda are connected with primary source from Ramnagar Roorkee. 33/11 kV S/s Bhalswagaj is connected with the primary source from Chudiyala. At present all the mentioned substations have single source and whenever there is breakdown, we have to rectify the fault and after the rectification of fault only we would be able to restore the supply. Since the primary source 132 kV S/s Ramnagar is overloaded and due to that we usually faced under voltage condition in peak of winter and summer seasons and except for 33/11 kV S/s Bhalswagaaj. On the other hand the primary source of Chudiyala is under-loaded due to these extremities the voltage drops and technical loss is also of paramount quantum.

Post-project scenarios: -

After the execution of the proposed line i.e. from 132/33 kV S/s Chudiyala to 33/11 kV S/s devbhoomi we will be able to draw power from the 132 kV S/s Chudiyala (Underloaded) for 33/11 kV S/s Devbhoomi and 33/11 kV S/s Behdki Saidabad in normal conditions. For emergency situations we may also be able to charge other substations i.e. Jhabreda and Latherdeva for partial load. These arrangements will fulfill 'N-1' line contingency in real sense. By doing so we will also be able to provide good quality of power as per the norms of voltage regulation and power reliability as well.

(2) ...

Schematic drawing with detail of tapping arrangement is being annexed as Annexure"E"

(3) ...

In normal conditions we are planning to run 33/11 kV S/s Bhalswagaaj and behdki Saidabad in totality and 8 MVA load of 33/11 kV S/s Devbhoomi (and fully also if required). 33/11 kV S/s Latherdeva, Jhabreda and 5 MVA of Devbhoomi S/s will remains over existing lines. By doing so we will manage voltage regulation as per norms. But in breakdowns of any of the lines we may switchover to other 33 kV line immediately as per the requirement as mentioned above. Since our proposed line is covered conductor so chances of breakdown will be least over there also. By doing so we will ensure quality and reliability of power supply as well.

6.

Detail of 33 kV bays in 132 kV S/s Chudiyala:-

Total no. of 33 kV bays:	8 No.
Name of 33 kV feeders:	Sakumbari, Chudiyala, Bhalaswagaaj,
	Uttaranchal, Cosmos, Haridwar, Sikandarpur.
Name of Substations:	Chudiyala, Bhalaswagaaj, Sikandarpur.
Name of Industries:	Sakumbari(Solar), Uttaranchal(Industrial feeder
	feeding M/s Vimlesh Coil & M/s Tehri), M/s
	Cosmos, Haridwar(Solar)
Spare 33 kV Bay:	1 No.

, e			
Detail of 33 kV bays in 132 kV S/s	Ramnagar:-		
Total no. of 33 kV bays:	10 No.		
Name of 33 kV feeders:	Behedeki, MES,	Feeder for	Transformer-1
	Ramnagar(Rke),	Feeder for	Transformer-2
	Ramnagar(Rke),	Roorkee(Tou	vn), Landhora,
	Himalyan, Paniya	la, IIT(New),	Dhanori.
Name of Substations:	Behedeki, MES,	Feeder for	Transformer-1
	Ramnagar(Rke),	Feeder for	Transformer-2
	Ramnagar(Rke),	Roorkee(Tou	vn), Landhora,
	Himalyan, Paniya	la, IIT(New),	Dhanori.
Name of Industries:	NIL		
Spare 33 kV Bay:	NIL		
Occupied 33 kV Bay:	10 No.		

7 No.

7.

. . .

. . .

Occupied 33 kV Bay:

The required single line diagram of 33/11 kV S/s Devbhoomi depicting all the 11kV outgoing feeders and feeder wise industries being fed along with the contracted load is hereby annexed as Annexure-"F".

8.

Since we are well aware of that most of the existing line passes through agricultural area and along the road networks. Usually, people grow plants like poplar and eucalyptus along with the road and somewhere inside their land also. Due to that we usually face trippings over our 33kV lines and that reduces our reliability parameter (MAIFI and SAIFI, SAIDI also) and voltage fluctuation also. By constructing line with ACS AL-59 covered conductor surely, we will be able to filter out these unwanted trippings and breakdown ie reliability and voltage fluctuation related issues directly and thus we may provide good quality power to our esteemed Industrial and domestic consumers also.

ACS AL59 is homogenous alloy conductor of Aluminium + Magnesium + Silica alloy type. These conductors have a conductivity of 59% and hence lesser DC resistance. It is capable of 26%-31% more current carrying capacity than ACSR of same size, while maximum sag remains the same and working tension is lesser than that of ACSR. Since the resistivity is substantially lesser than that of ACSR/AAAC conductors, resulting in lower I²R losses and faster ROI. Apart from these ACS AL59 has higher corrosion resistance than 6201 alloy series (AAAC). Continuous current carrying capacity in air at 35 deg Celsius ambient temperature with continuous operating temperature at 90deg Celsius is 625 amp which is significantly more than the ACSR Panther conductor.

The data sheet is also being annexed as Annexure-"G".

9. ...

The basis of cost estimates of the proposed 33kV ACS AL59 covered conductor is the open market rates and few previous estimates. The copy of the supporting estimate of the work agreement carried out in Roorkee Circle is being annexed as Annexure-"H".

Adoption of ACS AL59 is new in UPCL and we are getting very good response in terms of power quality where these are being used by the field units. If we will get continuously good response then UPCL may also consider it to purchase as Centralized Stock Material.

10. ...

Devbhoomi Industrial area was established in 2005 in the line with Industrial Policy 2004. The then Chief Minister of Uttarakhand inaugurated it in the year 2006. The 33 kV Line which is emanating from primary source Ramnagar presently used for supplying the power to 33/11 kV S/s devbhoomi was constructed even before the formation of the state. So, it is clear that the said 33 kV line and Substation is also very old.

11.

The required details as per the format for FY 2021-22, FY 2022-23 and FY 2023-24 (up to Feb 2024) is hereby annexed as Annexure-"I"

12. ...

The details of existing industries being fed through 33/11 kV S/s Devbhoomi as per the format for FY 2021-22, FY 2022-23 and FY 2023-24 (up to Feb 2024) is hereby annexed as Annexure-"J"

13. ...

In this connection it is to inform that M/s HUDCO has given UPCL in-principle approval for the loan. To get remaining 30% amount as Share Capital under State Plan from GoU UPCL will take appropriate action in the FY 2024-25 (Letter No. 300 dated 05-04-2024 has been annexed as Annexure-"K").

14. ...

CBA calculation sheet has been revised considering distribution loss (Commercial losses has been considered as negligible being it as a industrial area). Also, Actual average Outage of three years at 11 kV level has been taken. The revised CBA calculation sheet is being annexed as Annexure "L".

15. ...

The feeder-wise monthly outages is being annexed as Annexure"M".

16. ...

The detail of application received for NSC/Load enhancement since 2021 is being annexed as Annexure "N". It is very much important to mention here that in the State's Global Investor Submit, 2023(December, 2023) many industrialists/firms have shown their willingness to establish industries/setups in our State and have also signed MOU with the government So, UPCL is expecting bulk of new connections throughout the state and this industrial area also."

13. On examination of UPCL's reply dated 05.04.2024, the Commission observed certain observations/requirement of additional information in its submission and the Commission vide its E-mail dated **15.04.2024** directed the Petitioner to furnish its compliance on the below mentioned points:-

"Construction of new 33 kV line from 132 kV S/s Chudiyala to 33/11 kV S/s Devbhoomi under EDC, Roorkee'

- 1. UPCL has proposed 3Cx400 sqmm 33 kV underground cable in two sections of 450 m length each at railway crossings. UPCL is required to furnish the current carrying capacity of the aforesaid cables duly considering the various derating factors viz temperature, depth of laying, group laying etcs. for U/G cables. Further, UPCL has to confirm that whether 1 run or 2 run would be used for railway crossing considering 'N-1' line contingency, if 2 run, please confirm whether already considered in estimate or not.
- 2. UPCL in its submission dated 05.04.2024 submitted that the current carrying capacity of ACS AL59 conductor in air at 35 oC ambient temperature with continuous operating temperature at 90 oC is 625 A. UPCL is required to confirm that the proposed 3Cx400 sqmm 33 kV underground cable discussed at point no. 1 above shall not be bottleneck for the proposed evacuation system.
- 3. UPCL is required to confirm whether post execution of the proposed works, the existing 33 kV line from 132/33 kV Chudiyala S/s to 33/11 Bhalswagaj S/s would be in use alongwith the proposed 33 kV ACS AL 59 line or the existing line would be dismantled. Further, UPCL is required to confirm regarding the support structure for the proposed system alongwith diagram for stringing of ACS AL 59 conductor on the said support structure.
- 4. UPCL is required to confirm that the path for the proposed 33 kV line from 132/33 kV Chudiyala S/s to 33/11 kV Devbhoomi S/s is the shortest path.
- 5. UPCL is required to submit the single line diagram w.r.t. solar power plant installed and connected with 132/33 kV S/s Chudiyala, 132/33 kV S/s Ramnagar, 33/11 kV Devbhoomi S/s, 33/11 kV Bhalswagaj S/s alongwith its capacity, evacuation arrangements & conductor length.
- 6. UPCL in its reply at point no. 6 of its submission dated 05/04/2024 has not mentioned the name of 33/11 kV Devbhoomi S/s in the list of substations that are connected to 132/33 kV Ramangar S/s. UPCL is required to check and clarify its submission.

- 7. UPCL is required to confirm whether one end or both end earthing/bonding arrangement has been proposed for the underground cable. Further, UPCL is required to ensure that the proposed earthing/bonding arrangement should suffice the safety as well as the current carrying capacity of the 33 kV cable.
- 8. UPCL is required to furnish GPS co-ordinates for:
 - *i)* 33/11 kV S/s Devbhoomi
 - *ii)* 132/33 kV S/s Ramnagar
 - iii) 33/11 kV S/s Bhalswagaj
 - iv) 33/11 KV S/s Behdki Saidabad
 - v) 132/33 kV S/s Chudiyala
 - vi) 33/11 kV S/s Jhabreda
 - vii) 33/11 kV S/s Latherdeva
 - viii) 220 kV S/s Ramnagar
- 9. UPCL at reply for point no. 5(2) of reply dated 05.04.2024 has furnished details of tapping arrangement, UPCL is required to confirm whether expenditure against the depicted arrangement has been included in its instant Petition, if not, furnish the estimate for the same. Further, UPCL is required to confirm regarding presence of similar arrangement at tapping point at 33/11 kV S/s Behdki Saidabad as depicted at Annexure-A(I) and furnish details of estimates of tapping point, if not included in instant Petition."
- 14. In compliance to the Commission's E-mail dated 15.04.2024, UPCL vide its letter No. 1700 dated 27.04.2024 submitted its reply as mentioned below:-

"

Additional information on Construction of new 33 kV line from 132 kV S/s Chudiyala to 33/11 kV S/s Devbhoomi under EDC, Roorkee'

1.) ...

At both sections of the railway crossings, we have taken underground cables in a double-circuit manner along with one spare circuit. Two circuits will be energized at a time and the third circuit will remain as a spare one. So, the current carrying capacity of the aforesaid cables duly considering the various derating factors viz temperature(K1), depth of laying (K2), group laying along with in between spacing(K3) is D.F.=0.90 [D.F. = 1.0x1.0x0.9 at depth1.05Mtrs, in between distance of cable centers in group laying is 0.6 mtrs, at Av temp of 30degree Celsius]. By applying the derating factor our working cable capacity will be 355.5 amps (395x0.9=355.5). Since at a time, two circuits will be energized as per the requirement and one circuit will remain in spare so considering the 'N-1' line contingency we are using 2+1 run arrangements as we have already taken it in our estimation.

Consideration of derating factors in calculation of current carrying capacity

As per Indian Standard the maximum current carrying capacity of 33 KV HT XLPE Three Core Aluminium conductor cable (3cx400 sa.mm, XLPE) at 30°C

Three Core Mummum conductor cube (Scx400 Sq.mm. ALI L) at 50°C								
Maximum	current	Ground	Air	Duct				
carrying capacity(Amp.))	395	519	361				

Basic assumption for current ratings & rating factors:

- *a)* Basic assumption for current ratings:
 - *i) Maximum permissible temperature* 90°*C for* XLPE *insulation.*
 - *ii) Ground temperature* 300*C*
 - *iii) Ambient temperature 400C*
 - *iv)* Single core cable installed in horizontal formation.
- *b)* Basic assumption for rating factors:
- 1. Rating factors for variation in ground temperature for cables laid direct in the ground:K₁=1)

Ground	15	20	25	30	35	40	45	50
Temperature(⁰ C)								
Rating Factor	1.12	1.08	1.04	1.00	0.96	0.91	0.87	0.82
(Maximum Conductor								
Temperature 90 ^o C)								

2. Rating Factors for depth of Laying for cables laid direct in the ground: (K₂-1.00)

Depth of laying (mm)	3.3,6.6 & 11KV cables	22&33 KV cables
900	1.00	-
1050	0.99	1.00
1200	0.97	0.99
1500	0.95	0.98
1800 and above	0.94	0.96

 $(K_2 = 1.00)$

3. Group Rating Factors for Three 3 core Cables in Horizontal Formation Laid Direct in The Ground: (K₃-0.90)

Number of cables	3 core cable in	3 core cable in horizontal formation						
in group	Touching	S=15 cm	S=30 cm	S=45 cm	S=60 cm			
2	0.80	0.85	0.90	0.92	0.95			
3	0.70	0.78	0.85	0.88	0.90			
4	0.64	0.73	0.81	0.86	0.89			
5	0.59	0.70	0.79	0.84	0.88			
6	0.55	0.67	0.77	0.83	0.87			
7	0.53	0.65	0.76	0.82	0.86			
8	0.51	0.64	0.76	0.82	0.86			
9	0.49	0.63	0.74	0.81	0.85			
10	0.48	0.63	0.74	0.81	0.85			
11	0.47	0.62	0.73	0.80	0.84			

Number of cables	<i>3 core cable in horizontal formation</i>				
in group	Touching	S=15 cm	S=30 cm	S=45 cm	S=60 cm
12	0.46	0.61	0.73	0.80	0.84

Calculation for the current carrying capacity considering derating factors for underground cable:

Current carrying capacity of cable operating at different condition from standard, various factors are multiplied as follows:

1 a = DF x Is (in amperes)

1 a: Current rating at actual operating conditions (amperes)

1s : Current rating at standard operating conditions (amperes)

DF: Rating factor, as applicable.

The actual current carrying capacity of cable in operating condition will be

 $1a = K1 \times K2 \times K3 \times Is$

 $1a = 1 \ x \ 1 \ x \ 0.90 \ x \ 395$

= 355.5 Amp.

Since as per proposal our two underground circuits will be energized at a time at railway crossings and the third circuit will remain as a spare one. Even after by applying the derating factor our working cable capacity will be 355.5 amps for single circuit and as per proposal, we will energize two circuit at a time so considering the 'N-1' line contingency we are using 2+1 run arrangements as we have already taken it in our estimation

Thus, capacity of underground cable section at railway crossings are chosen while balancing the technical requirement and financial viability of the project.

Reference: Havells cables

2.) ...

The current carrying capacity of our proposed 400 sq. mm 33 KV XLPE underground cable is nearly 395 amps in underground conditions at 30 degrees Celsius temperature. Even after considering the derating factor as in point no 1 as per site conditions, the safe limit will be 355 amperes. Since as per proposal our two underground circuits will be energized at a time at railway crossings and the third circuit will remain as a spare one. Even after applying the derating factor our working cable capacity will be 355.5 amps for single circuit and as per proposal, we will energize two circuit at a time so it is confirmed that proposed 3Cx400 sqmm 33 KV underground cable discussed above at point no. 1 shall not be the bottleneck for the proposed evacuation system.

3.) .

As per the proposal, we are going to replace the existing ACSR dog conductor with ACS AL59 covered for the old line from 132/33 KV s/s Chudiyala to 33/11 KV s/s Bhalswagaj. For this work, we have already taken sufficient quantity of support structures of SP-55 and SP-72 STP along with existing structures. New poles will be utilized over the midspan to reduce the span length and also to replace a few old

structures that are not at par with the technical requirements. (drawing annexed as Annexure-"A")

4.) ...

Our path for the proposed 33KV line from 132/33KV s/s Chudiyala to 33/11KV s/s Devbhoomi is in two parts. The first one is the same as the current route of the existing 33KV line from 132/33KV s/s Chudiyala to 33/11KV s/s Bhalswagaj. The path for the second part of the proposed line will be from 33/11KV s/s Bhalswagaj to 33/11KV s/s Devbhoomi, where in, we have proposed to go along with the existing motor road, which is almost one of the shortest workable and maintainable routes to go with. This path is most feasible and also suitable to meet our ROW issues.

5.) ...

Detail is being annexed as Annexure"B"

6.) ...

At present 33/11 KV s/s Devbhoomi is energized through 220/33 KV s/s Ramnagar(Roorkee). After the completion of the proposed line, we will shift 33/11 KV s/s Debhoomi (presently energized from 220 KV s/s Ramnagar) and 33/11 KV s/s Behdki Saidabad (presently energized from 132 KV s/s Ramnagar) to 132/33 KV s/s Chudiyala and that will help out to reduce overloading of existing source. The present loading pattern is being enclosed herewith as **Annexure "C"** for kind reference.

7.) ...

As per the proposal, one-end earthing/bonding arrangements have been proposed to meet our technical requirements for cable safety. This is our common practice in corporations and to date, we have not faced any kind of safety issues due to such practices. For example, the underground work with all required safety measures in Haridwar has been carried out in similar manner where so far system has run smoothly.

8.) ...

Detail is being annexed as Annexure "D".

9.) ...

In proposed evacuation system tapping point arrangement is without metering and protection for 33/11 KV s/s Behdki Saidabad and 33/11 KV s/s Bhalswagaj substations. So, the tapping point arrangement along with metering and protection for 33/11 KV s/s behdki Saidabad and 33/11 KV s/s Bhalswagaj substations will be surely incorporated further in time as a separate work and the same will be ensured prior to the energization of the proposed Line work."

Commission's Observations, Views & Directions:-

- 15. On examination of the Petition and subsequent submissions made by the Petitioner, observations and views of the Commission are as follows:
 - The Petitioner is proposing for construction of the new 33 kV line emanating from 132kV KV S/s Chudiyala to 33/11 kV S/s Devbhoomi under EDC Roorkee with an estimated cost of project as Rs. 9.95 Cr. (including IDC). The proposed 33 kV line is to be constructed in 2 segments by constructing new 9.41 Km. 33 kV line for 33/11 kV S/s Devbhoomi by tapping 33 kV Bhalswagaj line (segment 1) and reconductoring of 6.90 Km. 33 kV Bhalswagaj line from 132 kV S/s Chudiyala to tapping point (segment 2).
 - (2) The Petitioner in its DPR has mentioned that Devbhoomi industrial area is one of the oldest and rapidly growing industrial areas under the jurisdiction of EDD Roorkee (Rural). This industrial area is being fed through 33/11 kV S/s Devbhoomi (5+8 MVA). The load (136 Amp.) catered by 33/11 kV S/s Devbhoomi is purely industrial load, so it is crucial from revenue point of view. This 33/11 kV S/s Devbhoomi is connected through 132 kV S/s Ramnagar whose capacity is fully exhausted and the associated 33 kV line is also very old due to which there are issues of quality & reliability of power supply and availability of load for upcoming industries/load enhancement of existing industries. 33/11 kV S/s Devbhoomi has no other alternate source of supply.
 - (3) With regard to the above submission of the Petitioner regarding the primary source substation for 33/11 kV S/s Devbhoomi, the Petitioner later in its submission submitted that the primary source for the said S/s is 220/33 kV S/s Ramnagar instead of 132/33 kV S/s Ramnagar as stated in its Petition.
 - (4) The proposed investment has been accorded by the 116th BoD on dated 15.02.2024 and the estimated cost of the project is Rs. 9.95 Cr., which shall be met through loan (70%) from HUDCO and remaining 30% amount as Share Capital under State Plan from GoU.
 - (5) With regard to the underground line at 2 nos. railway crossings between the proposed 33 kV line from 132/33 kV S/s Chudiyala to 33/11 kV S/s

Devbhoomi, the Commission is of the view that such underground links may result in weak links in the distribution network of the licensee in case the same are not planned, designed and maintained from long term perspective. Hence, the Petitioner is cautioned to ensure establishment of a robust distribution network.

(6) With regard to the tapping arrangement on the proposed 33 kV line, the Petitioner in its submission dated 27.04.2024 has submitted that:-

"In proposed evacuation system tapping point arrangement is without metering and protection for 33/11 KV s/s Behdki Saidabad and 33/11 KV s/s Bhalswagaj substations. So, the tapping point arrangement along with metering and protection for 33/11 KV s/s behdki Saidabad and 33/11 KV s/s Bhalswagaj substations will be surely incorporated further in time as a separate work and the same will be ensured prior to the energization of the proposed Line work."

In this regard, the Commission is of the view that ensuring proper protection system at T-points along with metering arrangement is crucial from the protection & energy accounting perspective. Therefore, the Petitioner is directed that the said proposed 33 kV line shall be energized only after providing robust protection & metering setup at the T-points on the proposed 33 kV line.

(7) As far as 'N-1' line contingency is concerned, the responsibility of long-term planning of distribution system lies with the distribution licensee and the licensee is required to comply with the Regulation 3.6(4) of UERC (Distribution Code) Regulations, 2018, which stipulates that:

"(4) In every Sub-Station of capacity 10 MVA and above there shall be a provision for obtaining alternate 33 kV supply to the Sub-Station in case of a failure in the incoming supply."

Therefore, in-line with the said provision of the Regulation, although Petitioner has attempted to provide an alternate source of power supply and in its submission dated 05.04.2024 has submitted that:-

"After the execution of the proposed line i.e. from 132/33 kV S/s Chudiyala to 33/11 kV S/s devbhoomi we will be able to draw power from the 132 kV S/s Chudiyala (Underloaded) for 33/11 kV S/s Devbhoomi and 33/11 kV S/s Behdki Saidabad in normal conditions. For emergency situations we may also be able to charge other

substations i.e. Jhabreda and Latherdeva for partial load. These arrangements will fulfill 'N-1' line contingency in real sense. By doing so we will also be able to provide good quality of power as per the norms of voltage regulation and power reliability as well."

However, the Commission has observed that the proposed 33 kV line emanating from 132/33 kV S/s Chudiyala would be connected to 33/11 kV S/s Bhalaswagaj and further 33/11 kV S/s Bhedki Saidabad & 33/11 kV S/s Devbhoomi. Furthermore, the proposed line would also be used to charge other substations namely Jhabreda and Latherdeva for partial load under emergency conditions. Hence, the Commission is of the view that maintaining the proposed line would be crucial from the perspective of ensuring reliable & quality power supply to the consumers connected to the aforesaid sub-stations/region.

Further, the Petitioner in its submission dated 27.04.2024 has submitted :-

"...At both sections of the railway crossings, we have taken underground cables in a double-circuit manner along with one spare circuit. Two circuits will be energized at a time and the third circuit will remain as a spare one. So, the current carrying capacity of the aforesaid cables duly considering the various derating factors viz temperature(K1), depth of laying (K2), group laying along with in between spacing(K3) is D.F.=0.90 [D.F. = 1.0x1.0x0.9 at depth1.05Mtrs, in between distance of cable centers in group laying is 0.6 mtrs, at Av temp of 30degree Celsius]. By applying the derating factor our working cable capacity will be 355.5 amps (395x0.9=355.5). Since at a time, two circuits will be energized as per the requirement and one circuit will remain in spare so considering the 'N-1' line contingency we are using 2+1 run arrangements as we have already taken it in our estimation." [Emphasis Added]

In this regard, the Commission is of the view that at locations where the Petitioner is proposing 2 parallel energized underground circuits, it should take utmost care with respect to the cable jointing arrangement including water ingress protections at such locations.

(8) With regard to the decentralized items as observed at point no. 9 of Commission's letter dated 15.03.2024, the Commission is of the strong

opinion that the Petitioner should give priority to the centralized procurement, this would not only help in achieving the benefits of economies of scale and quality supply of goods but also there would be uniformity of rates in the estimates.

- (9) With regard to the revised calculation of Cost Benefit Analysis (CBA), the Commission is of the view that the Petitioner should avoid portraying an optimistic picture about the proposed investment rather the same should be based on the realistic projections and prudent approach duly considering the factors viz. techno-commercial losses, depreciation, interest on loan, O&M on the asset, load growth etc.
- (10) The Commission is of the view that for maintaining quality & reliable power supply for the industrial area at Devbhoomi and future load growth in the area, the 'Construction of new 9.41 Km. 33 kV line for 33/11 kV substation Devbhoomi by tapping 33 kV Bhalswagaj line and reconductoring of 6.901 Km. 33 Bhalswagaaj line from 132/33 kV Substation Chudiyala to tapping point' is of prime importance from the perspective of taking a proactive step towards providing a provision for 'N-1' line contingency and towards operational readiness of the distribution licensee for catering to the future load growth demands of the consumers connected to 33/11 KV S/s Devbhoomi, 33/11 kV S/s Bhalaswagaaj & 33/11 kV S/s Bhedki Saidabad.
- (11) Therefore, considering the expected improvement in quality & reliability of power supply to the consumers connected to 33/11 KV S/s Devbhoomi, 33/11 kV S/s Bhalaswagaaj & 33/11 kV S/s Bhedki Saidabad, the Commission hereby grants in-principle approval for the proposed 'Construction of new 9.41 Km. 33 kV line for 33/11 kV substation Devbhoomi by tapping 33 kV Bhalswagaj line and reconductoring of 6.901 Km. 33 Bhalswagaaj line from 132/33 kV Substation Chudiyala to tapping point' subject to the fulfillment of the conditions mentioned below:
 - (a) The Petitioner is directed to obtain the prices through competitive bidding for the works allowed by the Commission under the prevailing Rules & Regulations.

- (b) The Petitioner must submit the detailed sanctioned letter from the Financial Institution, if any, to the Commission as soon as they get approval for the same. All the loan conditions as may be laid down by the funding agency in their detailed sanction letter should be strictly complied with. However, the Petitioner is directed to explore the possibility of swapping the loan with cheaper debt option.
- (c) 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.
- (d) The Petitioner shall ensure to furnish proposed 33 kV line as-built drawings clearly depicting the works executed under the projects. Further, post execution of the proposed works, the Petitioner is directed to furnish the GPS co-ordinates of the 33 kV Poles/underground lines.
- (e) The Petitioner should comply to the following CEA and UERC Regulations and amendments thereof while Construction and Operation & Maintenance of the lines & S/s and should ensure the compliance of relevant standards and the Project should be executed with safety and due diligence so that minimal incidents of break downs/fault occurrences/ hindrances are faced during operation & maintenance and the underground network proposed under the instant Petition:
 - 1. Central Electricity Authority (Safety requirements for construction, operation and maintenance of electrical plants and electric lines) Regulations, 2011.
 - Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2022.
 - 3. Central Electricity Authority (Measures relating to Safety and Electricity Supply) Regulations, 2023.
 - 4. UERC (Distribution Code) Regulations, 2018

- (f) The proposed 33 kV line shall be energized only after providing robust protection & metering setup at the T-points proposed in the Petition.
- (g) 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 proposed schemes.
- (h) After completion of the aforesaid schemes, the Petitioner shall submit the completed cost and financing of the schemes.
- (i) 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.

(M.L. Prasad) Member (Technical)/Chairman (I/c)