

Report of the visit of Shri Virendra Pal, Assistant Director (HPM), CEA on 3rd & 4th March, 2022 to Tapovan Vishnugad (4x130= 520 MW) HE Project being executed by NTPC in Uttarakhand for review of progress of works

1.0 Introduction:

Tapovan Vishnugad H.E. Project (4x130=520 MW) is located in Chamoli District of Uttarakhand State and would utilize the waters of river Dhauliganga, a tributary of Alaknanda for power generation. The project would afford an annual energy generation of 2060 Gwh in a 90% dependable year , harnessing a rated head of 483 m. The project was accorded Techno-Economic Clearance by CEA on 11.8.2004 at an estimated cost of Rs.2346.97 Crores. The latest cost of the project as reported by the project authorities is Rs. 5867.38 Crores.

Project layout is attached as **Annexure-I**.

The project was originally programmed for commissioning during the year 2012-13. However, due to flash floods in August-2012, Uttarakhand disaster in June-2013, massive glacial debris flow in Feb.,2021 and poor geology in HRT etc. project got delayed. The project is now programmed for commissioning during June,2024.

1.1 Salient features of the Project:

- **Barrage:** Crest Level EL 1783 m, 4 nos. of spillways of 14m each with 4 nos. of Radial gates 14x12m each.
- **Desilting Basin:** 140m x 76.5m in size for removal of 0.20 mm particle size.
- **Power Intake:** 4 Nos. of 7x2.5m each. with overall length of 76m
- **Head Race Tunnel (HRT) :** 12088m long, 5.64m Dia., Horse shoe (Non-TBM- 3314m)/Circular (TBM- 8774m) long.
- **Surge tank :** Restricted orifice type, 13.5m dia. , 143.2m high
- **Pressure shaft:** 2 Nos., Dia 3.6m and 580m long each.
- **Penstock :** 4 Nos., 2.6m dia, each, Total length about 160m.
- **Power House:** Underground with 158.5m x 22m x 48.72m size of Machine Hall housing four Pelton turbines driven generating units size 4x130 MW at rated head of 494 m.

- **Tail race Tunnel** : Horse shoe, 7m dia, 439m long

1.2 Award of works:

- **Barrage and Desilting Arrangement:** Works awarded in January 2007 to M/s SSJV Projects Pvt. Ltd and M/s ZVS, Russia. Contract terminated in November, 2010 due to financial crisis faced by M/s SSJV (Satyam Group) and balance works awarded to M/s Rithwik Projects Pvt. Ltd., Hyderabad on 18.07.2012.
- **Head Race Tunnel (HRT):** Works awarded in Nov. 2006 to M/s Larsen & Toubro Ltd. and M/s Alpine Mayreder Bau GmbH. Due to slow progress of works, contract was terminated in Jan-2014. Award of balance works was awarded to M/s HCC on 09-03-2016.
- **Power House & Penstock Package:** Works awarded in May 2007 to M/s Patel Engineering Ltd, Mumbai.
- **Electro-Mechanical package** : Works awarded in January 2008 to M/s BHEL, New Delhi.
- **Hydro-Mechanical package** : Works awarded in October 2007 to M/s Om Metals Infra projects Ltd.

1.3 Financial details of the project:

- Latest approved project cost : Rs.5867.38 crores
- Cumulative expenditure : : Rs.5122.69 crores

2.0. Present Status of works:

Before 06.02.2021:

Barrage (4 bays, 14 m each): As on 06.02.2021, 98 % of concreting work (1.72 lakh cum out of 1.75 lakh cum) was completed in Barrage, Intake and Cellular wall structure.

Silt Flushing Tunnel (Total length- 1455m (including limbs): Excavation of 1392m and lining of 336.3m was completed up to 06.02.2021.

De-silting Basin (140mx76.5m): As on 06.02.2021, excavation was completed & concreting was in progress (57530 cum out of 101509 cum completed).

HRT (5.64 m diameter, 12.08 km long):-HRT by DBM: Excavation of 2.82 km out of 3.81 km and lining of 1.5 Km out of 3.81km completed. HRT by TBM: Excavation and lining of 5.48 Km out of 8.27 Km by TBM are completed.

Surge Shaft (13.5 m diameter, 143 m height): Surge Shaft excavation completed in June'2011 and concrete lining and grouting work completed in Feb'2015

Pressure Shaft (2nos.,3.6m dia.,total length: 1222m) and Penstocks (4 nos., 2.6m dia., total length: 167m): -Pressure Shaft Excavation completed in Apr'15 and steel liner erection completed in Nov'16

Power House (Underground): As on 06.02.2021, 97% of the Power House works was completed.

E&M Works: U#1&2: Boxed up. U#3: Rotor lowering completed and Turbine erection completed. U#4: Turbine erection, Rotor assembly and Stator assembly is to be done. (20% works in Unit#4 are completed).

HM Works: As on 06.02.2021, 2 out of 4 radial gates were erected and erection of 3rd radial gate was in progress. Erection of Surge Shaft gate (2 nos.), TRT Outfall Gate and TRT Isolation was completed.

On the 07.02.2021 morning, there was a massive glacial outburst, avalanching into Rishiganga River. This caused an unprecedented, devastating flash flood in the river consisting of debris, silt, boulders, ice, rock pieces, soil, trees etc. During the flooding, the level of the river at barrage area of TVHEP crossed over the barrage by 5 m (approx.) above Full Reservoir Level (1803.50 mtr). The debris/silt entered and choked the Desilting basin including Intake Adit tunnel, Head Race Tunnel (HRT), Silt Flushing Tunnels and Gate Operation Chamber. As a consequence, all the approach roads/access to the project components located in Barrage, Desilting, Intake area, Chormi Adit for exit of TBM, Tail Race Tunnel (TRT) also got damaged. Due to silt deposition during the flash flood, the river bed level has now risen by approx.11 mtr in the barrage area.

Bridge Deck of Bay 1 & 2 and Breast wall of Bay 3 have been damaged and Radial Gates have been washed away. No other damages have been noticed during the rescue/restoration works performed till date. However, at present, the said rescue/restoration work is under progress and the extent of damage can only be assessed after completion of rescue work and removal of river borne material that has flooded the under construction barrage. Besides above various facilities developed for execution of the work such as crusher plant, batching plant, electrical substations, approach roads, construction equipment etc. have been washed out.

Further on 25th July,2021,a land slide occurred above the TBM Adit Portal which completely blocked the entry of TBM Adit portal. The restoration of TBM portal and its access road is under progress.

The present status of restoration works is as under:

Summary of Restoration works :-

Muck removal from Components	Unit of Measure	Total Quantity	Progress (27.02.22)
SFT Outfall	m	346	346
HRT Intake Adit	m	241	241
SFT Adit	m	99	99
Drainage Gallery (Power House)	m	99.5	99.5
Desilting Chamber	cum	2.5 lakh	2.37 lakh
Barrage	cum	80,000	73,220
Tail Race Tunnel	m	926	782
HRT Force #1 & # 2	m	1989	285.5
SFT Upstream and downstream	m	732	131
Drilling of unexcavated SFT	m	60	60
Structural assessment of Barrage	1 st phase completed in December, 2021, 2 nd phase yet to be completed. It is planned during the month of Mar'2022.		
Repair/Restoration of Support structure of Radial Gates	Damaged structure material testing done. Concrete chipping works in progress.		

Early Warning System:-

The status of early warning system is enclosed as **Annexure-II**.

3.0 Commissioning: Original commissioning schedule was 2012-13. The latest commissioning schedule is June,2024.

4.0 Assessment of works and Commissioning of units:

The completion of restoration works and completion of HRT excavation by TBM is the most critical activity for commissioning of the project as scheduled in June,2024.

HRT Adit near Barrage site and Barrage Bay



Landslide on TBM portal

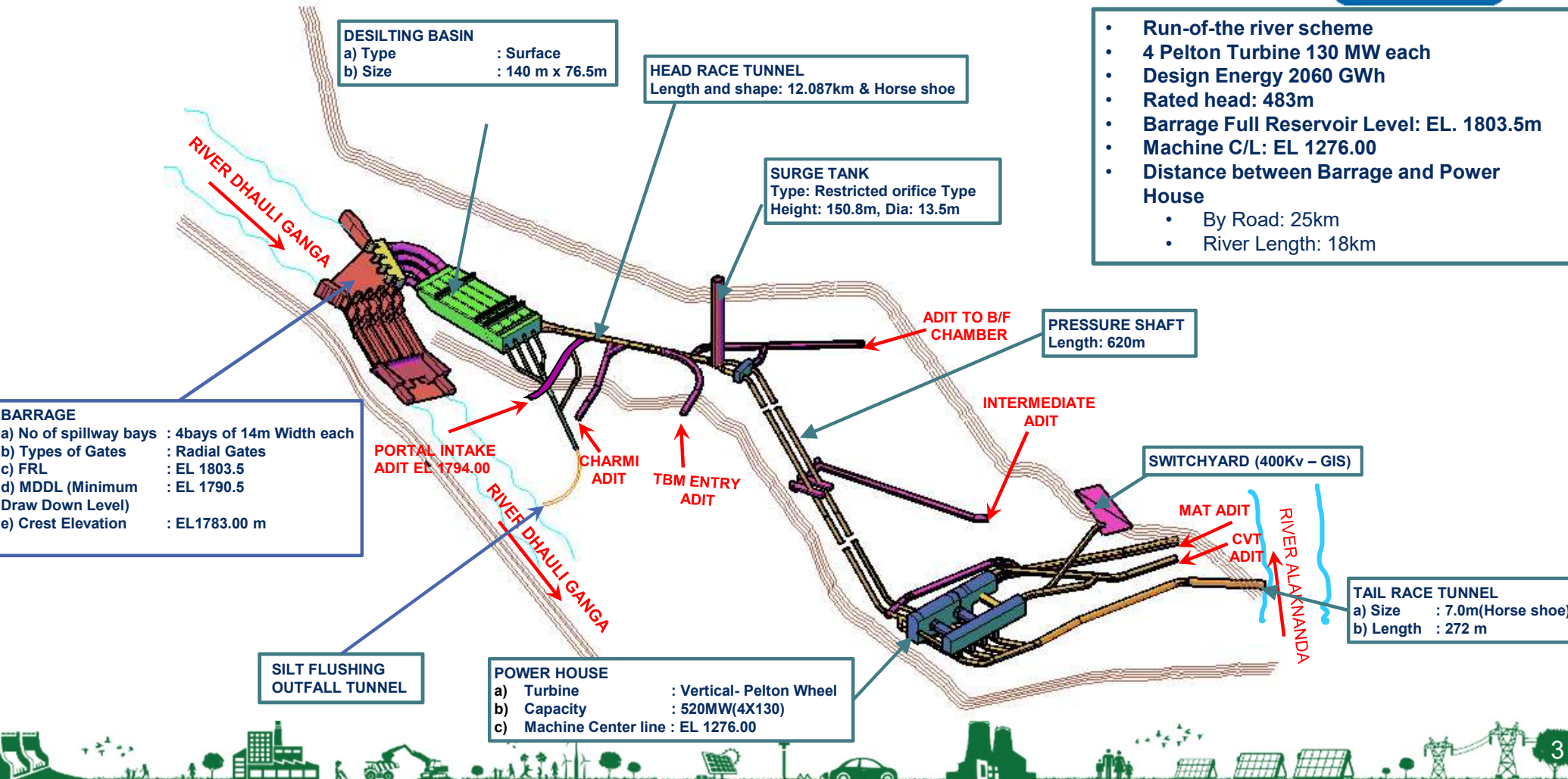


Power House UNIT-1 and Unit-2 Boxed Up





Project Layout of TVHPP (4X130MW)



- Run-of-the river scheme
- 4 Pelton Turbine 130 MW each
- Design Energy 2060 GWh
- Rated head: 483m
- Barrage Full Reservoir Level: EL. 1803.5m
- Machine C/L: EL 1276.00
- Distance between Barrage and Power House
 - By Road: 25km
 - River Length: 18km

Early warning system status of Tapovan Vishnugad HEP

S. N.	Item of Work	Start date of work	Targeted date of Completion	Present Status of work	Remarks
1.	Setting up AWS (Automatic weather station) G&D (Gauge and Discharge) sites/Sensors (flow/level) etc., in the upstream catchment	13 th Dec. 2021	April 2022 (Anticipated)	Flood warning system with flow& level sensors at 6 locations has been awarded. PO placed on 10.12.2021. Engineering is in progress. Ordering of Bought out items is in progress	<ul style="list-style-type: none"> • AWS- Automatic Weather stations are installed at Barrage and Powerhouse Sites. The system logs data on real time basis . • G&D- Guage and discharge – being measured manually in morning and evening at Barrage and are being recorded . • Automatic Flood warning system is under construction and expected by April 2022
2.	Establishing 24X7 real-time all-weather communication system with control room for each Hydro Project	13 th Dec. 2021	April 2022 (Anticipated)	Flood warning system with flow& level sensors at 6 locations and control room has been awarded. PO placed on 10.12.2021. Engineering is in progress. Ordering of Bought out items is in progress	<ul style="list-style-type: none"> • Hourly Observations are being made at Manual Observation Posts at three strategic locations and data recorded at Manual EWS control room located at Barrage Site. • Communications are being made through satellite phones and smart phones to Early Warning Control Room for data logging, raising alarm, and disseminate information. • Dedicated Mobile phones are provided at all locations mentioned above.
3.	Setting up warning system for downstream population/ project& District/State administration	Nov. 2023	June 2024	-	<ul style="list-style-type: none"> • Project is under construction stage. The warning system for downstream shall be established before commissioning of project. • The alerts from flood warning system (under construction) will be shared with district/state administration.
4.	Development of Project Specific SOP for flood forecasting/EWS (Early Warning System) &preparation of EAP (Emergency Action Plan), DMP (Disater Management Plan)& CMP (Crisis Management Plan).	-	-	-	<ul style="list-style-type: none"> • 24X7 manning at Reni village, Sorraithota and GovindGhat to Observe Rishiganga, Dhauliganga and Alaknanda riverlevel, flow, and any physical change of Water colour. • Communication through Satellite phone & Mobile phone have been arranged between Manual Observation Posts and Early Warning Control Room. Hourly data is being recorded • IMD Daily weather report and 7 days forecast for Tapovan are being followed for planning project works. • Project Specific SOP for Manual Early Warning System (ref: TVHPP/P&S/13/20-21) is in place. SOP for automated flood monitoring will be prepared after installation of Automated Flood Warning system which is under tendering stage • DMP for the project as prepared & approved by Project Authority is in place. However, under the Guidance of National Safety Council, Mumbai, DMP is being revised /upgraded.

