

Tour Report of the site visit of Teesta Stage - VI HE Project (500 MW), Sikkim being executed by M/s NHPC Ltd.

As per Teesta Basin Study report, cascade development of six hydro schemes were identified by CWC on Teesta river for power generation in Sikkim. Summary of these hydro schemes are as under:

Sl. No.	Name of the Project	Installed Capacity (MW)	Present Status
1	Teesta Stage-I	320	Not feasible.
2	Teesta Stage-II	480	Not feasible.
3	Teesta Stage-III	1200	In operation
4	Teesta Stage-IV	520	Concurred by CEA and yet to be taken up for construction.
5	Teesta Stage-V	510	In operation
6	Teesta Stage-VI	500	Under Construction

The upstream project is Teesta Stage- V HEP while no project is in downstream of Teesta Stage – VI HEP in Sikkim. The Teesta Stage – VI HEP (500 MW) is presently under construction by NHPC Ltd. and likely/ anticipated commissioning is 2023-24 (Mar' 2024).

1. Introduction

Teesta Stage-VI HE Project is located in South Sikkim District in the State of Sikkim is being executed by NHPC Ltd. The project is designed as a Run-of-River scheme on Teesta River (tributary of Brahmaputra river). The project was allotted by the Govt. of Sikkim to M/s Lanco Energy Pvt. Ltd. (LANCO) for its development on 08.04.2005. An agreement was signed between Power Department Government of Sikkim and M/s Lanco Energy Pvt. Ltd. on 07.12.2005 for implementation/execution of Teesta-VI HEP on build, own, operate and transfer (BOOT) basis with 26 % equity participation by Government of Sikkim. Detailed Project Report of the project was concurred by CEA on 27.12.2006 for execution by M/s Lanco Energy Pvt. Ltd. with completion cost of Rs. 3283.08 Crores including IDC & FC of Rs.415.73 Crores.

The construction works of the project was taken up by M/s Lanco Teesta Hydro Power Pvt. Ltd. (SPV of Lanco group for execution of Teesta-VI HEP) and was stalled since April, 2014 due to financial crunch. Accordingly, the Corporate

Insolvency Resolution Process (CIRP) was initiated vide order dated 16.03.2018 of Hon'ble NCLT, Hyderabad Bench. In the Bidding process, NHPC emerged as successful bidder for acquisition of LTHPL. Subsequently, the investment proposal for an estimated cost of Rs 5748.04 crores (Jul'18 PL), which includes Bid amount of Rs. 907 crores for acquisition of LTHPL; estimated cost of balance work of Rs. 3863.95 crores and IDC & FC of Rs. 977.09 crores with completion period of 60 months was approved by the CCEA on 08.03.2019 for investment, acquisition of M/s LTHPL and execution of balance works of Teesta-VI HE Project by NHPC.

The consideration amount of Rs. 897.50 Crore was released by NHPC on 09.10.2019 and the Company was taken over along with all assets and documents as a 'Going concern' completed w.e.f. 09.10.2019. NHPC informed CEA on 08.01.2020 that acquisition of Lanco Teesta Hydro Power Ltd. (LTHPL) has been completed.

2. Project Components

The major project components of the project are as under:

- **Barrage:** 26.5 m height from River bed, 105 m long, 5 Nos. Radial Gates, site located at Downstream of L.D. Kazi Bridge on Teesta River at Sirwani.
- **Head Race Tunnels:** 2 nos. Modified Horse Shoe-Shape, 13.76 km each (approx.), 9.8 m diameter (finished)
- **Surge Shaft:** 2 nos., Restricted Orifice type, 16 m dia, 89.3 m high
- **Pressure Shaft:** 4 nos., 151 m for 5.4 m dia. & 30.5 m for 4.5 m dia
- **Penstocks:** 4 nos. 4.5 m dia., 30.5 m each, circular shaped
- **Power House:** Underground, 142.75m (L) x 18.5m (W) x 52.44m (H), 4 units of 125 MW each.
- **Tail Race Tunnels:** 4 nos., D-Shaped, 8.5m(W) x 7.5m(H), Average Length 247 m (approx.)

The detailed salient features of the project are enclosed at **Appendix-I**. The project layout plan is enclosed at **Appendix-II**.

3. Brief Details of Contracts

- a) **Civil Works:** The Civil works have been divided into two Lot i.e. Lot-I & Lot-II. Works of Lot-I awarded to M/s Jaiprakash Associates Ltd on 31.03.2020 while works of Lot-II awarded to M/s M/s Patel Engg Ltd. on 22.09.2021.
- b) **Hydro-mechanical Works:** Works awarded to M/s PES Engineers Pvt. Ltd on 27.10.2020.

- c) **Electromechanical Works:** E&M works have been divided into eight packages & awarded to various agencies.
- d) **Other Packages:** Works awarded to M/s Cranex on 16.10.2020.

The details of contract, value of contract, completion period etc. are enclosed at **Appendix-III**.

4. Status of works

❖ Civil Works:

- a) **Barrage:** Excavation 7.61 lac cum (77 %) out of 9.83 lac cum has been completed while concreting 1.25 lac cum (50 %) out of 2.51 lac cum has been completed.
- b) **HRT:** Heading excavation of approx.11.01 km (40%) executed out of total 27.51 km, benching excavation of approx. 3.08 km (11%) and Overt Lining of approx.1.55 km (6%) has been completed.
- c) **Desilting Basin:** Surface Excavation of approx. 2.50 lac cum (73%) executed out of 3.42 lac cum, underground excavation of approx. 1.4 thousand cum (2%) executed out of 6.78 thousand cum, concreting of 0.51 lac cum (20%) executed out of 2.5 lac cum.
- d) **Surge Shaft:** Excavation 67 % & concreting 59% has been completed.
- e) **Pressure Shaft:** Excavation 100 % & Backfill concrete 29% has been completed.
- f) **Power House:** Excavation 100 %, cumulative concrete quantity achieved 42394 cum out of 52289 cum (81%).
- g) **MIV Cavern:** Excavation of MIV cavern is completed.
- h) **Downstream Surge Chamber:** Excavation of Adit has been completed; however concrete lining is still to be taken up.
- i) **Tail Race Tunnel:** Excavation of all four tail race tunnel (TRT-I, TRT-II, TRT-III & TRT-IV) have been completed leaving the required plugs of 20m length at the river end. The concrete lining of all four TRT's are

completed leaving a small patch near the junction as per the excavation plan.

- j) **Slope Stabilization Work, Intake Area:** Rock Support of right side wall by rock bolting is in progress. Drilling & grouting is in progress. 27 holes completed by M/s JAL.

❖ **HM Works:**

1) Barrage Radial Gates:

- Erection of Barrage Radial Gate No. 1 and 2 without flap has been completed and gate is in dogged position without rubber Seals.
- All major component of Radial Gates No. 3 & 4 with flap has been supplied at site.
- Supply of Sill beam of radial gate, upstream stoplog & downstream stoplog of Bay#3 is completed on 07.01.2022.
- Supply of Sill beam of radial gate, upstream stoplog & downstream stoplog of Bay#4 is completed on 11.02.2022.
- Supply of Glacis Steel liner for Bay#3 - to be completed by 31.03.2022.
- Supply of Glacis Steel liner for Bay#4 - to be completed by 31.03.2022.

2) Barrage Stoplogs:

- Upstream stoplogs: 4 sets of upstream stop logs fabricated.
- Downstream Stoplogs: 3 sets of Downstream stoplogs out of 4 found fabricated.

3) Bay#3

- Handing over of 1st stage embedded parts to Civil Contractor.
- Erection of 1st Stage embedment of d/s Stoplog is completed on 18.02.2022.

4) Bay#4

- Handing over of 1st stage embedded parts to Civil Contractor.
- Erection of 1st Stage embedment of d/s Stoplog is completed on 27.01.2022.

5) Other Items

- Supply of material for repair/refurbishment of 100T Gantry crane to be completed by 31.03.2022.
- Supply of 1st stage embedded parts of Head Regulator Stoplog & Trash rack completed on 21.02.2022.
- Installation of ferrules in vertical section of 1 no. Pressure shaft has been completed.
- Supply of four Radial gates and Stop logs (First Stage & Second Stage Embedded Parts, Gate Parts and Hoists) for the Barrage received at Site. Most of the materials for Pressure Shaft Liners received at Site from which fabrication of ferrules have been completed.

❖ E&M Works:

1) **EM-I Package - Design, Manufacturing, Supply, Erection and commissioning Turbine Generator, MIV, cabling etc. (M/s GE Power)**

- Assembly of 04 No. of Stator Frame Segment of Unit#1 has been completed. Welding is under progress.
- Assembly & welding of Lower Pit Liner have been completed and subsequently lowered at U#2 Bay.
- Assembly & welding of Stay ring have been completed and subsequently lowered at U#2 Bay. Levelling & Centering of Stay ring is under progress.
- 02 no. of spiral casing strakes have been shifted to Powerhouse service bay and edge preparation is under progress.

2) **EM-II Package - Bus Duct, GT, GIS, XLPE Cable, Pothead Yard, 220V DC System etc. (M/s BHEL)**

- Laying of Earth Mat in Transformer Cavern is under progress.

3) **EM-III - Fire Fighting System (M/s Technico)**

- Approval of Design and drawings is under process.

4) **EM-IV- DG Set (M/s Jakson Limited)**

- Designing and approval of drawings are under process.

- 5) **EM-V- HVAC System (M/s SHES Air and Automation)**
 - LOA has been placed to M/s SHES Air and Automation on 06.08.2021.
- 6) **EM-VI – Illumination System (M/s Avaid)**
 - Designing and approval of drawings are under process.
- 7) **EM-VII – Construction of Transmission Line (M/s PGCIL on Consultancy basis)**
 - M/s Powergrid has floated the tender for construction of transmission line. The Technical bid has been opened on 30.01.2021 and evaluation is in progress.
- 8) **EM-VIII -Drainage Dewatering (M/s BC Technomation Pvt. Ltd.)**
 - Design & drawing related to Flow Diagram / Diagram of Control Gear for Drainage and Dewatering system has been approved by DEM division.
- 9) **Refurbishment of EOT Cranes (M/s Cranex Ltd.)**
 - EOT Cranes have been taken over after completion of Refurbishment work.
 - Lifting Beam has arrived at site and its commissioning including Tandem Operation is under progress.

Some photographs of Barrage site, HRT, Power House site have been taken during the site visit and are enclosed at **Appendix-IV**.

5. Deviation from TEC conditions

CEA has accorded approval to the Memorandum of Changes (MoC) proposal of Teesta-VI HEP on 05.07.2021.

6. Power Evacuation Arrangement

A dedicated 220kv D/c (Twin Moose conductor) transmission line will be used to evacuate the power generated from the Teesta-VI hydroelectric power project. It will be connected to the Power Grid Corporation of India (PGCIL) Rangpo substation, which is located approximately 15 km away from the project switchyard i.e. Pamphok. M/s Powergrid has floated the tender for construction of transmission line. The total no. of Tower Locations are 53.

The Technical bid has been opened on 30.01.2021 and award of the contract is likely to be in Mar' 2022. The expected Commissioning Schedule of Transmission line is by November, 2023.

7. Early Warning System (EWS)

As discussed with the project authorities, Early Warning mechanism is in place in the Teesta VI HE Project. The River discharge data being collected on real time basis from upstream located Teesta V power station which is presently in operation. The dedicated manpower engaged for recording the data / information/ flow through GSM network.

8. Infrastructure Grant

As discussed with the project authorities, enabling Infrastructure grant is not applicable for Teesta VI HEP.

9. Issues/ constraints

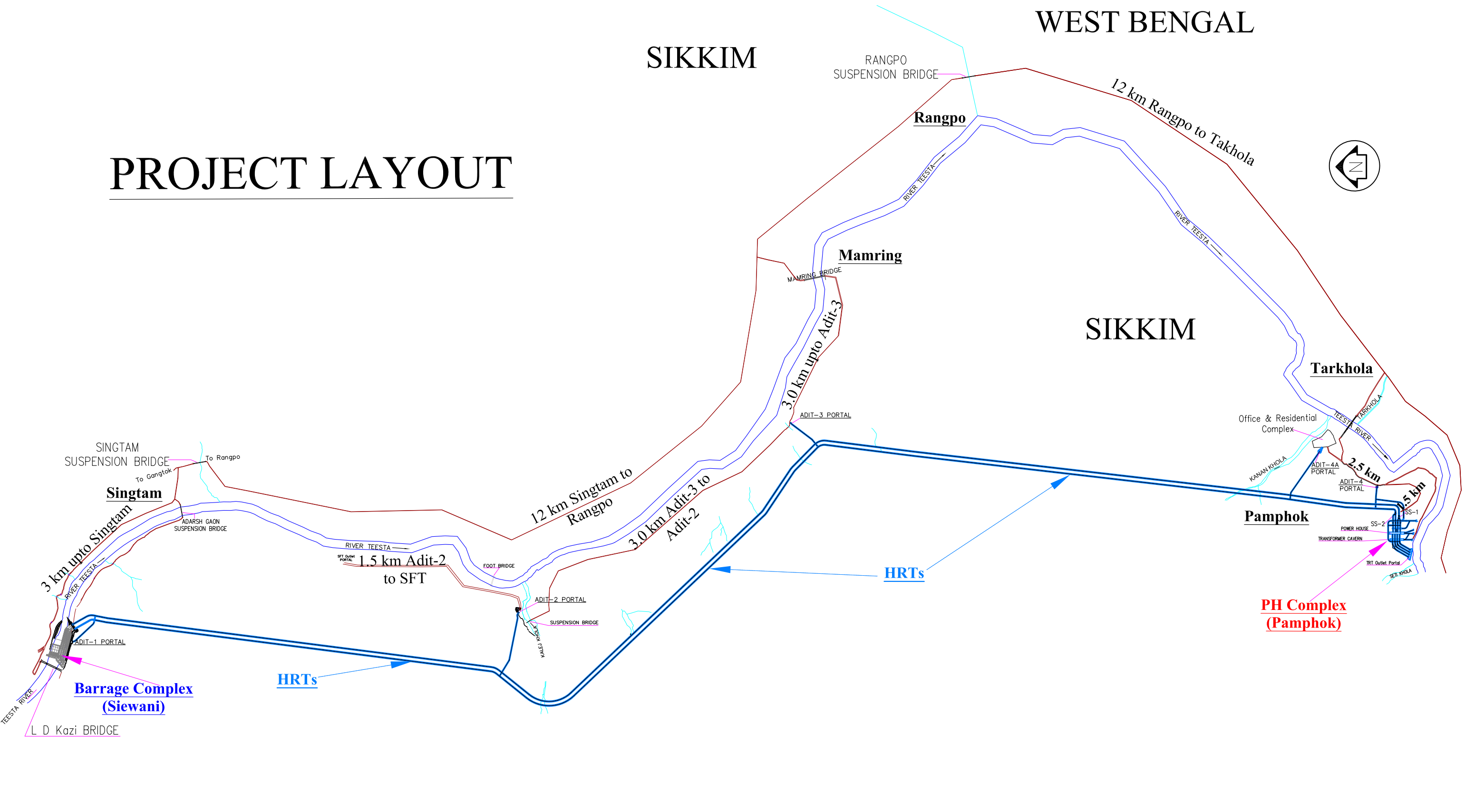
The progresses of works had been hampered on account of 1st & 2nd wave of Covid-19 and have been subjected to series of lockdowns and restrictions imposed by Central/ State Govt. However, LTHPL is making efforts to expedite the balance works to the extent possible. As discussed with the project authorities, adverse geological condition affecting the progress of works of HRT. The presence of pedestal of Electrical tower in Face 4B of Adit III & seepage from Kalez Khola nallah are some hindrances which are delaying the completion of the HRT.

10. Commissioning of the Project

The anticipated commissioning of the project is 2023-24 (Mar' 2024). However, it has been observed that civil works awarded under Lot I & Lot II are scheduled to completed by 2024-25. Therefore, it is felt that in most likely scenario, the project would be commissioned by 2024-25.

SALIENT FEATURES OF TEESTA VI HE PROJECT		
Location		
a)	Site Location	South & East Sikkim
b)	Type of Scheme	Run of the river
c)	Barrage Site	Downstream of L. D. Kazi Bridge
d)	Power House Site	Pamphok (R/B of Teesta)
Hydrology		
a)	Catchment Area	4,558sq km
b)	Standard Project Flood (SPF)	11,600 Cumecs
Reservoir		
a)	Full Reservoir Level (FRL)	El 360 M
b)	Minimum Draw Down Level	El 354 M
c)	Live Storage	1.83 Mcum
Barrage Complex		
a)	Type & Top Elevation	Concrete, El 369 M
b)	Length at Top	105 m
c)	Height from River Bed	26.5 m
d)	No. & Size of Bays	5 Nos., 15 m (W) x 17.5 m (H)
e)	Min. Environmental Flow	8.252 cumecs
De-silting Basins		
a)	Type & No. of Basins	Dufour, 2 Nos.
Head Race Tunnels		
a)	No., Shape & Size	2, Modified Horseshoe, 9.8 m dia
b)	Length	13.76 km each (Approx.)
c)	Design Discharge	531 cumecs (Cumulative)
d)	Adits	Five Nos.
Power House		
a)	Type	Underground
b)	Type of Turbine	Francis (Vertical Axis)
c)	Installed Capacity	500 MW (4 x 125 MW)
d)	Size of PH Cavern	142.75m (L) x 18.5m (W) x 52.44m (H)
e)	Size of Transformer-cum- GIS Cavern	128 m (L) x 14.5 m (W) x 21 m (H)
f)	Rated Head	105.4 m
g)	Type of Switchgear	GIS (Indoor)
h)	Annual Energy Generation	2400 MU
Tail Race Tunnels		
a)	No., Shape & Size	4, D-shaped, 8.5 m (W) x 7.5 m (H)
b)	Average Length	247 m (Approx.)
Financial Aspects		
a)	Project Cost	₹ 5748.04 Crores (At July 2018 PL)
b)	1 st Year Tariff	₹ 4.59 / kwh
c)	Levellised Tariff	₹ 4.07 / kwh
Evacuation System		
a)	Transmission Line	About 12 km from PH to Rangpo Pooling Station

PROJECT LAYOUT



PH Complex (Pamphok)

HRTs

HRTs

Details of award for various packages

SI No.	Particulars	Remarks
1.	Name of Project	TEESTA-VI HE PROJECT
2.	Capacity(Benefits)	500 MW
3.	Executing Agency	M/s Lanco Teesta Hydro Power Ltd(A Wholly Owned Subsidiary of NHPC Ltd)
4.	Date of TEC/Approval	CCEA approval dt 08.03.2019
5.	Status of Placement	

Description of Contract	Brief details of Contract	Name of the agency to whom contract Awarded	Value of Contract (Rs. In Crores)	Date of Contract	Contracted Completion Period
Civil Works					
Lot-I(Civil works)	Construction of Balance Civil Works of Barrage, Desilting Basins, SFT, Intake Structure, Part of HRT-I & HRT-II upto 6100 mtr from Barrage and other associated Structures etc	M/s Jaiprakash Associates Ltd	1710.00	31.03.2020	52 months 8 days
Lot-II	Balance Civil works of part HRT-I & HRT-II beyond 6100 mtr , Surge Shaft, Pressure Shaft, Power House, TRT)	M/s Patel Engg Ltd	1251.00	22.09.2021	42 months
Hydromechanical Works					
H.M Works	Design, Manufacturing, Supply, Erection and commissioning Entire HM works	M/s PES Engineers Pvt Ltd	110.76(INR)+ 1757600.13 EURO	27.10.2020	50 months
Electromechanical Works					
EM-I	Design, Manufacturing, Supply, Erection and commissioning Turbine Generator, MIV, cabling etc.	M/s GE Power	107.49	14.12.2020	42 months
EM-II	Design, Manufacturing, Supply, Erection and commissioning Transformers, GIS, XLPE cables etc.	M/s BHEL	150.10	04.09.2020	47 months

Description of Contract	Brief details of Contract	Name of the agency to whom contract Awarded	Value of Contract (Rs. In Crores)	Date of Contract	Contracted Completion Period
EM-III	Design, Manufacturing, Supply, Erection and commissioning of Fire fighting	M/s Technico India Pvt. Ltd	3.98	22.09.2020	36 months
EM-IV	Design, Manufacturing, Supply, Erection and commissioning DG system	M/s Jakson Ltd, Noida	3.07	01.10.2020	24 months
EM-V	Supply, Erection and commissioning HVAC system	M/s SHES AIR Automation	5.63	06.08.2021	39 months
EM-VI	Design, Manufacturing, Supply, Erection and commissioning Illumination system	M/s Avides Technovators Pvt Ltd	3.80	16.04.2021	39 months
EM-VII	Transmission work	M/s PGCIL	55.57	Deposit work basis signed on 21.12.2020	32 months form the date of signing of Project Specific Agreement
EM-VIII	Design, Manufacturing, Supply, Erection and commissioning Drainage & dewatering & compressed air system	M/s B C Technomation Pvt Ltd	6.23	28.08.2020.	36 months
Other Packages					
	Refurbishment work of 2 Nos. 200/30/10 Ton Electric Overhead Travelling (EOT) Crane of Power House	M/s Cranex	5.78	16.10.2020	10 months

Photos of Site Visit of Teesta VI HEP

POWERHOUSE SITE



Ventilation Tunnel (VT)



Main Access Tunnel (MAT)



Reinforcement works around Stay Ring



EOT Crane



Transformer cavern



Powerhouse Cavern



Surge Shaft



Pressure Shaft

BARRAGE SITE



Bays and Cofferd Dyke



Desilting Basin and Cut-Off Wall

ADITS and HRT

Two HRTs- HRT I (A denotes River side) & HRT II (B denotes Hill Side).

Five Adits – I, II, III, IVA & IV. (Number of Adits depends on the no. of working faces required)



Face 0A



Face 0B



Face 1A



Face 1B



Face 2A



Face 2B



Face 3A



Face 3B



Face 4A



Face 4B
(Pedestal of Electrical Tower)



Face 5A



Face 5B