



Ref: NH/CCW/CC-II/CO-323/PR-11124/47/348

Date: 18-07-2025

M/s Patel Engineering Ltd.

Patel Estate Road, Jogeshwari (W),
 Mumbai - 400102

E-Mail: contract@pateleng.com

Sub: Letter of Acceptance for “Package-6, Modification of Diversion Tunnel into Tunnel Spillway Arrangement - Civil & HM Works (Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement), for Teesta-V Power Station, Sikkim”.

Ref: 1. E-Tender ID: 2024_NHPC_812702_1

2. Tender Reference No. NH/CCW/CC-II/CO-323/PR-11124/47 dated 21-06-2024

Dear Sir,

1.0 This has reference to the following:

- (i) Online Bid invited through CPP Portal vide Notice Inviting e-Tender dated 21.06.2024 with Tender Specification no. NH/CCW/CC-II/CO-323/PR-11124/47 and Tender ID No. 2024_NHPC_812702_1 dated 21.06.2024 comprising the following:

Section I : Notice Inviting E-Tender (NIT),
 Section II : Instructions to Bidders (ITB), Bidding Data and Information for Bidders (IFB),
 Section III : Tender Forms, Form of declaration and Qualification Information,
 Section IV : General Conditions of Contract (GCC) and Schedules,
 Section V : Forms,
 Section VI : Special Conditions of Contract (SCC),
 Section VII : Schedule of Quantities and Prices (Bill of Quantities (BOQ)),
 Section VIII : Technical Specifications (TS), General Technical Specification (GTS) Particular Technical Specification (PTS), Technical Data Sheets (TDS), Mode QAP and Safety Manual,
 Section IX : Drawings.

- (ii) Your Bid (Single Stage, Two Envelope System i.e. Cover-I: Techno-Commercial Bid & Cover-II: Price Bid) for the subject work submitted by you on CPP Portal on/before 29.07.2024 vide your Letter of Tender dated 29.07.2024 and Bid no. 3059001.

- (iii) Corrigendum / Amendments to the Tender Document issued and published by us on the Central Public Procurement Portal (CPPP):

स्वहित एवं राष्ट्रहित में ऊर्जा बचाएं / Save Energy for Benefit of Self and Nation
 विजली से संबंधित शिकायतों के लिए / डायल करें 1912 Dial 1912 for Complaints on Electricity
 CIN: L40101HR1975GOI032564

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- Corrigendum no. 1 dated 03-07-2024: Amendments in PTS and Extension of bid submission & opening dates.
- Corrigendum no. 2 dated 05-07-2024: Inclusion of additional Tender Drawings.
- Corrigendum no. 3 dated 10-07-2024: Amendment in Tender Drawings.
- Corrigendum no. 4 dated 15-07-2024: Extension of bid submission & opening dates

- (iv) Opening of offline bid on 30.07.2024 and online Techno-Commercial Bids through Central Public Procurement (CPP) Portal on 30.07.2024.
- (v) Clarifications on bid document sought vide our letter No. NH/CCW/CC-II/2341 dated 16.08.2024
- (vi) Submissions made by you vide your letter no. 100 / 4092 / 13898 dated 20.08.2024
- (vii) Clarifications letters regarding nomination of sub-contractor for HM Works issued vide no. NH/CCW/CC-II/2304 dated 26.09.2024 & no. NH/CCW/CC-II/2307 dated 27.09.2024.
- (viii) Confirmation of sub-contractor for HM Works by M/s Patel Engineering Ltd. vide letter no. 100/4092/14264 dated 27.09.2024.
- (ix) Clarifications letter regarding corrected BOQ issued vide no. NH/CCW/CC-II/2315 dated 01.10.2024.
- (x) Corrected BOQ submitted by M/s Patel Engineering Ltd. vide letter no. 100/4092/14311 dated 03.10.2024.
- (xi) Request for Bid Validity made vide our letter no. NH/CCW/CC-II/2350 dated 06.11.2024.
- (xii) Bid Validity Extended by M/s Patel Engineering Ltd. vide letter no. 100/4092/14716 dated 11.11.2024.
- (xiii) Request for Bid Validity made vide our letter no. NH/CCW/CC-II/2747 dated 06.02.2025.
- (xiv) Bid Validity Extended by M/s Patel Engineering Ltd. vide letter no. 100/4092/15424 dated 14.02.2025.

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स्वहित एवं राष्ट्रहित में ऊर्जा बचाएं / Save Energy for Benefit of Self and Nation
विजली से संबंधित शिकायतों के लिए / डायल करें 1912 Dial 1912 for Complaints on Electricity
CIN: L40101HR1975GOI032564

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2.0 We confirm having accepted your bid dated 29.07.2024 read in conjunction with all the specifications, terms and conditions of Bidding documents and subsequent letters referred to in Para 1.0 above and award to you the Contract for the work of "**Package-6, Modification of Diversion Tunnel into Tunnel Spillway Arrangement - Civil & HM Works (Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement), for Teesta-V Power Station, Sikkim**", for a Contract price of INR 239,97,64,065/- (INR Two Hundred Thirty Nine Crore Ninety Seven Lac Sixty Four Thousand and Sixty Five Only) including all Taxes and duties. Schedule of Quantities and Prices is attached as **Annexure-I**.

3.0 You have confirmed M/s PES Engineers Private Ltd. as Sub-Contractor for the Hydro Mechanical Works vide letter no. 100/4092/14264 dated 27.09.2024.

4.0 The completion time of Five Hundred Forty Six (546) Days shall be reckoned from the date of issue of this Letter of Acceptance in terms of Sub-Clause 14.1 & 39.1 of General Conditions of Contract.

5.0 You are requested to enter in to a Contract Agreement with the Employer as per Proforma enclosed in the Bidding Document on non-judicial stamp paper of appropriate value within 28 days from the date of issue of this Letter of Acceptance in terms of Sub-Clause 26.2 of Instruction to Bidder (ITB).

6.0 You are requested to submit duly executed Integrity Pact on Non-judicial Stamp Paper of appropriate value prior to signing of Contract Agreement in terms of Sub-Clause 2.4 of ITB.

7.0 You are requested to submit the Performance Security within 28 days of issue of this Letter of Acceptance in terms of Sub-Clause no. 3.2 of General Conditions of Contract.

8.0 You are advised to take specific care during construction stage to keep the variation under check in the quantities specified in '**Schedule of Quantities and Prices**'. Variation in Abnormally High Quoted (AHR) items of Bill of Quantities (BOQ) shall be done only after prior technical approval of the Engineer-in-Charge. You are also advised to ensure that the Abnormally High Quoted (ALR) items of Bill of Quantities (BOQ) are not substituted during execution. List of AHR and ALR Items is detailed hereunder:

A. Abnormally Low Quoted Items (ALR):

Schedule-1:	Item no. 7.3.2, 17.2
Schedule-3:	Item no. 1.6, 3.4, 3.5, 4.3

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Schedule-4:	Item no. 1.2, 1.5, 1.6, 2.7, 3.4, 3.5, 4.3, 4.4, 4.6, 5.2
B. Abnormally High Quoted Items (AHR):	
Schedule-1:	Item no. 3.5, 4.5, 4.10, 4.13
Schedule-3:	Item no. 1.3, 2.1, 2.2, 2.4, 2.5, 2.6, 4.2, 4.5, 5.1
Schedule-4:	Item no. 1.3, 2.2, 4.2, 4.5
Schedule-5:	Item no. 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 4.4, 4.5

9.0 This Letter of Acceptance is being issued to you in duplicate. We request you to return its duplicate copy duly signed and stamped on each page by the authorized signatory of your company as a proof of your acknowledgement and confirmation.

10.0 You are hereby directed to contact Head of Project, Teesta-V Power Station, NHPC Limited for taking over the work site and to commence the Works immediately.

Thanking you,

Yours faithfully,
For and on behalf of NHPC Limited

18/7/25

General Manager (CC-II)
 Contracts Civil Division
 Corporate Office, Faridabad
 e-Mail id: contcivil2-co@nhpc.nic.in

Validate **Print** **Help**

Tender Inviting Authority: General Manager (CC-II), Contracts Civil Division, NHPC Ltd, Corporate Office, Faridabad

Name of Work: Package-6, Modification of Diversion Tunnel into Tunnel Spillway Arrangement - Civil & HM Works (Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement) for Teesta-V Power Station, Sikkim.

Tender Reference No: NH/CCW/CC-II/CO-323/PR-11124/47

Tender ID: 2024_NHPC_812702_1

Name of the Bidder/ Bidding Firm / Company :	Patel Engineering Limited							
PRICE SCHEDULE Schedule-6: Grand Summary								
(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)								
NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #				
Sl. No.	Item Description	Total of Foreign Currency 1	Total of Foreign Currency 2	Total of INR				
1	2	3	4	5				
1	Total of Schedule-1: Civil Works			1858000000.00				
2	Total of Schedule-2: Hydro Mechanical Works - Plant, Equipment and Mandatory Spare Parts supplied from abroad.	0.00	0.00					
3	Total of Schedule-3: Hydro Mechanical Works - Plant, Equipment and Mandatory Spare Parts supplied from within the Employer's Country.	0.00	0.00	425631746.00				
4	Total of Schedule-4: Hydro Mechanical Works - Local Transportation including port clearance & port charges and inland insurance.	0.00	0.00	18011464.00				
5	Total of Schedule 5: Hydro Mechanical Works - Installation, Testing and Commissioning.	0.00	0.00	98120855.00				
Total in Figures		0.00	0.00	2399764065.00				



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Item Rate BoQ

Tender Inviting Authority: General Manager (CC-II), Contracts Civil Division, NHPC Ltd, Corporate Office, Faridabad

Name of Work: Package-6, Modification of Diversion Tunnel Into Tunnel Spillway Arrangement - Civil & HM Works (Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement) for Teesta-V Power Station, Sikkim.

Tender Reference No: NH/CCW/CC-II/CO-323/PR-11124/47

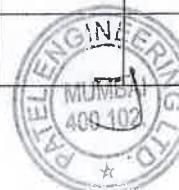
Tender ID: 2024_NHPC_812702_1

Name of the Bidder/ Bidding Firm / Company :	Patel Engineering Limited								
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PRICE SCHEDULE,
Schedule-1: Civil Works

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	TEXT #	NUMBER #	TEXT #	NUMBER	NUMBER	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item No. & Description	Item No.	Quantity	Units	Rate of Fixed Rate Items in INR (₹)	Ref. to Tech. Spec.	RATE including Taxes in Figures To be entered by the Bidder in INR (₹)	TOTAL AMOUNT With Taxes in INR (₹)	TOTAL AMOUNT In Words
1	2	3	4	5	6	7	8	9	10
1	Dewatering During Construction (fixed rate item)	1	10000	KWh	27.78	B.1	27.78	277800.00	INR Two Lakh Seventy Seven Thousand Eight Hundred Only
2	Surface Excavation	2				B.2			
3	Common Excavation	2.1	15000	m³			368.00	5520000.00	INR Fifty Five Lakh Twenty Thousand Only
4	Rock Excavation	2.2	10000	m³			758.00	7580000.00	INR Seventy Five Lakh Eighty Thousand Only
5	Underground Excavation	3				B.3			
6	Excavation of Tunnel Spillway & Environment flow tunnel	3.1							
7	Class I, II, III	3.1.1	50000	m³			2581.00	129050000.00	INR Twelve Crore Ninety Lakh Fifty Thousand Only
8	Class IV, V	3.1.2	21700	m³			3012.00	65360400.00	INR Six Crore Fifty Three Lakh Sixty Thousand Four Hundred Only



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9	Excavation of Gate operation chamber including excavation of Gate shaft in all classes of rock, Shaft for Environmental Flow tunnel & its Access Gallery & construction adit	3.2							
10	Excavation of Gate operation chamber in all classes of rock including Adit to GOC and Access Gallery to Shaft for Environmental Flow tunnel	3.2.1	17700	m ³			2711.00	47984700.00	INR Four Crore Seventy Nine Lakh Eighty Four Thousand Seven Hundred Only
11	Excavation in Gate shafts and Shaft for Environmental Flow tunnel in all classes of rock	3.2.2	11000	m ³			6422.00	70642000.00	INR Seven Crore Six Lakh Forty Two Thousand Only
12	Removal of material arising from overbreak accepted due to geological conditions.	3.3	10000	m ³			1534.00	15340000.00	INR One Crore Fifty Three Lakh Forty Thousand Only
13	Line Drilling	3.4	1510	m			618.00	933180.00	INR Nine Lakh Thirty Three Thousand One Hundred & Eighty Only
14	Dental Excavation	3.5	50	m ³			3212.00	160600.00	INR One Lakh Sixty Thousand Six Hundred Only
15	Dismantling of existing concrete	3.6	2000	m ³			5778.00	11556000.00	INR One Crore Fifteen Lakh Fifty Six Thousand Only
16	Common Excavation (silt removal from existing diversion tunnel)	3.7	43200	m ³			466.00	20131200.00	INR Two Crore One Lakh Thirty One Thousand Two Hundred Only
17	Extra for haulage beyond 3 km and upto 6 km	3.8	20000	m ³			131.00	2620000.00	INR Twenty Six Lakh Twenty Thousand Only
18	Rock Stabilization and Supports	4				B.4			
19	Rockbolts 25mm dia. Including accessories in Tunnel Spillway, GOC, Gate Shaft, environment-flow tunnel & Construction Adit	4.1							
20	Length upto 4.0m	4.1.1	5000	m			1032.00	5160000.00	INR Fifty One Lakh Sixty Thousand Only
21	Length more than 4.0m and up to 6.0 m	4.1.2	52000	m			1064.00	55328000.00	INR Five Crore Fifty Three Lakh Twenty Eight Thousand Only
22	Rockbolt Testing	4.1.3	100	nos			860.00	86000.00	INR Eighty Six Thousand Only
23	Extension for embedding into concrete where required	4.1.4	500	KG			103.00	51500.00	INR Fifty One Thousand Five Hundred Only
24	Rockbolts 32mm dia. Including accessories in GOC	4.2							



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25	Length more than 6.0m and up to 9.0 m	4.2.1	20000	m			1326.00	26520000.00	INR Two Crore Sixty Five Lakh Twenty Thousand Only
26	Rockbolt Testing	4.2.2	25	Nos			860.00	21500.00	INR Twenty One Thousand Five Hundred Only
27	Rock anchors 25mm dia. Including accessories in Tunnel Spillway Portal	4.3							
28	Length more than 4.0m and up to 6.0 m	4.3.1	4000	m			1032.00	4128000.00	INR Forty One Lakh Twenty Eight Thousand Only
29	Grouted Anchors Bars	4.4							
30	Length up to 4.0m	4.4.1							
31	25 mm dia	4.4.1.1	380	m			1067.00	405460.00	INR Four Lakh Five Thousand Four Hundred & Sixty Only
32	32 mm dia	4.4.1.2	50	m			1423.00	71150.00	INR Seventy One Thousand One Hundred & Fifty Only
33	Length more than 4.0m and up to 6.0 m	4.4.2							
34	25 mm dia	4.4.2.1	6000	m			1100.00	6600000.00	INR Sixty Six Lakh Only
35	32 mm dia	4.4.2.2	2000	m			1472.00	2944000.00	INR Twenty Nine Lakh Forty Four Thousand Only
36	Self Drilling Hollow Core Anchor - 25 mm dia	4.5	1000	m			2155.00	2155000.00	INR Twenty One Lakh Fifty Five Thousand Only
37	Steel Ribs	4.6	300	MT			120562.00	36168600.00	INR Three Crore Sixty One Lakh Sixty Eight Thousand Six Hundred Only
38	Precast Concrete Lagging	4.7	390	m ³			20623.00	8042970.00	INR Eighty Lakh Forty Two Thousand Nine Hundred & Seventy Only
39	Steel Lagging	4.8	20	MT			121505.00	2430100.00	INR Twenty Four Lakh Thirty Thousand One Hundred Only
40	Forepoling	4.9	1500	m			1504.00	2256000.00	INR Twenty Two Lakh Fifty Six Thousand Only
41	Grouting Operations	4.9.1	150	nos			2265.00	339750.00	INR Three Lakh Thirty Nine Thousand Seven Hundred & Fifty Only
42	Pipe roofing 88.9 mm dia High Tensile Steel including grouting operation	4.10	2000	m			7800.00	15600000.00	INR One Crore Fifty Six Lakh Only

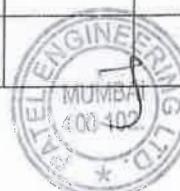


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43	Welded Wiremesh	4.11	2500	m ²			460.00	1150000.00	INR Eleven Lakh Fifty Thousand Only
44	Post tensioned Rockbolts (Tendons)	4.12	500	m			10609.00	5304500.00	INR Fifty Three Lakh Four Thousand Five Hundred Only
45	Testing of Post Tensioned Rock Bolts	4.13	1	No.			41189.00	41189.00	INR Forty One Thousand One Hundred & Eighty Nine Only
46	Shotcrete	5				B.5			
47	Plain Shotcrete	5.1	250	m ³			20355.00	5088750.00	INR Fifty Lakh Eighty Eight Thousand Seven Hundred & Fifty Only
48	SFR Shotcrete excluding steel fibre	5.3	2400	m ³			20989.00	50373600.00	INR Five Crore Three Lakh Seventy Three Thousand Six Hundred Only
49	Micro silica	5.4	100	MT			26790.00	2679000.00	INR Twenty Six Lakh Seventy Nine Thousand Only
50	Steel Fibers	5.5	90	MT			126700.00	11403000.00	INR One Crore Fourteen Lakh Three Thousand Only
51	Superplastisizers	5.6	19200	kg			54.00	1036800.00	INR Ten Lakh Thirty Six Thousand Eight Hundred Only
52	Cement variation in Shotcrete (fixed rate item)	5.7	84	MT	10428.25		10428.25	875973.00	INR Eight Lakh Seventy Five Thousand Nine Hundred & Seventy Three Only
53	Embankment Construction and Backfill	6				B.6			
54	Compacted Backfill (for roadworks at inlet, outlet portal and embankment etc.)	6.1	62800	m ³			531.00	33346800.00	INR Three Crore Thirty Three Lakh Forty Six Thousand Eight Hundred Only
55	Random Backfill	6.2	2650	m ³			488.00	1293200.00	INR Twelve Lakh Ninety Three Thousand Two Hundred Only
56	Drilling, Grouting and Pressure Relief Holes	7				B.7			
57	Contact Grouting	7.1							
58	Drilling 45mm holes for Contact Grouting	7.1.1	1500	m			977.00	1465500.00	INR Fourteen Lakh Sixty Five Thousand Five Hundred Only
59	Grouting Operation	7.1.2	1500	Nos			1280.00	1920000.00	INR Nineteen Lakh Twenty Thousand Only
60	Consolidation Grouting	7.2							



61	Drilling 45mm holes for Consolidation Grouting	7.2.1	4900 m			971.00	4757900.00	INR Forty Seven Lakh Fifty Seven Thousand Nine Hundred Only
62	Grouting Operations	7.2.2	980 Nos			2157.00	2113860.00	INR Twenty One Lakh Thirteen Thousand Eight Hundred & Sixty Only
63	Grouting materials	7.3						
64	Cement	7.3.1	400 MT			12907.00	5162800.00	INR Fifty One Lakh Sixty Two Thousand Eight Hundred Only
65	Admixtures	7.3.2	4 MT			52014.00	208056.00	INR Two Lakh Eight Thousand & Fifty Six Only
66	Drainage Holes	7.4						
67	Drilling of 45mm holes for Drainage/Pressure relief holes	7.4.1	5200 m			971.00	5049200.00	INR Fifty Lakh Forty Nine Thousand Two Hundred Only
68	Supply and installation of 36 mm dia perforated PVC pipes	7.4.2	5200 m			432.00	2246400.00	INR Twenty Two Lakh Forty Six Thousand Four Hundred Only
69	Concrete	9			B.9			
70	Concrete in Tunnels & Adits (including formwork)	9.1.						
71	PCC lining M25/A40 in tunnel invert	9.1.1	228 m ³			9133.00	2082324.00	INR Twenty Lakh Eighty Two Thousand Three Hundred & Twenty Four Only
72	PCC lining M25/A40 in tunnel overt	9.1.2	600 m ³			10197.00	6118200.00	INR Sixty One Lakh Eighteen Thousand Two Hundred Only
73	PCC lining M25/A40 in tunnel overt in geologically approved overbreaks at (75% rate of 9.1.2)	9.1.2.1	300 m ³			7647.75	2294325.00	INR Twenty Two Lakh Ninety Four Thousand Three Hundred & Twenty Five Only
74	High Performance Concrete (HPC) excluding silica fumes M70/A20	9.1.3	0 m ³				0.00	INR Zero Only
75	Lining in tunnel invert	9.1.3.1	5200 m ³			14294.00	74328800.00	INR Seven Crore Forty Three Lakh Twenty Eight Thousand Eight Hundred Only
76	Lining in tunnel overt	9.1.3.2	5800 m ³			16966.00	98402800.00	INR Nine Crore Eighty Four Lakh Two Thousand Eight Hundred Only
77	Lining in tunnel overt in geologically approved overbreaks at (75% rate of 9.1.3.2)	9.1.3.2.1	3900 m ³			12724.50	49625550.00	INR Four Crore Ninety Six Lakh Twenty Five Thousand Five Hundred & Fifty Only
78	At Bellmouth	9.1.3.3	11900 m ³			11688.00	139087200.00	INR Thirteen Crore Ninety Lakh Eighty Seven Thousand Two Hundred Only



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79	Silica fumes	9.1+3.4	1206 MT		29158.00	35164548.00	INR Three Crore Fifty One Lakh Sixty Four Thousand Five Hundred & Forty Eight Only
80	Backfill Concrete M15/A40 in geologically approved overbreaks	9.1.4	3700 m ³		897.00	33103900.00	INR Three Crore Thirty One Lakh Three Thousand Nine Hundred Only
81	M15/A80 at inlet portal	9.1.5	12000 m ³		8429.00	101148000.00	INR Ten Crore Eleven Lakh Forty Eight Thousand Only
82	Self Compacting Backfill concrete M20/A40 behind steel liner in Tunnel Spillway and steel pipe for environmental flow	9.2	3300 m ³		8925.00	29452500.00	INR Two Crore Ninety Four Lakh Fifty Two Thousand Five Hundred Only
83	M20/A40 in Geologically approved overbreaks (75% rate of 9.2)	9.2.1	900 m ³		6693.75	6024375.00	INR Sixty Lakh Twenty Four Thousand Three Hundred & Seventy Five Only
84	M25/A40	9.3					
85	At Outlet Portal (including formwork)	9.3.1	500 m ³		7563.00	3781500.00	INR Thirty Seven Lakh Eighty One Thousand Five Hundred Only
86	GOC & Gate shaft (including transitions) (including formwork)	9.3.2	12200 m ³		9171.00	111986200.00	INR Eleven Crore Eighteen Lakh Eighty Six Thousand Two Hundred Only
87	Second stage concrete (self compacting) M35/A20 (including formwork)	9.4	200 m ³		10413.00	2082600.00	INR Twenty Lakh Eighty Two Thousand Six Hundred Only
88	Concrete Cladding M20/A20 (including formwork)	9.5	1200 m ³		9508.00	11409600.00	INR One Crore Fourteen Lakh Nine Thousand Six Hundred Only
89	Concrete Blocks M25/A40 (including formwork)	9.6	150 m ³		10131.00	1519650.00	INR Fifteen Lakh Nineteen Thousand Six Hundred & Fifty Only
90	M35/A40 Concrete in Energy Dissipation Arrangement (including formwork)	9.7	5000 m ³		9660.00	48200000.00	INR Four Crore Eighty Two Lakh Only
91	Construction of (M25/A20) RCC slab bridge, approach slabs etc as per IRC classification rested over pier/fabutment of dam, complete in all respect as per drawings and specifications (including formwork)	9.8					
92	M25/A20 grade concrete	9.8.1	210 m ³		10247.00	2151870.00	INR Twenty One Lakh Fifty One Thousand Eight Hundred & Seventy Only
93	Pre-cast unit (Beams)	9.8.2	900 m ³		13197.00	11877300.00	INR One Crore Eighteen Lakh Seventy Seven Thousand Three Hundred Only
94	M30/A20 Concrete in pedestals over piers for bridge (including formwork)	9.9	250 m ³		11938.00	2984500.00	INR Twenty Nine Lakh Eighty Four Thousand Five Hundred Only
95	Concrete In training wall, concrete cladding, coffer dyke,tunnel Plug etc. (including formwork)	9.10					



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96	M15/A40	9.10.1	5000 m ³			7602.00	38010000.00	INR Three Crore Eighty Lakh Ten Thousand Only
97	M25/A40 RCC	9.10.2	500 m ³			8488.00	4204000.00	INR Forty Two Lakh Four Thousand Only
98	Tunnel Plug -M20/A40	9.10.3	9000 m ³			10865.00	97785000.00	INR Nine Crore Seventy Seven Lakh Eighty Five Thousand Only
99	Bridge ancillaries	9.11						
100	Elastomeric bearing pads	9.11.1	100 Nos.			20561.00	2056100.00	INR Twenty Lakh Fifty Six Thousand One Hundred Only
101	Drain boxes	9.11.2	35 Nos.			21341.00	746935.00	INR Seven Lakh Forty Six Thousand Nine Hundred & Thirty Five Only
102	Cement Variation (fixed rate item)	9.12	1500 MT	10428.25	10428.25	15642375.00	15642375.00	INR One Crore Fifty Six Lakh Forty Two Thousand Three Hundred & Seventy Five Only
103	Super Plasticizer	9.13	333200 kg			54.00	17992800.00	INR One Crore Seventy Nine Lakh Ninety Two Thousand Eight Hundred Only
104	Air entraining agent	9.14	20900 kg			186.00	38887400.00	INR Thirty Eight Lakh Eighty Seven Thousand Four Hundred Only
105	Providing and applying Epoxy mortar for repair works in existing tunnel	9.15	1000 kg			1220.00	1220000.00	INR Twelve Lakh Twenty Thousand Only
106	Providing and applying Cementitious mortar for repair works in existing tunnel	9.16	2000 kg			220.00	440000.00	INR Four Lakh Forty Thousand Only
107	Providing and applying two-components epoxy binder (resin & hardener) conforming to ASTM C881 Type-IV, Class C as per technical specification	9.17	100 kg			1175.00	117500.00	INR One Lakh Seventeen Thousand Five Hundred Only
108	Designing,supplying and fixing rebars in already cast concrete including drilling and injection of epoxy as per Technical specification all complete	9.18						
109	25mm dia	9.18.1	825 Nos.			5305.00	4376625.00	INR Forty Three Lakh Seventy Six Thousand Six Hundred & Twenty Five Only
110	32mm dia	9.18.2	165 Nos.			5349.00	882585.00	INR Eight Lakh Eighty Two Thousand Five Hundred & Eighty Five Only
111	36mm dia	9.18.3	110 Nos.			5620.00	618200.00	INR Six Lakh Eighteen Thousand Two Hundred Only
112	Reinforcing Steel	11		B.11				



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113	Deformed Reinforcing steel Fe 500	11.1	2110	MT			89480.00	188802800.00	INR Eighteen Crore Eighty Eight Lakh Two Thousand Eight Hundred Only
114	Slope and River Bed Protection Works	17				B.17			
115	Supply and placing boulders of around 20 kg to 40 kg in weight and 150 mm to 300 mm in size in PP rope gabion for box barrage protection.	17.1	3000	Cum			3133.00	9399000.00	INR Ninety Three Lakh Ninety Nine Thousand Only
116	Supply of 9 mm 4-strand Polypropylene (PP) Rope Gabions (UV stabilized size 2m x 1m x 1m).	17.2	1500	Nos.			2449.00	3673500.00	INR Thirty Six Lakh Seventy Three Thousand Five Hundred Only
117	Supply and placing boulders of around 20 kg to 40 kg in weight and 150 mm to 300 mm in size in Boulder Wire Crates	17.3	3000	Cum			3133.00	9399000.00	INR Ninety Three Lakh Ninety Nine Thousand Only
118	Supply of mechanically woven double twisted hexagonal gabions of size 2m x 1m x 1m (Zn coated).	17.4	1500	Nos.			3360.00	5040000.00	INR Fifty Lakh Forty Thousand Only
Total In Figures							1858000000.00		INR One Hundred Eighty Five Crore Eighty Lakh Only
Quoted Rate in Words							INR One Hundred Eighty Five Crore Eighty Lakh Only		

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Tender Inviting Authority: General Manager (CC-II), Contracts Civil Division, NHPC Ltd, Corporate Office, Faridabad

Name of Work: Package-6, Modification of Diversion Tunnel Into Tunnel Spillway Arrangement - Civil & HM Works (Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement) for Teesta-V Power Station, Sikkim.

Tender Reference No: NH/CCW/CC-II/CO-323/PR-11124/47

Tender ID: 2024_NHPC_812702_1

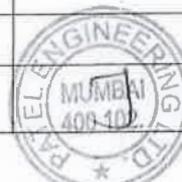
Name of the Bidder/ Bidding Firm / Company :	Patel Engineering Limited									
----------------------------------------------	---------------------------	--	--	--	--	--	--	--	--	--

PRICE SCHEDULE

Schedule-2: Hydro Mechanical Works - Plant & Equipment Including Mandatory Spare Parts, Mandatory Tools and Tackles Supplied from Abroad.

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	TEXT	Unit Price (Including Taxes & Duties)				NUMBER	NUMBER
Sl. No.	Item Description	Quantity	Units	Country of Origin	FOB or FCA + Taxes & Duties		CIF or CIP + Custom Duty + Taxes & Duties		TOTAL (CIF or CIP) AMOUNT (Including Custom Duty + Taxes & Duties)	
1	2	3	4	5	6	7	8	9	10	11
NAME OF CURRENCY										
Statement -1	Hydro mechanical Works									
1	Tunnel Spillway Radial Gates & Hydraulic Hoists									
1.1	Tunnel Spillway Radial Gates complete in all respect including Stainless Steel skin plate (AISI 304), stiffeners, girders, arms, trunnions, guide rollers etc	2	Set	0.00					0.00	0.00
1.2	Sill beam for 1.1	2	Set	0.00					0.00	0.00
1.3	Embedded Parts including 1st stage and 2nd stage (wall plates, hoist supporting structure, trunnion brackets, Dogging etc.) for 1.1	2	Set	0.00					0.00	0.00
1.4	Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.	4	Nos	0.00					0.00	0.00
1.5	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	2	Set	0.00					0.00	0.00
1.6	Mandatory Spare Parts (As per statement-IB)	1	Set	0.00					0.00	0.00
2	Spillway Stoplog & EOT Crane									
2.1	Spillway Stoplog (Slide type) (1 set comprising of 4 units)	1	Set	0.00					0.00	0.00
2.2	Sill beam for 2.1	2	Set	0.00					0.00	0.00
2.3	Embedded Parts including 1st stage and 2nd stage (air vent pipe, Dogging arrangement etc.) for 2.1	2	Set	0.00					0.00	0.00



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2.4	Storage arrangement for storing stoplog units	2	Set	0.00	
2.5	Lifting Beam with automatically engaging and disengaging hooks including probe mechanism etc.	1	Set	0.00	
2.6	EOT Crane complete in all respect incl. rails and fixtures etc.	1	Set	0.00	0.00
2.7	Mandatory Spare Parts (As per statement 1B)	1	Set	0.00	0.00
3	Steel liner in Spillway Glacis, Piers/ Sides and Breast wall for Tunnel spillways	2	Set	0.00	0.00
3.1	Steel liners on Breast wall of the spillway openings	2	Set	0.00	
3.2	Steel liners in spillway gate grooves, about 1m height above top seal.	2	Set	0.00	0.00
3.3	Steel liners between spillway stoplog gate groove and up to the center line of runnion beams (including glacis and side piers)	2	Set	0.00	0.00
3.4	Steel transition from 10.0m x 10.0m rectangular section to 10.00m dia. circular section.	2	Set	0.00	0.00
3.5	Tunnel spillway Steel liners having an internal diameter of 10.00 m circular section including bends as described in technical specification.	2	Set	0.00	0.00
4	Environmental flow pipe, Gates & Hydraulic Hoists				
4.1	Environmental flow Gates, slide type (service and emergency) complete in all respect including skin plate (IS 2062 E4/10), stiffeners, girders, sliding block assemblies, guide shoes etc.	2	Set	0.00	0.00
4.2	First stage embedded parts for 4.1 (service and emergency) including steelmers, bonnet and bonnet cover, Hoist supporting structure, Dogging arrangement and air vent pipe etc. as described in technical specification.	1	Set	0.00	0.00
4.3	Double acting Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.	2	Nos	0.00	0.00
4.4	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	1	Set	0.00	0.00
4.5	Environmental flow pipe 1500 mm dia approx. 60m length including bend, transition pieces, supports etc.	1	Set	0.00	0.00
4.6	Mandatory Spare Parts (As per statement-1B)	1	Set	0.00	0.00
5	Instrumentation				
5.1	i) Water level measuring system to indicate balance head condition of spillway stop logs. ii) Feeder pillar for all HM equipments in the contract.	2	Set	0.00	0.00



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5.2	Mandatory Spare Parts (As per statement-B)	1	Set	0.00		0.00		0.00
Total in Figures							0.00	0.00



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Tender Inviting Authority: General Manager (CC-II), Contracts Civil Division, NHPC Ltd, Corporate Office, Faridabad
Name of Work: Package-6, Modification of Diversion Tunnel into Tunnel Spillway Arrangement - Civil & HM Works (Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement) for Teesta-V Power Station, Sikkim.

Tender Reference No: NHCCW/C/C-II/CO-323/PR-1124/47

Tender ID: 2024_NHPC_812702_1

NUMBER #	TEXT #	NUMBER #	TEXT #	Unit Price (including Taxes & Duties)				NUMBER	NUMBER
				Quantity	Units	INR	Foreign Currency 1		
PRICE SCHEDULE									
1	2	3	4	5	6	7	8	9	10
						Please enter currency name (if required)		Foreign Currency 1	Foreign Currency 2
Schedule-3: Hydro Mechanical Works - Plant & Equipment Including Mandatory Spare Parts, Mandatory Tools and Tackles Supplied from within country.									
Items quoted in Price Schedule-2 shall not be quoted in Price Schedule-3.									
(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)									
SI. No.	Item Description	Quantity	Units	INR	Foreign Currency 1	Foreign Currency 2			
1		3	4	5	6	7			
NAME OF CURRENCY									
Statement -1	Hydro mechanical Works			INR					
1	Tunnel Spillway Radial Gates & Hydraulic Hoists								
1.1	Tunnel Spillway Radial Gates complete in all respect including Stainless Steel skin plate (ASIS 304), stiffeners, girders, arms, trunnions, guide rollers etc	2	Set	33003345.00			66006690.00	0.00	0.00
1.2	Sill beam for 1.1	2	Set	902001.00			1804002.00	0.00	0.00
1.3	Embedded Parts including 1st stage and 2nd stage (wall plates, hoist supporting structure, trunnion brackets, Dogging etc. for 1.1	2	Set	11931408.00			23862816.00	0.00	0.00
1.4	Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.	4	Nos	99664423.00			39873692.00	0.00	0.00
1.5	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	2	Set	5072989.00			10145978.00	0.00	0.00
1.6	Mandatory Spare Parts (As per statement-B)	1	Set	752071.00			752071.00	0.00	0.00
2	Spillway Stoplog & EOT Crane								
2.1	Spillway Stoplog (Slide type) (1 set comprising of 4 units)	1	Set	23491282.00			23491282.00	0.00	0.00



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2.2	Sill beam for 2.1	2	Set	2896204.00		5792408.00	0.00	0.00
2.3	Embedded Parts including 1st stage and 2nd stage (air vent pipe, Dogging arrangement etc.) for 2.1	2	Set	4802509.00		9611018.00	0.00	0.00
2.4	Storage arrangement for storing stoplog units	2	Set	233110.00		4662220.00	0.00	0.00
2.5	Lifting Beam with automatically engaging and disengaging hooks including probe mechanism etc.	1	Set	1127501.00		1127501.00	0.00	0.00
2.6	EOT Crane complete in all respect incl. rails and fixtures etc	1	Set	19213944.00		19213944.00	0.00	0.00
2.7	Mandatory Spare Parts (As per statement 1B)	1	Set	1018923.00		1018923.00	0.00	0.00
3	<u>Steel liner in Spillway Glacis, Piers/ Sides and Breast wall for Tunnel spillways</u>							
3.1	Steel liners on Breast wall of the spillway openings	2	Set	2136983.00		4273966.00	0.00	0.00
3.2	Steel liners in stoplog gate grooves, about 1m height above top seal.	2	Set	642843.00		1285686.00	0.00	0.00
3.3	Steel liners between spillway stoplog gate groove and up to the center line of trunnion beams (including glacis and side piers)	2	Set	25174697.00		50349394.00	0.00	0.00
3.4	Steel transition from 10.0m x 10.0m rectangular section to 10.0m dia. circular section.	2	Set	17630106.00		36260212.00	0.00	0.00
3.5	Tunnel spillway Steel liners having an internal diameter of 10.00 m in circular section including berids as described in technical specification.	2	Set	50753335.00		101506670.00	0.00	0.00
4	<u>Environmental flow pipe, Gates & Hydraulic Hoists</u>							
4.1	Environmental flow Gates, slide type (service and emergency) complete in all respect including skin plate (IS 2032 E410), stiffeners, girders, sliding block assemblies, guide shoes etc.	2	Set	5577205.00		1114410.00	0.00	0.00
4.2	First stage embedded parts for 4.1 (service and emergency) including steel liners, berid and bonnet cover, Hoist supporting structure and Dogging arrangement and air vent pipe etc. as described in technical specification.	1	Set	10084327.00		10084327.00	0.00	0.00
4.3	Double acting Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.	2	Nos	2587225.00		5174450.00	0.00	0.00
4.4	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	1	Set	3985520.00		3985520.00	0.00	0.00
4.5	Environmental flow pipe 1500 mm dia approx 60m length including bend, transition pieces, supports etc.	1	Set	6293958.00		6293958.00	0.00	0.00

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4.6	Mandatory Spare Parts (As per statement-B)	1	Set	583971.00		583971.00	0.00
5	Instrumentation						0.00
5.1	i)Water level measuring system to indicate balance head condition of spillway stop logs. ii)Feeder pillar for all HM equipments in the contract.	2	Set	985186.00		1970372.00	0.00
5.2	Mandatory Spare Parts (As per statement-B)	1	Set	581865.00		581865.00	0.00
Total In Figures						425631746.00	0.00



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Tender Inviting Authority: General Manager (CC-II), Contracts Civil Division, NHPC Ltd, Corporate Office, Faridabad

Name of Work: Package-6, Modification of Diversion Tunnel into Tunnel Spillway - Civil & HM Works [Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement] for Teesta-V Power Station, Sikkim.

Tender Reference No: NH/CCW/CC-II/CO-323/PR-11124/47

Tender ID: 2024_NHPC_812702_1

Name of the Bidder/Bidding Firm / Company :	Patel Engineering Limited
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(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

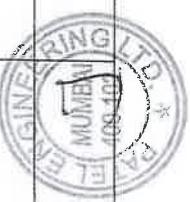
NUMBER #	TEXT #	ITEM DESCRIPTION	QUANTITY	NUMBER #	TEXT #	UNIT PRICE (INCLUDING TAXES & DUTIES)			NUMBER	NUMBER
						INR	FOREIGN CURRENCY 1	FOREIGN CURRENCY 2		
1	2		3	4	5	6	7	8	9	10
						Please enter currency name (if required)				
		NAME OF CURRENCY			INR				INR	FOREIGN CURRENCY 1
		Hydro mechanical Works								
Statement -1										
1	Tunnel Spillway Radial Gates & Hydraulic Hoists									
1.1	Tunnel Spillway Radial Gates complete in all respect including Stainless Steel skin plate (ASI 304), stiffeners, girders, arms, trunnions, guide rollers etc		2	Set	1207440.00				2414880.00	0.00
1.2	Sill beam for 1.1		2	Set	33001.00				66002.00	0.00
1.3	Embedded Parts including 1st stage and 2nd stage (wall plates, hoist supporting structure, trunnion brackets, Dogging etc.) for 1.1		2	Set	436515.00				873030.00	0.00
1.4	Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.		4	Nos	364699.00				1458796.00	0.00
1.5	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.		2	Set	185598.00				371196.00	0.00
1.6	Mandatory Spares Parts (As per statement-1B)		1	Set	27515.00				27515.00	0.00
2	Spillway Stoplog & EOT Crane									
2.1	Spillway Stoplog (Slide type) (1 set comprising of 4 units)		1	Set	859438.00				859438.00	0.00



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2.2	Sill beam for 2.1	2	Set	105959.00		211918.00	0.00
2.3	Embedded Parts including 1st stage and 2nd stage (air vent pipe, Dogging arrangement etc.) for 2.1	2	Set	175812.00		351624.00	0.00
2.4	Storage arrangement for storing stoplog units	2	Set	8529.00		17058.00	0.00
2.5	Lifting Beam with automatically engaging and disengaging hooks including probe mechanism etc.	1	Set	41251.00		41251.00	0.00
2.6	EOT Crane complete in all respect incl. rails and fixtures etc.	1	Set	702950.00		702950.00	0.00
2.7	Mandatory Spare Parts (As per statement 1B)	1	Set	37278.00		37278.00	0.00
3	Steel liner in Spillway Glacis, Piers/ Slides and Breast wall for Tunnel spillways						
3.1	Steel liners on Breast wall of the spillway openings	2	Set	106850.00		213700.00	0.00
3.2	Steel liners in stoplog gate grooves, about 1m height above top seal.	2	Set	28574.00		57148.00	0.00
3.3	Steel liners between spillway stoplog gate groove and up to the center line of trunnion beams (including glacis and side piers)	2	Set	1199863.00		2399726.00	0.00
3.4	Steel transition from 10.0m x 10.0m rectangular section to 10.00m dia. circular section.	2	Set	881506.00		1763012.00	0.00
3.5	Tunnel spillway Steel liners having an internal diameter of 10.00 m circular section including bends as described in technical specification.	2	Set	2537667.00		5075334.00	0.00
4	Environmental flow pipe, Gates & Hydraulic Hoists						
4.1	Environmental flow Gates, slide type (service and emergency) complete in all respect including skin plate (IS 2032 E410), stiffeners, girders, sliding block assemblies, guide shoes etc.	2	Set	20386.00		40772.00	0.00
4.2	First stage embedded parts for 4.1 (service and emergency) including steel liners, bonnet and bonnet cover, Hoist supporting structure and Dogging arrangement and air vent pipe etc. as described in technical specification.	1	Set	368339.00		368339.00	0.00
4.3	Double acting Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.	2	Nos	94655.00		189310.00	0.00
4.4	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	1	Set	145827.00		145827.00	0.00
4.5	Environmental flow pipe 1500 mm dia approx. 60m length including bend, transition pieces, supports etc.	1	Set	230267.00		230267.00	0.00

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4.6	Mandatory Spare Parts (As per statement-1B)	1	Set	21365.00			21365.00	0.00
5	Instrumentation							
5.1	Water level measuring system to indicate balance head condition of spillway stop logs. ii)Feeder pillar for all HM equipments in the contract.	2	Set	25185.00			50370.00	0.00
5.2	Mandatory Spare Parts (As per statement-1B)	1	Set	22758.00			22758.00	0.00
Total In Figures				18011464.00			18011464.00	0.00



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Tender Inviting Authority: General Manager (CC-II), Contracts Civil Division, NHPC Ltd, Corporate Office, Faridabad
 Name of Work: Package-6, Modification of Diversion Tunnel Into Tunnel Spillway - Civil & HM Works [Tunnel Spillway, Adit to GOC, GOC Gate Shaft, Inlet Bellmouth, Outlet Concrete Dyke and Energy Dissipation Arrangement] for Tessa-V Power Station, Siklum.

Tender Reference No: NH/CCW/CC-II/CCO-323/PR-11124/47

Tender ID: 2024_NHPC_812702_1

NUMBER #	TEXT #	NUMBER #	ITEM DESCRIPTION	QUANTITY	UNITS	INR	UNIT PRICE (INCLUDING TAXES & DUTIES)		NUMBER	NUMBER
							FOREIGN CURRENCY 1	FOREIGN CURRENCY 2		
1	2	3	4	5	6	7			8	9
							Please enter currency name (if required)			10
			NAME OF CURRENCY			INR			INR	FOREIGN CURRENCY 2
Statement -1	Hydro mechanical Works									
1	Tunnel Spillway Radial Gates & Hydraulic Hoists									
1.1	Tunnel Spillway Radial Gates complete in all respect including Stainless Steel skin plate (ASI 304), stiffeners, girders, arms, trunnions, glide rollers etc	2	Set	7127566.00					14255132.00	0.00
1.2	Sill beam for 1.1	2	Set	165001.00					330002.00	0.00
1.3	Embedded Parts including 1st stage and 2nd stage (wall plates, hoist supporting structures, trunnion brackets, Dogging etc.) for 1.1	2	Set	2182575.00					4365150.00	0.00
1.4	Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc	4	Nos	1823492.00					7293968.00	0.00
1.5	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	2	Set	927386.00					1855972.00	0.00
1.6	Mandatory Spare Parts (As per statement-B)	1	Set						0.00	0.00
2	Spillway Stoplog & EOT Crane									
2.1	Spillway Stoplog (Sliding type) [1 set comprising of 4 units]	1	Set	4297186.00					4297186.00	0.00



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2.2	Sill beam for 2.1	2	Set	529794.00		1059588.00	0.00	0.00
2.3	Embedded Parts including 1st stage and 2nd stage fair vent pipe, Dogging arrangement etc, for 2.1	2	Set	879057.00		1758114.00	0.00	0.00
2.4	Storage arrangement for storing stoplog units	2	Set	42642.00		85284.00	0.00	0.00
2.5	Lifting beam with automatically engaging and disengaging hooks including probe mechanism etc.	1	Set	206251.00		206251.00	0.00	0.00
2.6	EOT Crane complete in all respect incl. rails and fixtures etc.	1	Set	3514746.00		3514746.00	0.00	0.00
2.7	Mandatory Spare Parts (As per statement 18)	1	Set			0.00	0.00	0.00
3	Steel liner in Spillway Glacis, Piers/ Sides and Breast wall for Tunnel spillways							
3.1	Steel liners on Breast wall of the spillway openings	2	Set	634124.00		1268248.00	0.00	0.00
3.2	Steel liners in stoplog gate grooves, about 1m height above top seal	2	Set	120157.00		240314.00	0.00	0.00
3.3	Steel liners between spillway stoplog gate groove and up to the center line of trunnion beams (including glacis and side piers)	2	Set	6024177.00		12048354.00	0.00	0.00
3.4	Steel transition from 10.0m x 10.0m rectangular section to 10.00m dia. circular section.	2	Set	5231522.00		10463044.00	0.00	0.00
3.5	Tunnel spillway Steel liners having an internal diameter of 10.00 m circular section including bends as described in technical specification.	2	Set	15060442.00		30120884.00	0.00	0.00
4	Environmental flow pipe, Gates & Hydraulic Hoists							
4.1	Environmental flow Gates, slide type (service and emergency) complete in all respect including skin plate (IS 2062 : E410), stiffeners, girders, sliding block assemblies, guide shoes etc.	2	Set	101928.00		203856.00	0.00	0.00
4.2	First stage embedded parts for 4.1 (service and cover, Hoist supporting structure and Dogging arrangement and air vent pipe etc. as described in technical specification).	1	Set	1844694.00		1844694.00	0.00	0.00
4.3	Double acting Hydraulic Cylinder complete in all respect incl. suitable arrangement for gate position indication etc.	2	Nos	473273.00		946546.00	0.00	0.00
4.4	Hydraulic Power pack complete in all respect including Piping, Electrical Control Panels etc.	1	Set	729132.00		729132.00	0.00	0.00
4.5	Environmental flow pipe 1500 mm dia approx. 60m length including bend, transition pieces, supports etc.	1	Set	1151334.00		1151334.00	0.00	0.00



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4.6	Mandatory Spare Parts (As per statement-IB)	1	Set				0.00	0.00	0.00
5	Instrumentation								
5.1	i)Water level measuring system to indicate balance head condition of spillway stop logs. ii)Feeder pillar for all HM equipments in the contract.	2	Set	41528.00			83056.00	0.00	0.00
5.2	Mandatory Spare Parts (As per statement-IB)	1	Set				0.00	0.00	0.00
Total In Figures							98120855.00	0.00	0.00

Ramste





Risk Inspection Report

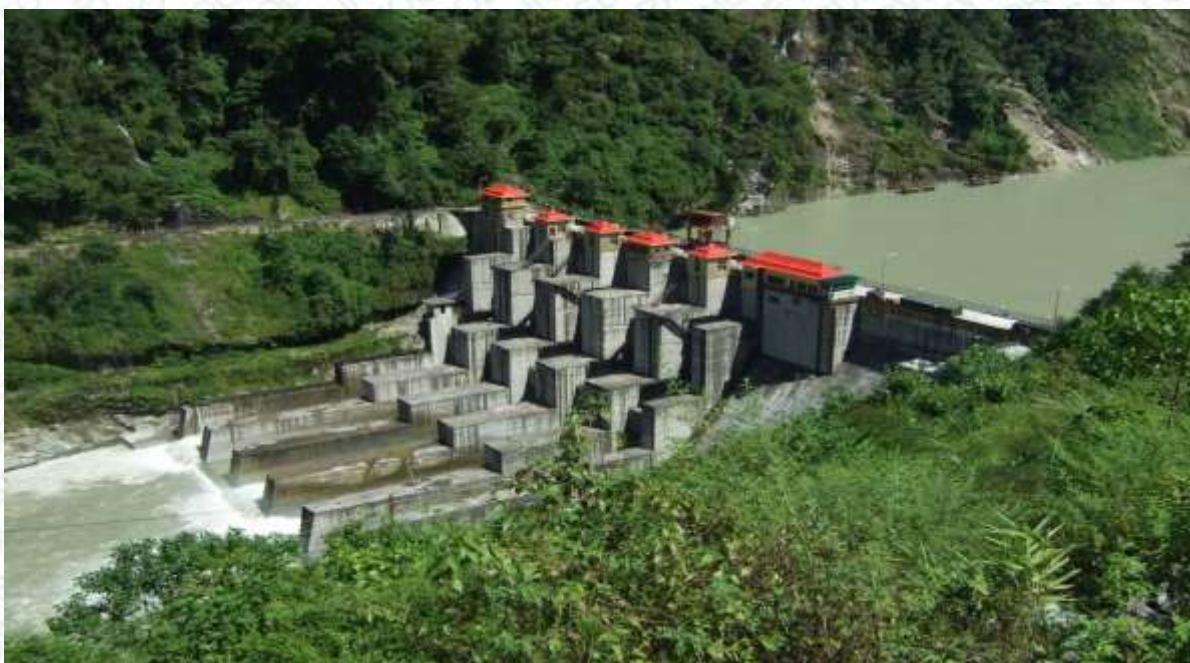
Reference

2021INS100835 (Teesta-V)
26th of August 2021

Project Stage: Operational

Teesta-V Hydro-Electric Project – 510 MW

Sikkim, India



Account

M/s National Hydro Power Corporation (NHPC) Limited, India

Client

The New India Assurance Co. Ltd.

PROTOCOL INSURANCE SURVEYORS & LOSS ASSESSORS PVT. LTD.

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Executive Summary

Teesta-V Power Station is owned and operated by NHPC Limited. The installed capacity of Power Station is 510 MW (3x170). The power station is constructed on the river scheme with diurnal storage to harness the hydro power potential of river Teesta for peaking during the lean season and is located in the state of Sikkim and 110 KM from Bagdogra Airport by road route.

The project was commissioned in 2008 (first unit on 28.03.2008, second on 06.02.2008 and third in 20.03.2008).

The project comprises of a 52 meter high concrete dam with 05 nos. of Spillway sluice gates designed for a PMF of 9500 cumec.

The powerhouse has 03-units of 170 MW capacity of each, operating at a net rated head of 197 m. Annual Design Energy is 1086/1108.17 MU in a 90% dependable year with 95% machine availability.

Climate and Rainfall Characteristics

The project catchment has its own climatic peculiarities caused by its geographical location, relief and altitudinal variation. The maximum and minimum temperature varies from 37° C in summer to 8° C in winter and the relative humidity varies from 40% to 100%.

The bulk of the total annual rainfall in the catchment occurs during the months of May to October. The average annual rainfall at Damsite (Dikchu) is 2544 mm.

Water Availability

The CWC approved water availability series at Teesta-V has been developed on the basis of observed discharges at Dikchu. The average annual runoff as per the approved water availability series is 7554 MCM.

Design Flood

A Probable Maximum Flood of 9500 cumec was recommended as design flood and later on Revised to 14596 cumec.

Operational History

The study of plant maintenance was done and following was observed:

- ❖ There has been no major breakdown of Plant & Machinery in the last 3 years.
- ❖ The power generation has not been hampered (except for on some occasions due to very minor issues & that too for short period) due to any mechanical problems.
- ❖ As a routine measure, all the 03 machines are taken-up for annual maintenance one-by-one during the lean Flow Season (November – February) each year.

Construction, build & Civil Infrastructure

In overall analysis for Civil & Hydro-mechanical works, the following is concluded:

- ❖ The routine inspection system is in place for all the structures, in Pre-Monsoon and Post-Monsoon Season.
- ❖ All Civil structures including Dam, Spillways, embankments, energy dissipation system and working of Hydromechanical components like Gates, stop logs, trunnions etc. is regularly inspected.
- ❖ The various instruments are installed at all critical locations for capturing Hydrometeorological, Geo-Technical & Geodetic data for observing any movements, distress and also for the routine data collection involving measurement of water flow, wind, rainfall data etc.
- ❖ The study of above does not indicate of any movements/ distress in the structure.

Breakdown History

There has been no major damage noted in the plant that could have caused loss of generation or major breakdown. The insurers have been notified of some damages between 2016-2018 but all of them have been minor and well below deductible. The damages due to landslides / flash floods primarily have been to road works & have not hampered the generation.

The generation data & operation data of the plant revealed that generation as well as plant availability factor in last 5 years have always exceeded the respective annual targets.

Probable Maximum Loss (PML)

The generation data & operation data of the machines was studied.

A	Natural Calamity
	PML – Flood
	= INR 1,022.00 Crores
	PML – Earthquake
	= INR 2,137.00 Crores
The PML for BI Shall be in addition to this and can go up to complete indemnity period of 12 months (INR 594.60 Crore)	
B	Machinery Breakdown
	PML For Breakdown damage & Business Interruption
	= INR 355.00 Crores
C	Fire & Allied Perils
	PML for Material Damage & Business Interruption
	= INR 879.00 Crores

Conclusion

- ❖ Teesta-V has been designed for a probable maximum flood (PMF) of 9,500 m³/s. In 2011, CWC revised this to 14,596 m³/s.
- ❖ However, the maximum flood recorded over the past 20 years was 3,397m³/s, in 2002.
- ❖ NHPC is monitoring and is conducting safety inspections of the dam and other infrastructure on a regular basis. Emergency action and disaster management plans have been prepared to enhance emergency preparedness and response capacity.
- ❖ Site is well connected by road in all weather conditions and hence any hindrance in project material can be ruled out.
- ❖ The housekeeping in and around the plant is upto mark.
- ❖ Overall, the project is well maintained and running satisfactory.

1. PREAMBLE

M/s NHPC Limited are major Hydro-plant operators in the country with over 20 plants in operations. All these plants have been insured in Mega Policy. The insurers / re-insurers in consultation with the brokers wanted the risk review of some of the plants.

After due discussions & defining the Scope of Work, we were appointed to carryout the Risk Inspections.

The virtual inspection was carried out at Teesta-V Power Station, East Sikkim District, Sikkim. During the course of inspection, various details of the project noted, discussions held and relevant data was procured. In addition, we have conducted several physical visits at the site on earlier occasions.

We gratefully acknowledge the kind co-operation of the following Insured's officials towards successful completion of this exercise.

1.1 At NHPC Corporate Office

Team from Insurance Cell including:

1. Mr. Ajay Jain : General Manager (Finance)
2. Mr. Praveen Ghansola : Deputy General Manager (Finance)
3. Mr. Sanjay Verma : Senior Manager (Finance)

1.2 At Teesta-V Power Station

Technical teams from Civil Engineering Division, Electro & Mechanical Division and Operations Divisions deputed by Plant head.

2. SCOPE OF WORK

Objective & Scope of Work

2.1 Objective

To carry out the Inspection and Risk Analysis of various Hydro Electric plants of NHPCs.

2.2 Scope of Work

The scope or work as envisaged and discussed with brokers. After complete feed back the scope was divided into following main sections:

1. General Review of Project Parameters
2. Operational History of Teesta-V Hydropower Plant
3. Overall Risk Review including but not limited to:
 - Electro-Mechanical
 - Civil & Hydro-Mechanical
4. Equipment Importance
5. Calculation of PML

3. ABOUT NHPC

NHPC Limited is the largest organization for hydropower development in India.

At present, NHPC Limited has an installation base of 7071.2 MW from 24 power stations including 02 Solar Plants on ownership basis including same projects taken up in Joint Venture.

The details of Operational Power Stations (Hydel) are as under:

Sl. No.	Name of Project	State/UT	Total Capacity (MW)
1	Baira Siul	Himachal Pradesh	180
2	Loktak	Manipur	105
3	Salal	UT of Jammu & Kashmir	690
4	Tanakpur	Uttarakhand	94.2
5	Chamera - I	Himachal Pradesh	540
6	Uri - I	UT of Jammu & Kashmir	480
7	Rangit	Sikkim	60
8	Chamera - II	Himachal Pradesh	300
9	Indira Sagar	Madhya Pradesh	1000
10	Dhauliganga	Uttarakhand	280
11	Kishanganga	UT of Jammu & Kashmir	330

Sl. No.	Name of Project	State/UT	Total Capacity (MW)
12	Dulhasti	UT of Jammu & Kashmir	390
13	Omkareshwar	Madhya Pradesh	520
14	Teesta - V	Sikkim	510
15	Sewa - II	UT of Jammu & Kashmir	120
16	Chamera-III	Himachal Pradesh	231
17	Teesta Low Dam - III	West Bengal	132
18	Nimmo-Bazgo	UT of Ladakh	45
19	Chutak	UT of Ladakh	44
20	Uri-II	UT of Jammu & Kashmir	240
21	Parbati - III	Himachal Pradesh	520
22	Teesta Low Dam - IV	West Bengal	160

3.1 Under Construction Hydro Projects

- ❖ NHPC is presently engaged in the construction of 6 projects aggregating to a total installed capacity of 5774 MW.

On Ownership basis:

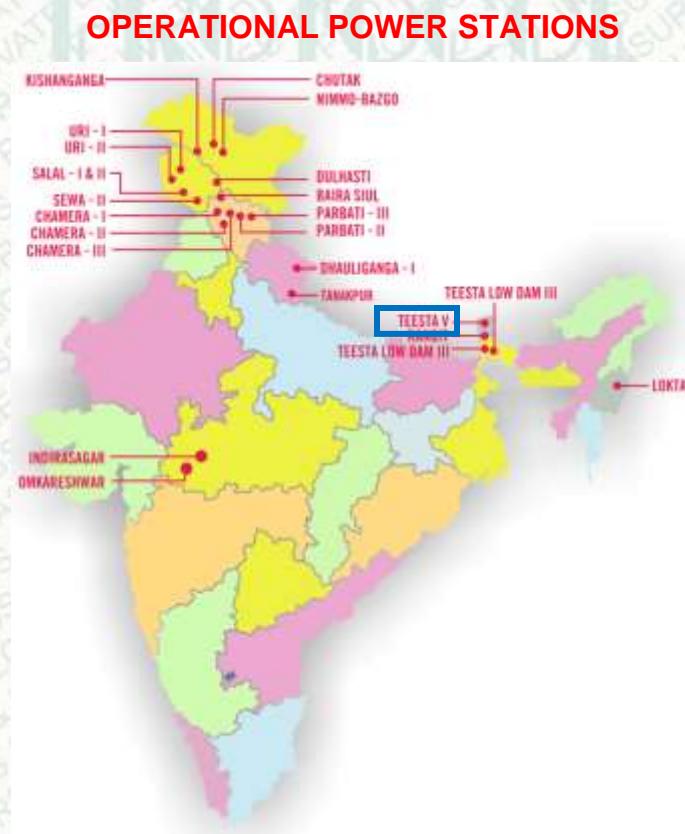
- 2000 MW Subansiri Lower HEP
- 800 MW Parbati-II HEP

Through Subsidiary/ JV Companies:

- 500 MW Teesta-VI HE Project
- 1000 MW Pakal Dul HE Project
- 850 MW Ratle HE Project
- 624 MW Kiru HE Project.
- ❖ In addition, 16 Hydro Projects with aggregate capacity of 10382 MW are under clearance stage which includes 10 Schemes of NHPC's own and 6 in JV mode. Further, 4 projects with aggregate capacity of 1628 MW are in survey stage.

3.2 Development of Geothermal Energy

The Ministry of Non-Conventional Energy Sources (MNES) has appointed NHPC Limited as a Nodal Agency for exploitation of Geothermal Energy in the country. The ranking studies of geothermal fields in India have been carried out through an International Consultant viz. M/s Geotherma Ex, USA.



4. ABOUT TEESTA-V POWER STATION

Teesta-V Power Station (3x170 MW) is a run of the river scheme with diurnal storage to harness the hydro power potential of river Teesta for peaking during the lean season and is located in the state of Sikkim and 110 KM from Bagdogra Airport by road route.

The project comprises of 88.6 m high Concrete Gravity Dam (located 2 Kms downstream of its confluence with Dikchu Nala) with three penstocks of length 321 m and 17.2 Km long Head Race Tunnel housed on left bank. The underground Power House is built near Sirwani with installed capacity of 510 MW houses 3 units of 170 MW capacity each designed to operate under the net rated head of 197 m and designed to generate 2573 MUs of energy in 90% dependable year with 95% machine availability.

The beneficiary states of this Power Station are Bihar, Sikkim, West Bengal, Orissa, Jharkhand and DVC with the construction of the project, the area is also benefitted by development of infrastructure, education, medical facility and employment avenues.

4.1 Date of Commissioning

Unit#1	:	28.03.2008
Unit#2	:	06.02.2008
Unit#3	:	20.03.2008

4.2 Date of Commercial Operation

Unit#1	:	10.04.2008
Unit#2	:	01.03.2008
Unit#3	:	03.04.2008

Generation Flow Chart



5. SALIENT FEATURES

Sl. No.	Features	Description
1	Location	
	State	Sikkim
	District	East Sikkim
	River	Teesta
	Latitude	27°23' 08" N
	Longitude	88° 30' 20" E
2	Hydrology	
	Catchment area	4307 Sq.km
	Design flood	9500 Cumec
3	Reservoir	
	Maximum reservoir level	EL 580.72 M
	Minimum draw down level	EL 568.00 M
	Gross storage	9.79 M Cum (Post monsoon 2011)
	Live storage	6.3 M Cum
4	Teesta Dam	
	Max. height above river bed level	52.2 m
	Max. height from deepest level	88.60 m
	Elevation of dam crest	EL 583.20 M
	Length of dam crest	176.5 m
5	Spillway	
	Crest of spillway	EL 540.00 M
	Type	Ogee shaped with gated sluices and flip bucket
	Design flood	9500 cumec
	Invert level of the gated sluices	EL 540.00 M
	Number and size of sluices	Five (Each 12.0m high, 9.0m wide)
	Energy dissipation	Flip bucket

Sl. No.	Features	Description
6	Intake Structure	
	Number size of inlets	Three of 6.5m x 6.5 m
	Discharge capacity	350.84 Cumec
	Invert level	EL 554.00 / 556.50 m
7	Desiliting Chamber	
	Length	250 m
	Number and size	Three; 19.7 m x 24.5 m
	Minimum particle size to be removed	0.2 mm
8	Head Race Tunnel	
	Diameter & Shape	9.5 m (finished) & Horse-shoe shape
	Discharge capacity	292.37 Cumec
	Length	17.2 Km
9	Surge Shaft (Concrete Lined)	
	Type	Semi underground (restricted orifice)
	Internal diameter & height	30.0 m & 90 m
10	Pressure Shafts	
	Number and type	Three vertical shafts steel lined
	Diameter (lined)	4.7 m
	Height	173.65 m
11	Underground Power House	
	Installed capacity	510 MW
	Dimensions of machine hall	22 x 117.5x 47.5 m high
	Dimensions of transformer cavern	14.5x 100.5 x 10.7 m high
	Type of turbine	Francis, vertical axis
	Number and capacity of units	3 of 170 MW each
	Gross head	215.33 m
	Rated net head	197 m

Sl. No.	Features	Description
12	Tailrace Tunnel	
	Tunnel shape	D-shaped, 3 nos
	Diameter (finished)	6.0 m x 5.52 m
	Length	165 m, 175 m & 185 m
13	Power Generation Figures	
	Installed capacity	510 MW
	Dry season peaking capacity	510 MW
	Annual energy production in a	2573 GWh

6. HYDROLOGY

Teesta-V is run-of- the river type of project in which waters of Teesta are being diverted by dam at Dikchu, 2km downstream of confluence of Dikchu Nala with Teesta River. The power house is located at Sirwani with an installed capacity of 510 MW.

An Upstream operational Hydropower Project named Teesta-III (1200 MW) is also built upon Teesta River with its Power House Situated at Mangan, about 50 km from the Dams Site of Teesta -V.

The river Teesta is one of the main Himalayan River originating in the glaciers of Northern Sikkim at an elevation of 8500m. Flowing generally in the southern direction the river drains the entire state before entering West Bengal at Sevoke near Siliguri. The river in its longest course on Lachen chu originates as Chemuo chu travelling westward which turns southward and is joined by Zemu chu on the right bank, Lachen chu further downstream is joined by Lachung chu at Chungthang.

The slope of the Teesta River upto confluence of Lachen chu and Lachung chu is very steep gradient, about 1 in 20. After confluence of Lachen chu and Lachung chu the river gradually increases in width and takes a wide loop flowing down to Singhik. The total catchment area upto the Teesta-V Dam site is 4307 sq. Km.

6.1 Climate and Rainfall Characteristics

The project catchment has its own climatic peculiarities caused by its geographical location, relief and altitudinal variation. The maximum and minimum temperature varies from 37° C in summer to 8° C in winter and the relative humidity varies from 40% to 100%.

The bulk of the total annual rainfall in the catchment occurs during the months of May to October. The average annual rainfall at Dikchu on basis of available data is 2544 mm.

6.2 Water Availability

The CWC approved water availability series at Teesta-V has been developed on the basis of observed discharges at Dikchu. The average annual runoff as per the approved water availability series is 7554 MCM.

6.3 Design Flood

A Probable Maximum Flood of 9500 cumec was recommended as design flood and later on Revised to 14596 Cumec by CWC (central water commission).

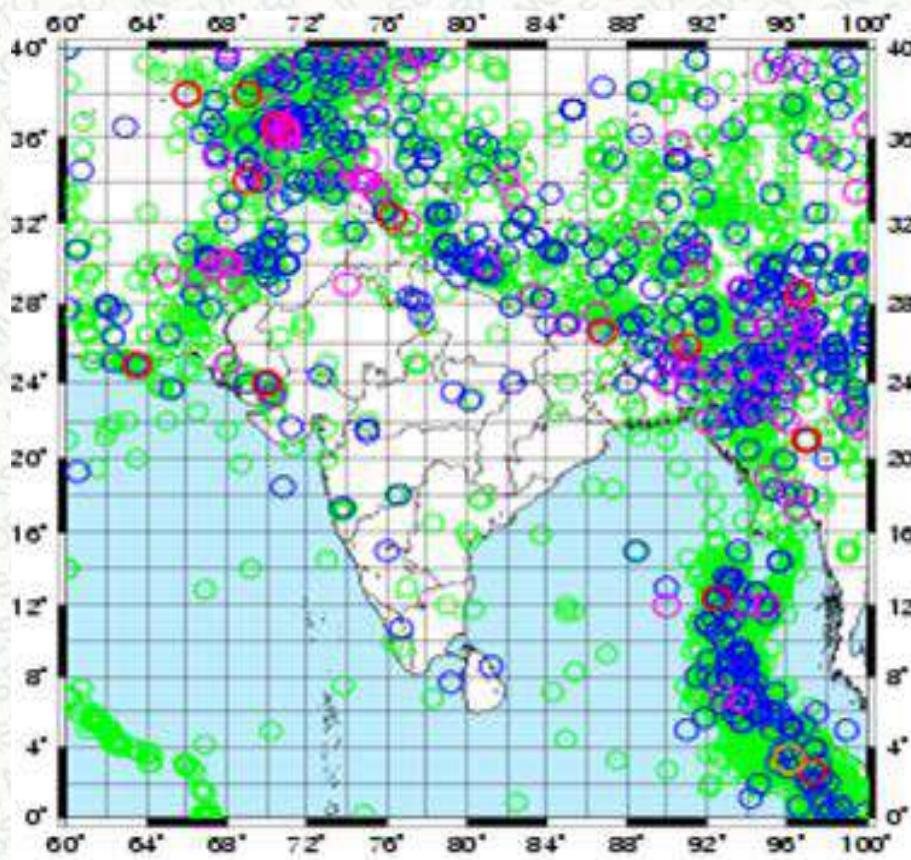
Some technical changes like raising a parapet wall on top of dam, and reactivating the diversion tunnels and rechecking the structural safety and stability analysis was proposed, however, further details in this regard are not available as yet.

7. SEISMOLOGY

Teesta-V Power Station falls in Zone – IV of Earthquake Sensitivity Zone.

Bureau of Indian Standards [IS-1893 – part – 1: 2002], based on various scientific inputs from a number of agencies including earthquake data supplied by IMD, has grouped the country into four seismic zones viz., Zone-II, III, IV and V. Of these, zone V is rated as the most seismically active region, while zone II is the least

SEISMICITY MAP: Seismicity of India (1505 to October, 2005) (M>5.0)



Courtesy : Website of India Meteorological Department, Govt of India

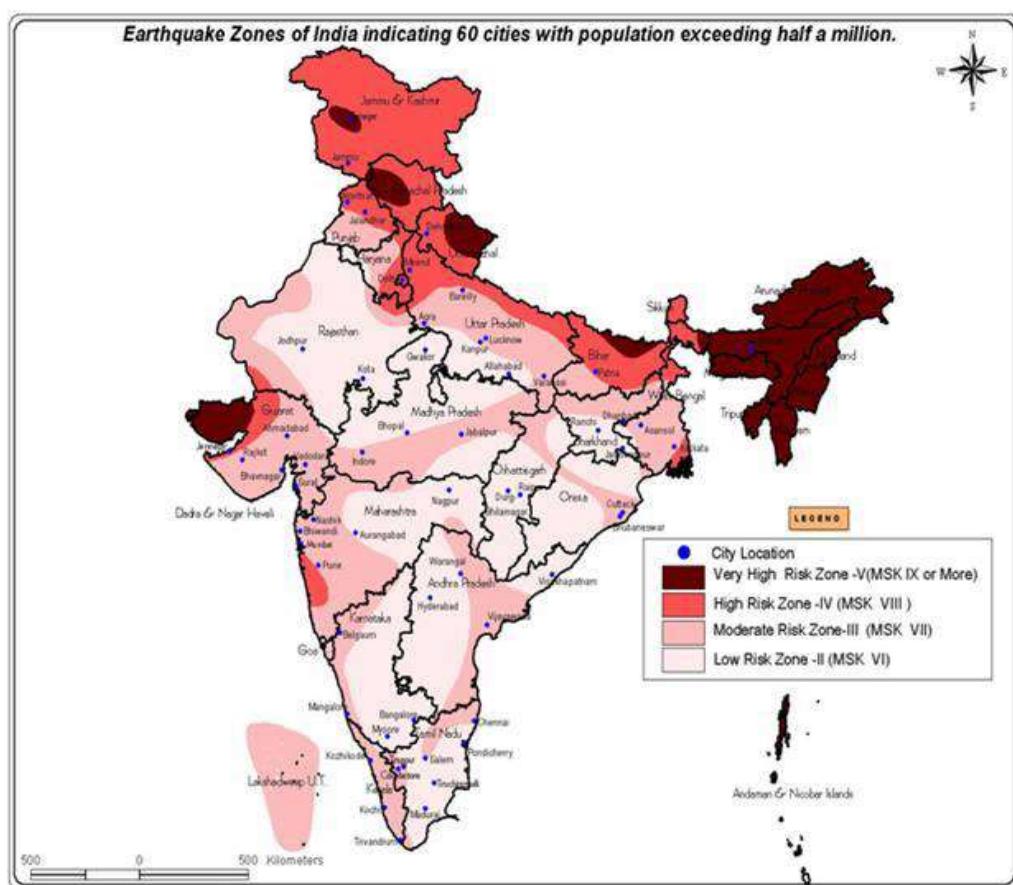
Magnitude

	5 - 5.9
	8 - 8.9

	6 - 6.9 7
	9 & above

7.9 8

Map of Earthquake Zones of India



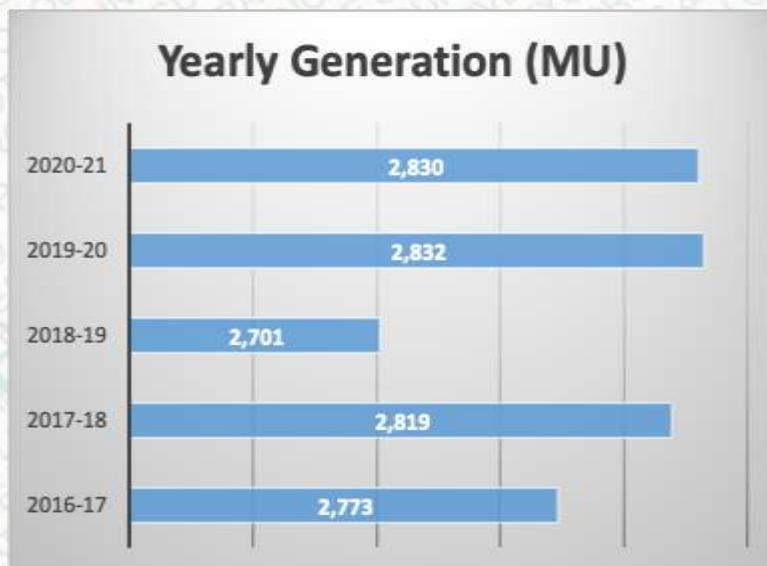
8. OPERATIONAL HISTORY

The project was commissioned in 2008 (first unit on 28.03.2008, second on 06.02.2008 and third in 20.03.2008).

The operational data of the plant from Financial Year 2016-17 onwards was studied and the summary of same is as under:

Performance at a Glance

Sl. No.	Year	Yearly Generation (MU)
1	2016-17	2,773
2	2017-18	2,819
3	2018-19	2,701
4	2019-20	2,832
5	2020-21	2,830



The generation summary for year 2020-2021 was also procured, the details of which are as under:

SI No.	Month	Generation (MU)
1	April 2020	189.635
2	May 2020	309.574
3	June 2020	355.622
4	July 2020	370.606
5	August 2020	385.069

SI No.	Month	Generation (MU)
6	September 2020	373.379
7	October 2020	317.682
8	November 2020	161.541
9	December 2020	107.353
10	January 2021	83.970
11	February 2021	68.960
12	March 2021	106.397

The study of plant maintenance was done and following was observed:

- ❖ There has been no major breakdown of Plant & Machinery in last 3 years.
- ❖ The power generation has not been hampered (except for on some occasions due to very minor issues & that too for short period) due to any mechanical problems.

As a routine measure, all the 03 machines are taken-up for annual maintenance one-by-one during the lean Flow Season (November – February) each year.

9. CIVIL & HYDRO MECHANICAL - GENERAL OBSERVATIONS

Based upon our inspections and discussions held with site officials, it was noted that regular inspections are held at the Power station for general conditions of all components of project.

Major inspections are held bi-annually i.e. pre and post monsoon. In addition, state bodies and Central Water Commission (CWC) also seek regular reports from NHPC regarding the respective power stations.

With regard to Teesta-V Power Station, the observations are as below:

9.1 Reservoir

- ❖ No signs in decline in water quality & recent sediment deposition.
- ❖ There is no indicator of major active or inactive landslide area in the reservoir rim.

9.2 Dam & Dam Block/Reach (Concrete/Masonry)

9.2.1 Upstream Face

- ❖ There is no evidence of surface defects (honeycombing, staining, stratification).
- ❖ There is no concrete / masonry deterioration (spalling, leaching, disintegration).
- ❖ There is no cracking (structural, thermal, along joints).
- ❖ There is no evidence of differential settlement (displaced/offset/open joints).
- ❖ No damage to joints and/or water stops is observed.

9.2.2 Crest of Dam

- ❖ No evidence of differential settlement (displaced/offset/open joints).
- ❖ No cracking (structural, thermal, along joints).

- ❖ No degradation to access road & upstream parapet or downstream curb wall.

9.2.3 Downstream Face

- ❖ No surface defects (honey-combing, staining, stratification) & concrete/masonry deterioration (spalling, leaching, disintegration).
- ❖ There is no cracking (structural, thermal, along joints)
- ❖ No evidence of differential settlement (displaced/offset/open joints).
- ❖ No damage to joints and /or water stops.
- ❖ No seepage/sweating at any location on downstream face.

9.2.4 Abutment Contacts

- ❖ Leaks, springs or wet spots in the vicinity of abutment is present as seepage from left bank at RD 40m downstream at EL. +565m near abutment.
- ❖ No cracking or settlement.

9.3 Gallery/Shaft & drainage (concrete/masonry)

There are no Slushy conditions or water logging immediately downstream of dam.

9.3.1 Gallery/Shaft Condition

- ❖ No problem in accessing or inspecting gallery/ shaft (obstruction).
- ❖ No Safety issues (inadequate handrails, lighting or ventilation).
- ❖ There is the problem of inadequate drainage (slippery stairs, water logging of gallery, clogged porous of foundation drains). Clogged Porous Drains were being cleaned by drilling for their functionality.
- ❖ No differential settlement (displaced/offset/open joints).

- ❖ There is no excessive seepage/sweating at any location along gallery/shaft)
- ❖ Minor leakage from right bank drift in R-1 block and rock interface observed at EL. 529.22m moderate leakage from left bank drift at EL.529.22m observed. Quantum of water is monitored regularly by V-notch in Gallery-C.

Data at reservoir level 575 M are as follows:

- EL 499 (u/s) : 1.80 lps
- EL 499 (d/s) : 0.35 lps
- EL 529.22 (R/B) : 1.90 lps
- EL 529.22 (L/B) : 8.40 lps
- ❖ Seepage is measured by V-notch at 4 locations in foundation galleries. There is no significant leakage from the porous drains and monolith joints.
- ❖ No substantial progressive reduction in the seepage through the foundations.
- ❖ Clogged Porous Drains were being cleaned by drilling for their functionality.
- ❖ PH-7.27, Chloride-14.87 mg/l, Dissolved solids-167 mg/l Calcium Hardness-19.4 mg/l. As per test conducted in April 2021.
- ❖ No Leachate deposition.

9.3.2 Drain Condition

- ❖ No calcium or other deposits in drain.
- ❖ Dewatering pumping station is fully operational.
- ❖ No deterioration of pump & associated equipment.
- ❖ The sump well is clean & maintained.
- ❖ The V notch before sump well is clean & maintained.

9.4 Body wall (masonry/concrete) of 'NOF' Dam and Spillway

- ❖ Minor seepage observed from porous drains. Porous drains were being cleaned for their intended use.
- ❖ Minor leaching & deposition was observed at few locations in foundation gallery.
- ❖ The samples of the seepage water and reservoir water being regularly tested for reactive & corrosive properties.
- ❖ No swelling & cracking is observed on the downstream face especially near the points of concentration of stress like the toe or locations of abrupt change in geometry of the face of the opening.
- ❖ The pointing on upstream face of the dam is in good condition.
- ❖ Seepage is measured by V-notch at 4 locations in foundation/dam galleries. Porous drains were being cleaned for their intended use.

9.5 Structure performance of the 'NOF' & 'OF' portions of Dam Foundation.

- ❖ No Excessive deflection with respect to permissible deflection at the time of design.
- ❖ No tendency of gradual sliding.
- ❖ No cracking & upheaval or settlement in any part of the body wall or foundations.
- ❖ No Excessive uplift.
- ❖ No Excessive seepage and leaching through the body of the dam and the foundation.

9.6 Spilling & Energy Dissipation Structure

9.6.1 Spillway

- ❖ Moderate damages were seen from trunion beam elevation in some part of the glacis & pier reinforcement near radial gate sill beam in bay S1 & S3. Bay No. S2 & S5 were repaired with steel liner in 10m stretch d/s of radial gate sill beam. Steel liner works in bay S1, S3 & S4 have also been completed during this season.

- ❖ There are no displaced, offset or open joints.
- ❖ There is no cracking (structural, thermal, along joints) and any surface defects (honeycombing, staining, stratification).
- ❖ No damage to joints and or waterstops is observed.
- ❖ There is no seepage/sweating at any location on spillway glacis.

9.6.2 Energy Dissipation Structures

- ❖ No obstructions in or immediately downstream of dissipation structure & same filled water in plunge pool.

9.7 Intake / Outlet & Water Conveyance Structure

9.7.1 Intake / Outlet Structure

- ❖ There is no Evidence of structural distress (displaced/offset/open joints, cracking).
- ❖ There is some evidence of surface defects (honeycombing, staining, stratification).

9.8 Hydro-Mechanical Components & pump

9.8.1 Spillway gates (Radial gates, vertical lift gates, Automatic gates)

- ❖ Leakage was observed from damage seal of radial gate #1 & 2 in the rubber seals.
- ❖ All the following structural members were found to be satisfactory:
 - Gate leaf and stiffeners
 - End arms
 - Trunnion girders/ Yoke girder
 - Stop logs
 - Lifting beams
 - Gantry cranes
 - Tracks
 - Trunnion bracket
 - Chains/wire ropes
 - Bridge structure

9.8.2 Hoists, Cranes and Operating Mechanisms

- ❖ The Hoists are working satisfactorily.
- ❖ Alternative power system for gate operation working properly as dam electrical system charged/standby with 2 nos 500 KVA DG set & 2 no. 11 KV transmission line are available at dam site. However, 01 number DG set is found under repair.

9.8.3 Spillway, Bridge, Hoist Bridge, Trunnion Level Bridge Catwalk

- ❖ The decking, girders and structural supports of Spillway Bridge, Hoist Bridge, trunnion level bridge and catwalks are structurally sound & RCC Bridge.
- ❖ Parapet or railing over the bridge is sound, safe and painted.
- ❖ The track rails for gantry cranes are structurally sound & intact.

9.8.4 Valves

- ❖ There is no problem in inspecting valve.
- ❖ There are no obstructions in preventing or impairing smooth operation.
- ❖ There is no deterioration of valve & associated equipment.

9.8.5 Trash Racks and rack cleaning machines

- ❖ The trash rack is fixed and the cleaning mode is TRCM.
- ❖ No deterioration of equipment (wheel trolleys, gantry structures, operating mechanism, connecting bolts, welds, surface, paint work).
- ❖ There is wear or damage to wire cables & other moving parts.

9.9 Access Road

- ❖ There is properly constructed and well-maintained all-weather access road to the dam site. The access road to Dam top at few locations are found to be sinking. Periodic maintenance is required to keep the road accessible always.
- ❖ The pavement of access road is of cement concrete & PCC.

9.10 Instrumentation

- ❖ There are no problems in ensuring correct functioning of instrument (lighting, ventilation).
- ❖ No evidence of degradation to condition of instrument (rusting, vandalism).
- ❖ Most of the instruments are working satisfactorily and reading are taken regularly.

9.11 Communication facilities

Wireless Telephone/mobile/Fax/Internet is available at dam site.

List of Various Instruments Installed on Dam

Sl. No.	Name of Instrument	Nos.
1	Multi Point Borehole Extensometer-1	10
2	Pore Pressure Gauge Vibration type	5
3	Stress-strain set I/c Pore Pressure Gauge	6
4	Uniaxial Joint Meter (Electronic Type)	14
5	Perimetric Joint Meter vibrating type	11
6	Temperature Meter (vibrating type)	18
7	Pendulum (Mechanical)	2
8	Uplift Measuring stand pipe hydraulic	6
9	V Notch (Mechanical)	4
10	Strong Motion Accelerograph (3 No.) (Electronic Type)	3
11	Survey Instruments	9
12	Survey Points (Mechanical)	6
13	AWS (Electronic type)	1

10. CIVIL & HYDROMECHANICAL RISK REVIEW & PREVENTIVE MEASURES

Hazards in power stations can be due to:

- Flood /cloud burst
- Fire / explosion
- Earthquake
- Landslides / slide prone area
- Terrorists threats / attacks & Sabotage
- Bomb threat and bomb explosion
- Disruption in power supply,

10.1. Hazards

10.1.1 Flooding at Dam

Teesta River on which the dam is located is originating from Cho Lamo Glacier in the Himalayas. This river is prone to floods in the monsoon season commencing from 1st May to 31st October, due to various reasons viz. heavy rains, occasional cloud burst, landslides, etc.

10.1.2 Hazards – Landslides/ Snow falls

The Teesta-V Power Station lies in the Himalayan area, as the area is prone to heavy rain falls/ snow falls, especially during the monsoons and earthquake, the occurrence of landslides at different locations is a common phenomenon.

Damages due to landslides:

- ❖ Landslide in reservoir areas causing flood.
- ❖ Road blockade due to landslides.

The various roads viz the Power House to Dam site and other sites are prone to damages often leading to road blockades and thereby cutting off essential supplies.

10.1.3 Hazards – Earthquakes

It is well known that damages due to earthquake at a location depend not only on the earthquake size and distance of the earthquake source, but also on the local site conditions. Hazard maps are essential for the comprehensive understanding of spatial and temporal occurrences of natural calamities. When an area is exposed to hazards, a map helps the planning team to analyze it for vulnerability/risk and will be useful in the decision-making process. The hazard maps play a vital role in planning of new development projects as well as in incorporation of hazard reduction technique into existing developments.

Teesta-V Power Station lies in seismic zone-IV and is prone to earthquake.

10.1.4 Hazards – Bomb/ Terrorist Threat, Terrorist Attack, Strike, Violent Agitation, Sabotage, Hindrance in power supply, Cyber Attack

Teesta-V Power Station is situated in the district East-Sikkim of the State of Sikkim. Looking forward to the security conditions of the National interest, there is a constant threat to the electricity producing installations by the anti-national elements, etc. Hence, there is a necessity to have a Crisis and Disaster Management Plan. The main aim to have this plan is to prepare the installation to counter the possible danger, so that different agencies within the power station function in full co-ordination.

Below mentioned emergency conditions are possible in the installation:

- ❖ Terrorist attack or attack on the security personnel.
- ❖ Bomb attack & bomb threat.
- ❖ Strike by the employees
- ❖ Violent agitation.

- ❖ Destruction due to any reason and subsequent hindrance in the power supply.
- ❖ Local law and order problem.
- ❖ Cyber attack.

10.2 Preventive Measures

10.2.1 Flooding at Dam

Teesta Dam has been designed for a probable maximum flood of 9500 cumecs. The five nos. of gates at dam are designed for passing a continuous flow of 9500 cumec each.

As and when the river discharge crosses the limit of 500 cumec and sustains for a considerable period with rising trends, the river shall be considered under flood. It has also been observed that during the peak summer period i.e. in May & June due to snow melt coupled with weather disturbances, the river discharge increases suddenly, often leading to flood like situation.

10.2.2 Prevention and Mitigation of Hazards – Landslides/ Snowfalls

The landslide prone areas are being surveyed before the onset of monsoon and necessary preventive measures are undertaken.

Preventing Measures: Retaining & Breast Walls, Cross Drainage, Nallah Training Works and Cause Ways have been provided to take care.

Dam (Civil) division shall be responsible for restoration of road blockade due to landslides. Resources like Portable Air Compressor, Dumpers, Wheel Dozer, Wheel Loader all should be parked at Central workshop which can be used for restoration of road communication.

10.2.3 Seismic Design Parameters for Power Station

The seismic design parameters for Teesta-V power station have been adopted after detailed study of information on the tectonic models of the Himalayas and past history of earthquakes in the power station area.

Based on the data of earthquake occurrence and geological and tectonic set up of the area, the seismic risk at power station area in terms of peak ground acceleration from has been evaluated and the following values have been adopted for the design of the power station:

- ❖ Horizontal Peak ground acceleration of 0.16 g.
- ❖ Vertical Peak ground acceleration of 0.32 g.

10.3 Hydro-Mechanical

- ❖ Provision of independent gate with dedicated gantry for each opening of penstock (s)/pressure shaft (s) in surge shaft may be considered.
- ❖ Provision of independent gate with dedicated gantry for each Draft Tube shall be considered.
- ❖ Outfall structure of TRT shall be planned with suitable gate to prevent reverse entry of flood water from the river.
- ❖ Stop logs shall be parked near location of the gates, if possible, so as to avoid the time delay in transportation of same during emergency.
- ❖ Provision of standby DG supply of sufficient capacity shall also be made for operation of various gates.
- ❖ Regular preventive checks/maintenance of HRT, surge shaft draft tube. TRT, bulk head gates & associated seals and their water away from Power station.

10.4 Emergency Preparedness

- ❖ Emergency Action Plan (EAP) prepared for the dam as per the national guidelines& same is found satisfactory.

- ❖ Emergency Action plan was issued in February 2019.
- ❖ Inundation maps are updated and available to concerned authorities.
- ❖ Concerned authorities are informed about the system of emergency reporting procedure and warning.
- ❖ Villagers on the right bank are allowed to use Dam top road.
- ❖ The stakeholder consultation meeting along with mock drill exercise conducted annually.
- ❖ EAP disseminated to all the concerned stakeholders.



11. PERIODIC MAINTENACE - TURBINE

Periodic maintenance (Daily Checks, Weekly Checks, Monthly Checks and Annual Checks) of Turbine is carried out in the project as per associated vendor's guidelines, which are as under:

The units are subject to Daily, Weekly & Monthly check as under:

Items	Daily Checks	Weekly Checks	Monthly Checks	Annual Checks
Penstock	---	---	---	Calibrate penstock pressure gauge.
Spiral Casing	Check Water pressure below head cover before and after upper stationary labyrinth / wearing ring. Check spiral case man hole for water leakages, if any Check leakage from spiral casing drain valve.	---	---	Check/lubricate spiral casing drain valve. Check and ensure the spiral casing inlet pipe Flange connecting the spiral casing to the MIV s correctly assembled & secure. Calibrate spiral casing pressure gauge. Visual inspection of spiral casing, stay ring, stay vanes, bottom ring for corrosion, cavitation damage etc. Take remedial measure if required.
Draft Tube	Check any abnormal vibration & noise coming from draft tube. Visually check draft tube lower cone/ upper cone joint assembly for all mechanical & structural equipment and mounting for slackness, cracks or leakage. Check leakages from draft tube man-hole door.	Check draft tube pressures.	Check leakage at the flanges of the discharge ring / bottom ring / pivot ring and draft tube cone.	Check for cavitation, erosion, cracks in weld joint & any other damages in draft tube cone, elbow and discharge ring. Check and grease draft tube drain valve.
Pressure Balance Pipe	Check any leakages in the balancing pipes.	---	---	Visual inspect the balancing pipe work.
Top Cover	---	---	---	Check top cover for erosion, corrosion and cracks in weld joints.
Turbine Pit	Check for unusual /water leakages.	---	Clean up any oil in the turbine pit. Check drainage hole and accumulation of water.	

Items	Daily Checks	Weekly Checks	Monthly Checks	Annual Checks
Bottom Ring / Lower Ring / Pivot Ring / Discharge Ring	Check for unusual leakages under the bottom cover.	---	---	Check for erosion, corrosion and cracks in welds in bottom cover and liner.
Runner Assembly	---	---	---	Measure runner clearances & keep record of the clearances. Check runner blades, cone and hub for cavitation erosion, cracks in weld portion and any other damage.
Turbine Shaft	Check vibration trend for the day.	---	Check vibration trend for the month.	Check coupling cover bolts for its tightness. Check wobbling of shaft by measuring shaft throw. Check fatigue cracks in shaft and paint finish. Check unit axis alignment. Check rusting of shaft. Check journal for scouring pit-marks and dis-colouring.
Turbine Guide Bearing	Check vibration trend of the bearing housing for the day. Check turbine guide bearing oil level & replenish, if required. Check & analyze any temperature change of TGB pads/shell & oil for last 24 hours that is not attributable to normal operation under load conditions. Check for oil leakage from TGB housing. Check cooling water flow and pressure to oil.	---	Check temperature trend for the month. Check vibration trend for the month.	Check for oil leakage from TGB housing. Filtration, centrifuging and testing of the bearing oil for Viscosity, foaming tendency, contamination, moisture content etc. Inspect and clean bearing housing. Top up with clean oil and check for oil leakages from. Clean & check the babbitt metal of guide bearing pads / shell for scouring, lard spots or cracks. Measure the pre dismantling guide bearing clearance. Adjust the clearances and remove play, if any in pads. Measure final bearing clearances. Check Bearing housing bolts for any looseness and cracks in bearing housing. Calibration of RTDs & TSDs. Testing of all alarm & trip circuits by simulating the conditions.

Items	Daily Checks	Weekly Checks	Monthly Checks	Annual Checks
Turbine Shaft Seal	Check for excessive water leakage from shaft seal, if any. Check shaft seal cooling water pressure.	---	Record & keep log of shaft seal wear readings where wear indicators are given.	Test all alarm circuits by simulating alarm condition. Check looseness of bolts and nuts of shaft sleeve. Check condition of shaft sleeve for wear & if required replace it. Check shaft seal cooling water system.

Based on above schedule, the periodic maintenance are carried out and data captured. The plant undergoes major Annual checkup maintenance schedule in lean flow season which normally falls between November & February months.

Each unit is taken-up for maintenance one by one.

The data for maintenance schedules during the previous years were studied and it was noted that the plant had undergone all listed periodic check-up.

During last maintenance check-up between November 2020 & February 2021, the following major activities were carried out:

Component Name	Activity
Upper Draft Tube Linear	: No damage noted. Cleaned & Repainted.
Discharge Rings	: Wherever the Wearing Ring / Labyrinth was eroded, same have been replaced. Some Mild Steel Portion welded & grinded.
Runner Cone	: Some Minor repairs & Cleaning
Runner	: Out of 3 Units, Runner of two Units were replaced. Besides wherever the other minor damages were observed, same were rectified by welding & grinding.
Guide Vanes	: Wherever the Plates, Rings and Bushes were damaged for Bottom Ring, Head Cover facing Plates and Head Cover Wearing Ring were replaced with New Ones. The repairs in terms of Welding & Grinding wherever required have been carried out.

Component Name	Activity
	Guide vanes of the units have been replaced which had major erosions while the Guide Vanes with minor erosions were repaired.
Shaft Sleeve & Seal	: The Sleeves, Packing's were found affected & have been replaced. The shaft sleeves were found sound.
Pads : TGB, UGB, LGB & TB	: The pads were found to be in good conditions. These were cleaned & polished.
Stator & Rotor	: The test values, impendence test all were found to be in permissible limits. All terminals, Winding, Bolts, Coolers etc. were checked cleaned & found OK.
Excitation System	: The excitation system was found to be sound. This was cleaned.
Governor	: The Governor was inspected & its condition was found to be in order. Filter of Oil & Clearing was done.
Generator Transformer	: One no GSU transformer of one phase was faulty and hence replaced with spare transformer. All other transformers were tested and found in SOUND condition.
GIS + XLPE Cables	: GIS hardware & associated foundation works were checked & cleaned. All tests were carried out & rectifications wherever required was done.

It was noted that due to high silt levels in water, there is regular erosion of components. These components including runners, guide vanes etc. are regularly inspected and replaced.

Overall maintenance standards of the machinery and plant as a whole was good. The critical spares are in place. Although the suppliers of major equipment are Toshiba Japan, but it is ensured that supply of components in case of emergency is not hampered.

Breakdown History

There has been no major damage noted in the plant that could have caused loss of generation or major breakdown. The insurers have been notified of some damages between 2016-2018 but all of them have been minor and well below deductible. The damages due to landslides / flash floods primarily have been to road works & have not hampered the generation.

The generation data & operation data of the plant revealed that generation as well as plant availability factor in last 5 years have always exceeded the respective annual targets.



12. RISK REVIEW - ELECTROMECHANICAL RISK REVIEW & PREVENTIVE MEASURES

Hazards in power stations may happen due to occurrence of the following events:

- Fire / Explosion
- Flood / Cloud Burst
- Leakage in power house and other underground structures, etc.

Due to these events, following hazards/ risks may occur:

12.1 Hazards

12.1.1 Hazards – Fire/ explosion & Accidents

The power house is more prone to high hazards due to fire owing to storage of large volume of oils, lubricants etc., suffocation and limited outlets (for smoke & human being). The cause of fire may be due to failure of protection system of generator or failure of insulation.

The transformers are also prone to hazard like fire & explosion. The cause of fire may be due to failure of transformer winding, high oil temperature or failure of protection system of transformer.

Other likely prone areas are switchgear rooms, cable galleries, GIS, switchyard, etc.

12.1.2 Hazards – Floods

- ❖ Average inflow of last 24 hrs is calculated based on Power House Generation and change in reservoir level plus spillage.
- ❖ In addition, information regarding Teesta Ravi River discharge is also being monitored regularly from G&D site at Lachen, Lachung, Chungthang, Sanklang, Dikchu (Dam axis I and 14th mile) Sirwani.

- ❖ Information regarding any sudden change in discharge in u/s tributaries is also collected from Teesta-IV and Teesta-III H.E. Project.

12.1.3 Flooding in Power House

Following are the possible situations that can lead to flooding of Power House:

- ❖ Invert of main access tunnel / road of Power House portal is EL 380 m. It is feared that flood water may enter the Power House through Access Tunnel / road from river or any other source.
- ❖ The turbines of the Power House are designed for 5000 PPM of silt content in water. Beyond this limit, excessive silt in the water may damage shaft seal resulting in back flooding of the turbine pit.
- ❖ Heavy leakages from any point connected with water conductor system.
- ❖ Failure of pumps/ Power Supply to the pumps for longer duration.

12.2 Preventive Measures

12.2.1 Prevention And Mitigation Of Hazards – Fire & Accidents

For prevention and mitigation of fire hazards, Safety wing is in place. This wing is responsible for operation of fire control room 24x7, handling of any fire situation. Other duties of the Safety wing will be as under:

- ❖ To ensure the refilling of different types of fire extinguishers as and when required by any departments with the help of Central Store.
- ❖ To check the fire buckets filled with the sand.
- ❖ Availability of fire gadgets and apparatus.

- ❖ Fitness and operational check of fire tenders with the help of central workshop.

12.2.2 Safety Measures available at the Power Station

The following are some of the essential safety measures to be implemented in the power stations:

- ❖ Provision for smoke and heat sensors and other modern electronic aids in the sensitive and fire prone areas.
- ❖ Installation of integrated CCTV system to monitor and untoward happening in the cable gallery and other fire prone areas.
- ❖ Regular checking of fire headers and fire alarms.
- ❖ Provision of portable fire extinguishers at fire prone places.
- ❖ Identification and display of escape routes.
- ❖ Periodic review of the fire fighting arrangements by an independent and qualified fire fighting authority to plug loopholes if any.

12.2.3 Preventive measures for Power House in case of Fire

Fire prone areas in the powerhouse are identified and the following preventive measures are being taken to avoid major fire accidents:

- ❖ Regular checking of smoke & fire detectors and Emulsifier system. Automatic oxygen level measuring devices are to be installed at the various locations in the underground area.
- ❖ Maintaining of adequate spares, inventory of items which are most likely to be destroyed in case of minor fire, identifications of spares which cannot be procured in short duration, identifications of spares which can be procured from local markets. Availability of spare cable specially jointing kits has to be ensured.

- ❖ Identification of escape routes and assembly areas at different critical places like transformer gallery, knee liner floor, cable tunnel and machine floor area, have been displayed at different locations of the Power House and Switchyard etc. The escape routes displayed are essentially done using glow sign boards which are visible in darkness (in case of power failure).
- ❖ Minimum oil quantity is stored inside Power House. From time to time, cleaning of the storage area of oil in the power house is being ensured. Only bare minimum inflammable gases are being kept in the power house at designated locations. First Aid Box is kept in stock in a proper/ open place for use in emergency.
- ❖ In case of Fire, lift is not to be used. Further all Air Conditioners & Ventilation System should be switched off in case of Fire.

12.2.4 Preventive action plan for fire at different locations in fire prone areas of Power House.

12.2.4.1 Generator

Periodic testing of generator, its protection relays and Sprinkler Fire System are being done.

12.2.4.2 Transformer

Periodic testing of transformers and its protection system are done.

12.2.5 Action Plan in case of fire in Main Electrical Equipment:

- ❖ Emergency shut down all generating units.
- ❖ Trip, all running generator breakers, all line breakers and field breakers.
- ❖ Stop the machine mechanically by applying brakes.

- ❖ Emulsifier system as provided for fire extinguishing of transformers& Generator must be operated manually if not operated automatically.

Follow Evacuation guidelines :

- In case of emergency, the main controller shall declare emergency. The evacuation, head count and other necessary arrangements will be performed under the guidance of Security in-charge. Alarm (sirens) will be raised by the switch board operator (security) on the main gate after receiving instructions from main / incident controller. Besides, to alert other people during the emergency, people have been instructed to run to various departments shouting voices relating to the type of emergency situation.

12.2.6 Prevention and Mitigation of Hazards – Flood

12.2.6.1 Flooding in Power House

Preventive Measures for Flooding in Power House:

- ❖ Silt content in water at intake at Dam during floods is to be checked regularly. In case of continuous flood, if silt content exceed permissible limit (5000 PPM), the machines are to be stopped.
- ❖ It is necessary that all spillway gates and mechanical equipments for operating the gates be thoroughly inspected before the start of monsoon every year.
- ❖ Inflow data should be strictly monitored.

Dedicated dewatering pumps of adequate capacity are installed in the power station.

Following dewatering pumps are available in pump house to tackle any flood situation.

Sl. No.	Description of Dewatering Pumps and Capacity	Qty.	Location	Use
1	Grundfos SUBMERSIBLE PUMP 115 KW	3	Power House	Dedicated
2	Grundfos SUBMERSIBLE PUMP 30 KW	1	Power House	Dedicated
3	Grundfos SUBMERSIBLE PUMP 22 KW	3	Power House	Dedicated
4	Darling Dredging SUBMERSIBLE PUMP 30 HP	1	Power House	Dedicated
5	Aqua SUBMERSIBLE PUMP 150 HP	2	Power House	Dedicated

12.3 Electro-Mechanical

- ❖ Hourly monitoring of inflows and silt levels (PPM) are carried out during complete monsoon/high inflows period especially in case of silt prone projects/Power stations. Websites of weather predication agencies are regularly assessed for additional requisite data.
- ❖ Fixed type public address system and Siren (along with audio-visual devices at suitable locations, if required) for covering the complete project/Power station area are provided.
- ❖ System is built up for proper liaising with local bodies for sharing information regarding inflows, any blockade in upstream of dam and sudden release of water etc. Directory of contact numbers of key persons of civil administration, police/ambulance, fire station, etc. available with the project.
- ❖ Periodical Training programme for the operating personnel on “Flood prevention of Power station” conducted to enhance their alertness and effectiveness during such exigencies.
- ❖ Requisite number of Earth Moving Equipment e.g. Loader/Excavation and Dumpers etc. made available depending upon the flood related threat perception.

12.4 GENERAL

- ❖ Hourly monitoring of inflows and silt levels (PPM) are carried out during complete monsoon/high inflows period especially in case of silt prone projects/Power stations. Websites of weather predication agencies are regularly assessed for additional requisite data.
- ❖ Fixed type public address system and Siren (along with audio-visual devices at suitable locations, if required) for covering the complete project/Power station area are provided.
- ❖ System is built up for proper liaising with local bodies for sharing information regarding inflows, any blockade in upstream of dam and sudden release of water etc. Directory of contact numbers of key persons of civil administration, police/ambulance, fire station, etc. available with the project.
- ❖ Periodical Training programme for the operating personnel on “Flood prevention of Power station” conducted to enhance their alertness and effectiveness during such exigencies.
- ❖ Requisite number of Earth Moving Equipment e.g. Loader/Excavation and Dumpers etc. made available depending upon the flood related threat perception.

12.5 RESTORATION OF HYDRO POWER PLANT AFTER FLOODING

In the unfortunate event of any unforeseen failure, implementation of the following system is in place for faster restoration of the project / Power station:

- ❖ The first priority is to evacuate the trapped persons from the project/power station. Instruments, Electronic cards of important panels and other devices & equipment which can be easily removed may be taken out simultaneously, if possible.
- ❖ Immediate action will be taken to dewater the Power station. Simultaneously, the source of flooding shall be identified, e.g., major leakages from civil structures, leakages through intake, TRT gate, etc.

The source of flooding shall be blocked by lowering of intake, draft tube/TRT gates etc. to stop the ingress of water to the Power station despite identification of the source, the services of divers shall be arranged on top priority of rectification of the trouble spot like faulty gate seals, cracks in concrete etc.

- ❖ A control room, for the restoration/refurbishment of plant shall be set up where all the information regarding management of flooding shall be available.
- ❖ The damage room, rectification and testing of various components shall be done immediately after dewatering and cleaning of the Power station with the help of experts/supervisors/ O&M's representatives etc.
- ❖ All the human resources and facilities shall be planned for round the clock working till the completion of all the work(s). All event and arrangements shall be recorded in sequential order basis for future reference.

13. SAFETY / SECURITY AND FIRE PROTECTION SYSTEM

13.1 Safety / Security

Risk is protected by boundary wall and watched by CISF personnel round the clock by approx. 200 in nos. Strictly entry pass is in operation.

13.2 Fire Protection System

Various types of Fire extinguishers are installed in all the location as per norm.

As the main hazardous of Fire is in the power house, cable gallery, transformer and switch yard area, following elaborate fire extinguishing appliances has been provided. Mock drill is also carried out at regular intervals

13.3 Fire Fighting System – Power House

Level / Sl. No.	Description of Protection System
Level I	Fire Detection & Alarm System
	There are two types of fire alarm and detection systems installed at power house. Out of which one is smoke detection and alarm system and other is deluge controlled system. However both systems are also interconnected with each other but works only consociate alarms from other area. However, In smoke detection and alarm system the power house area have been dividing into 56 zones (32 Power house, 24 Switchyard) and having three alarm detection and annunciation panels installed at Power house control room, switchyard and Power house portal gate respectively.
Level I	Fire Protection – Water System
	There is an overhead tank of a capacity of 15 m ³ outside the power house cavern at an elevation of 649.0 meters. Two vertical turbine type pumps of 40 HP are installed which draw water from tail race tunnel and fill this overhead tank. As a back-up penstock in unit # 1 has been tapped with a pressure reducing valve for filling the tank. A charged system capable of delivering required water flow to handle the single largest fire hazard.

Level / Sl. No.	Description of Protection System
1	Fire Fighting System - Power House
	<p>2 No. vertical turbine water pumps of capacity 1200 LPM, 40 HP and rated head 110 M each complete with basket strainers are installed on Inlet Valve floor of unit #1 and unit #3 These pumps fill the overhead fire tank provided outside the power house through a single pipe line through transformer gallery.</p> <p>There are two fire water headers of red colour in the power house. The working pressure of H.P. fire header is 10 Kg/cm² and that of L.P. fire header is 5 Kg/cm². As a back-up, the penstock of unit # 1 has been tapped with a pressure reducing valve to reduce pressure from 18-20 Kg/cm² to 10 Kg/cm² for filling the overhead tank. Normally this tapping valve is in closed position.</p>
	<p>Pressure gauges are provided to indicate the fire water header pressure at EL. 547.5M. Another control panel is provided at the same floor that indicates whether overhead tank is full or empty, operation of pumps, AC supply failure, and pump strainer blocked etc.</p>
	<p>The operation of fire deluge system is set at a pressure of 5 Kg/cm² pressure. One pressure reducing station with pressure reducing valve, strainer, gauges and relief valve has been provided on inlet valve floor of unit # 2 at EL. 543.SM.</p>
2	Fire Fighting System -Transformer Gallery
	<p>The high pressure water header piping with a pressure of 10 Kg/cm² from power house becomes the low pressure header with 5 Kg/cm² as it goes to the transformer gallery, because of higher elevation level (from 547.5 M to 590.0 M).</p>
	<p>The control panel of fire deluge operating system has been provided in transformer gallery for automatic operation and stopping the deluge operation by push button. It also provides the switches to make supply ON & OFF.</p>
	<p>The deluge system in transformer gallery for fire hazards is provided on the same header with pressure of 5 Kg/cm²</p>

Level / Sl. No.	Description of Protection System
3	Fire Fighting System – Switchyard and Cable Tunnel
	One tapping is taken from the fire water header in transformer gallery, which takes the water to the switchyard area via. cable tunnel. The whole area is divided in various zones and deluge system has been provided at each zone to take care of any fire hazard.
Level III	FIRE FIGHTING EQUIPMENT
1	Fire Hydrants
	Fire Hydrant Points are provided at various locations of Power House & Switchyard. Hose reels & Nozzles are available in each boxes.
2	Fire Extinguishers
	CO ₂ type Fire Extinguishers & ABC Type of Fire Extinguishers are placed at all vulnerable place inside Power House.
3	Fire buckets is also placed at some places to extinguish the oil fire.

14. EQUIPMENT IMPORTANCE

The importance of the equipment is based on its utility for the running of the unit and the production of power. The relative importance of the equipment also varies with the season in case of a Hydro Power Project.

The discharge of water in Monsoon Season would be at its Peak; enabling to run all the units at full load. Whereas in the winter season when the discharge of water is low; the running of all 3 units becomes difficult.

Thus the importance of all the equipment to be operational in the months of high discharge is key to the complete power generation.

The relative importance of some of these equipment is depicted as under. We would like to mention that the relative importance; we have considered is for the period of high discharge when all units are operational:

Equipment Name	Relative Importance		Reserve Capacity	Indigenous Importance	Details of Loss Minimization	Technical Remarks
	On Individual Unit	On Project as a whole				
Stator	100%	33%	Partial (in CKD Condition)	Imported	CO2 Flooding System Installed	Winding Bars have been kept as spares and can be used if some bars have been affected
Rotor	100%	33%	Partial (in CKD Condition)	Imported	CO2 Flooding System Installed	Stamp Set have been kept as spares and can be used if only some windings have been affected
Shaft	100%	33%	--	Imported	CO2 Flooding System Installed	Shaft normally is unlikely to give way.
Shaft Bearings	100%	33%	Yes	Imported	CO2 Flooding System Installed	The reserve capacity of bearing shall not let the unit be down for long periods.

Equipment Name	Relative Importance		Reserve Capacity	Indigenous Importance	Details of Loss Minimization	Technical Remarks
	On Individual Unit	On Project as a whole				
Runner	100%	33%	Yes	Imported	Vibration meters installed for early detection of any damages	The reserve capacity of runner shall not let the unit be down for long periods.
Butterfly Valve	100%	33.34%	Yes	Imported	--	One No Butterfly Valve Controls supply of water to two MIVs. Thus, one damage can lead to two units being down. Down time likely to be less as spare available.
Transformer	100%	33%	Yes	Indian	Automatic Water Spray System installed	One No. spare transformer(103 mva) is available which can be connected to the line of affected transformer.
GIS (Individual)	100%	100%	Yes	Imported	Sectionalized panels are made	No deterioration; extremely short repair time in case of any fault.
GIS (Mains)	100%	100%	Yes	Imported	--	No deterioration; extremely short repair time in case of any fault.
Dam Gates	--	33.3%	Yes	Imported	--	A failure of Dam Gate can lead to lower water reservoir and hence less discharge.

Equipment Name	Relative Importance		Reserve Capacity	Indigenous Importance	Details of Loss Minimization	Technical Remarks
	On Individual Unit	On Project as a whole				
Control Panel (For individual Units)	100%	33%	Yes	Imported	Spares available	These can be used/handled to run the machine in auto mode

The relative importance of the critical items goes down in the winter season as the water flow can be shifted to the standby unit in those days; while any affected unit can be put under maintenance / repairs.

15. PROBABLE MAXIMUM LOSS (PML)

The PML Assessment is the Probable Maximum Loss that a risk can sustain due to fire, explosion or any such incident which is covered under the ambit of policy of insurance.

15.1 PML ASSESSMENT – NATURAL CALAMITY

We are of the opinion that Maximum concentration of risk is at the following areas;

Sl. No.	PARTICULARS	Reinstatement Value (Rs. in Crores)
1	GENERATING PLANT & MACHINERY	1,858.31
2	HYDRAULIC WORKS (DAMS)	2,787.47

To arrive at the PML Value, it is pertinent to note the following:

- (a) These areas are exposed to the catastrophic risk of Earthquake & Flood.
- (b) The Generating Plant & Machinery of Rs.1,858 Crores is concentrated within the Power House, hence its exposure is much higher.

In view of the above, the PML Assessment is tabulated as below:

Sl. No.	PARTICULARS	Reinstatement Value (Rs. in Crores)	All Rs. in Crores			
			PML due to Risk of Flood		PML due to Risk of Earthquake	
			%age	Amount	%age	Amount
1	GENERATING PLANT & MACHINERY	1,858	40.00	743.20	70.00	1300.60
2	DAMS / TUNNELS / CIVIL	2,787	10.00	278.70	30.00	836.10
Total =			1,021.90			2,136.70

Hence,

PML – Flood = INR 1,022 Crores

PML – Earthquake = INR 2,137 Crores

The PML for Business Interruption shall be in addition to this and can go up to complete indemnity period of 12 Months (INR 594.60 Crores)

15.2 PML ASSESSMENT-MACHINERY BREAKDOWN (MLOP)

15.2.1 Regarding Machinery Breakdown PML

The plant has No past experience of any major accidents. From detailed discussions with the project authorities and our experience, it is found that hydroelectric projects have got low risk of breakdown.

Insured is maintaining the stock of necessary critical items / spares. Some of the critical spares. Main equipment, Turbine, Generator etc. are of Toshiba make. Lead time for supply of Critical spares will take 6 to 12 months' time.

The possibilities of damage to turbines include breakage of guide blades, damage to rotor or stator of the generator. The amount of maximum damage to generator can be to the tune of INR 145 Crores. The other damage under breakdown can occur to generating transformer, which is about INR 10 Crores each. Thus, maximum loss in an incidence of breakdown can go up to INR 155 Crores.

The possibilities of the major breakdown can be in terms of:

- (a) Damage to turbines
- (b) Damage to stator / rotor windings
- (c) Breakage of guide blades
- (d) Breakdown of transformer
- (e) Breakdown of control panels (some malfunction of cards).
- (f) Failure of some pipe joint leading to water inundation.

Out of all the above, the major costs involved shall be damage to stator/ rotor windings of generator or inundation damage. It may be noted that the insured has sufficient pump capacity to avoid inundation of upper floors.

We are of the opinion that maximum costs in terms of Breakdown shall not be more than INR 155 Crores in one incident.

Therefore,

$$\begin{array}{lcl} \textbf{PML for Breakdown} & = & \textbf{INR 155 Crores} \\ \textbf{(Material Damage)} & & \end{array}$$

The damage on account of breakdown can lead to stoppage of power generation. However going by the longest duration of interruption of generation shall not be more than 1 unit & that too not more than 12 months. This is possible only in case where the rotor & stator are severely damaged.

In this case the client shall be losing generation for 1 unit and the loss on account of business interruption shall not be more than INR 200 Crores with 12 months liability period.

$$\begin{array}{lcl} \textbf{Total PML} & = & \textbf{INR (155 + 200) Crores} \\ \textbf{(For Breakdown damage &} & & \\ \textbf{Business Interruption)} & = & \textbf{INR 355 Crores} \\ \textbf{(MLOP)} & & \end{array}$$

15.2.2 PML ASSESSMENT- FIRE & ALLIED PERILS

We are not considering here the damage on account of natural calamities for the calculation of PML. However, as being underground powerhouse the clients have taken adequate flood protection measures like provision of floodgates. Thus only the damage by fire is possible inside the powerhouse, which has been considered by us.

The risk is well protected by dedicated dewatering pumps and other protections as explained earlier.

The various fire zones can be classified as follows:

- ❖ Single phase transformer.
- ❖ Alternator with associated electrical panels.
- ❖ GIS Gas insulated system equipment.
- ❖ Auxiliaries belonging to one generating unit comprising of unit auxiliary transformer, lightning arrestor and voltage transformer and grounding cubicles and bus duct between generator and generating transformer.
- ❖ Bus duct
- ❖ Battery room with battery charger & distribution board.
- ❖ Station service transformers with control panels.

Further, the fire can damage some of the surrounding units. This however can be controlled with available safety and firefighting measures available.

15.3 Civil Structure

The maximum cost incurred in the case of civil structure is towards the excavation of the power cavern or the transformer cavern. The other costs in terms of civil works would be in terms of following:

- (a) Excavation
- (b) Rock Bolting
- (c) Shotcreting
- (d) RCC slabs for different floors
- (e) Flooring

In event of any major fire in the cavern, the maximum damage are likely to occur to the RCC frame works or slabs or flooring.

However, keeping in view the maximum damage that can occur; we are of the opinion that maximum loss under Civil Structure can be to the tune of INR 65 Crores only.

15.4 Plant & Machinery

As per the safety measure already discussed and the spread of risk, following are the areas where Large Fires can take place:

- (a) A fire in any of the generating unit.
- (b) A fire in the transformer hall in any of the transformer.
- (c) A fire in control panel room.
- (d) A fire in GIS room.
- (e) A fire in cable gallery.

Of all the above listed fires, the maximum loss/ spread shall be in the generating unit.

15.4.1 Generating Unit

The cost of each generating unit as installed at each location of Machine hall shall be around INR 280 Crores. This includes the cost of stator, rotor, shaft, runner and other accessories installed on the machine. The fire in one unit can spread to other units however the damage to other unit can be limited due to effective water fire fighting system and the concrete enclosure of the individual unit. The maximum, a fire can damage in the individual unit shall not be more than 70% of the cost involved at individual unit. Besides it can cause damage to the extent of 30% to other 2 units, are on each side.

Therefore,

$$\begin{aligned}
 \textbf{PML of Generating Unit} &= \textbf{INR (70\% of INR 280 Crores)} \\
 (\textbf{On account of fire}) &+ \textbf{30\% of INR } 280 \times 2 \text{ Crores} \\
 &= \textbf{INR 196 Crores + 168 Crore} \\
 &= \textbf{INR 364 Crores}
 \end{aligned}$$

Thus loss due to fire shall be as under:

Civil Work	=	INR 65 Crores
Fire	=	INR 364 Crores
Fire PML (MD) (due to Fire)	=	INR 429 Crores

15.5 Business Interruption

Any fire in the unit shall lead to interruption of power generation to not more than 1 unit for long periods & other 2 units for short duration. This interruption period can be large if the control cables of each unit which are passing on the trays in open area are also affected. However, going by Sum Insured, the total revenue of plant is around INR 595 Crores depending upon the water availability & plant running in the Interruption period. Thus the damage in the above scenario could be INR 450 Crores.

Therefore,

Total PML :

Fire = **INR (429 + 450) Crores**

**Material Damage &
Business Interruption** = **INR 879 Crores**

The summary of Probable Maximum Loss (PML) Assessment is as under:

A	Natural Calamity
	PML – Flood
	= INR 1,022.00 Crores
	PML – Earthquake
	= INR 2,137.00 Crores
	The PML for BI Shall be in addition to this and can go up to complete indemnity period of 12 months (INR 594.60 Crore)
B	Machinery Breakdown
	PML For Breakdown damage & Business Interruption
	= INR 355.00 Crores
C	Fire & Allied Perils
	PML for Material Damage & Business Interruption
	= INR 879.00 Crores

16. CONCLUSION & RECOMMENDATIONS

Teesta-V Power Station is owned and operated by NHPC Limited, situated in North eastern state Sikkim. The installed capacity of Power Station is 510 MW (3x170).

- ❖ Teesta-V has been designed for a probable maximum flood (PMF) of 9,500 m³/s. In 2011, CWC revised this to 14,596 m³/s.
- ❖ However, the maximum flood recorded over the past 20 years was 3,397m³/s, in 2002.
- ❖ NHPC is monitoring and is conducting safety inspections of the dam and other infrastructure on a regular basis. Emergency action and disaster management plans have been prepared to enhance emergency preparedness and response capacity.
- ❖ Site is well connected by road in all weather conditions and hence any hindrance in project material can be ruled out.
- ❖ The housekeeping in and around the plant is upto mark.
- ❖ Overall, the project is well maintained and running satisfactory.

Signed

PROTOCOL INSURANCE, SURVEYORS & LOSS ASSESSORS PVT. LTD.

SJNS/HM/BG/MP/PS/HN



17. PHOTOGRAPHS



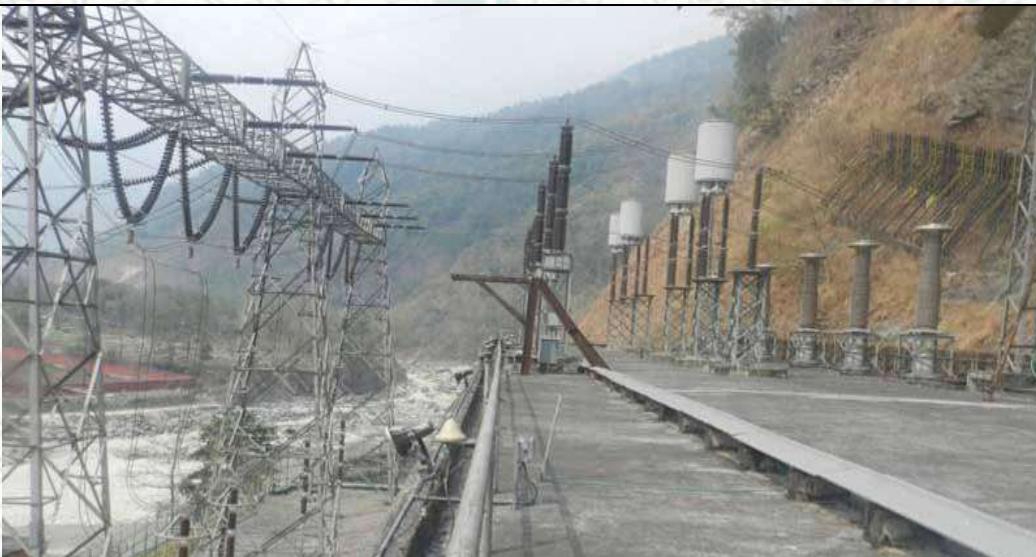
Dam



Power House



Reservoir



Switchyard



PATEL ENGINEERING– NHPC- TEESTA V POWER STATION PACKAGE 6, SIKKIM - CONTRACTORS ALL RISK REINSURANCE SLIP

1. RISK DETAILS

TYPE	: Contractors All Risk Insurance Policy: Section 1 – Material Damage Section 2 – Third Party Liability (TPL)
FORM	: As Per Original Policy Wordings
REINSURED	: TBA
ORIGINAL INSURED	: a) Principal: NHPC Limited - NHPC Office complex, sector-33, Faridabad (Haryana) – 121 003 b) Contractor: Patel Engineering Limited, Patel Estate Road, Jogeshwari (West) Mumbai-400102 and/or as more fully described within the Original Policy Wordings
INSURED's PROJECT	: Teesta V Package 6, Modification of diversion tunnel into tunnel spillway arrangement - Civil & HM works (Tunnel Spillway, Adit to GOC, GOC gate shaft, Inlet Bellmouth, Outlet concrete dyke and Energy Dissipation arrangement), for Teesta-V power station, Sikkim and/or as more fully described within the Original Policy Wordings
PERIOD OF REINSURANCE	: 18 Months From: Date TBA Plus, 12 Months Maintenance Period and/or as more fully described within the Original Policy Wordings
PROJECT PERIOD	: From: TBA (00:00:00 Hrs.) To: TBA (24:00:00 Hrs.), Plus, 12 Months Maintenance Period
SITUATION / LOCATION REINSURED	: Teesta V Power Station Package 6, (510 MW) , Sikkim and/or as more fully described within the Original Policy Wordings
TOTAL SUM REINSURED	: <p>Section 1 –Material Damage: INR 3,099,705,081 (INR 2,399,764,065 + 25% As per contract- INR 599,941,016 + INR 100,000,000 Temporary works)</p> <p>Section 2 – Third Party Liability (TPL): INR 250,000,000 with Cross Liability (any one occurrence and in aggregate) including cover to any claim arising during extended maintenance period</p> <p>and/or as more fully described within the Original Policy Wordings</p>



ORIGINAL POLICY LIMIT OF LIABILITY	For Act of God, Natural Catastrophic Perils: INR 600,000,000 Any One Accident & In Annual Aggregate For Other Perils: Full Sum Insured
ORIGINAL POLICY DEDUCTIBLE (EACH & EVERY LOSS)	<ul style="list-style-type: none"> • Normal Claims: 5% of the claim amount subject to minimum of INR 12,500,000 • Act of God / Natural Catastrophic Peril Claims: 10% Claim amount subject to minimum of INR 75,000,000 • Third Party Liability (PD): INR 12,500,000 • Design Defect: 5 times of AOG deductible
ORIGINAL CONDITIONS / ADD-ON COVERS / WARRANTIES	<p>Including below & Described in Detail in Original Policy</p> <p><u>Coverage Limits specified are from ground-up:</u></p> <ol style="list-style-type: none"> 1. Third Party Liability with Cross Liability Cross Liability. 2. MR 004: Extended Maintenance 12 months. 3. Owners surrounding property with FLEXA - up to 10% of the sums insured subject to maximum INR 100,000,000 aoa and in aggregate 4. Debris removal including foreign/external debris, drain clearance expenses, dewatering and desilting expenses- 10% of the loss is subject to a maximum of INR 25,000,000 per occurrence and INR 50,000,000 in the period aggregate; Foreign debris cover limited INR 10,000,000, foreign debris is covered for Flood and GLOF only 5. Escalation required – 15% of Project Sum Insured 6. Design Defect cover (LEG 2) 7. Pro-rata construction period extension is allowed only for additional 12 months if loss ratio on the project at the inception of extension period is less than 30%. 8. Riots, Strike, Malicious Damage (RSMD) Cover 9. 50-50 Clause 10. 72 Hours Clause 11. Cover for extra charges for overtime, night work, work on public holiday, express freight incl Air freight upto 30% of claim Amount as per MR 006 and MR 007 12. Free Automatic reinstatement clause upto 10% of Project Sum Insured 13. Cover for Temporary Access Road- Cover to cease after road is put to use 14. MR 013: Offsite storage cover and fabrication subject to INR 100,000,000 per location, 50 years return period. 15. On Account Payment Clause – as per Surveyor recommendation 16. Loss Minimization expenses- INR 50,000,000 aoa and INR 100,000,000 in the period aggregate. 17. Local authority clause/ civil / public authority clause- up to INR 100,000,000 in the aggregate. 18. MR 112: Firefighting facilities- Limit INR 100,000,000 per storage location. 19. Primary and Non-Contributory clause. 20. Waiver of contribution clause – restricted between Principal and Contractor. Excluding OEM. 21. Waiver of subrogation clause - agreed but only against named insureds. 22. Agreed Bank Clause 23. Loss of plans and documents- 5% of the claim amount subject to maximum INR 10,000,000 aoa and in the aggregate 24. MRe wet risk endorsement, 50 meters section limit



	<p>25. MR 102: Underground Cables, Pipes and Other Facilities.</p> <p>26. MR 008: Warranty concerning structures in earthquake zone.</p> <p>27. International Tunnelling code of practice to apply.</p> <p>28. Unlined/unprotected section of tunnel - 10 meters.</p> <p>29. MR 103: Crops, forests and cultures.</p> <p>30. MR 104: Dams and Reservoirs.</p> <p>31. MR 106: Sections, 150 meters x 3 unconnected sections, minimum distance between two sections 50 meters.</p> <p>32. MR 107: Camps and Stores, Limit INR 100,000,000 per location, 50 years return period, Maximum 2 location.</p> <p>33. MR 109 Construction material- 50 years return period.</p> <p>34. MR 110 Safety measures with respect to precipitation, flood and inundation, 50 years return period.</p> <p>35. Loss or damage arising out of the same cause to structures, parts of structures, machines or equipment of the same type shall be indemnified according to the following scale after applying the policy deductible for each loss- Serial losses, 1st Loss: 100% / 2nd Loss: 80% / 3rd Loss: 60% / 4th and subsequent loss: NIL. MR 114 (amended)</p> <p>36. MR 121: Piling foundation and retaining wall work.</p> <p>37. Professional Fees, Architect/ Surveyors and Consulting Engineers Fees (also includes foreign expert visit)- Limit 5% of the claim amount subject to a maximum of INR 25,000,000 aoa and in the period aggregate.</p> <p>38. Additional Custom Duty clause- Limit 10% of the claim amount subject to a maximum of INR 20,000,000 aoa and in the period aggregate.</p> <p>39. Cessation of work- 30 days</p> <p>40. Designation of property clause.</p> <ul style="list-style-type: none"> a. Nominated Loss Adjuster's clause: b. Bhatawadekar Insurance Surveyors and Loss Assessors Pvt. Ltd. c. Proclaim Loss Assessors d. Protocol <p>41. Free issuance of materials clause (covered if included in material damage sums insured).</p> <p>42. SR40: Dewatering</p> <p>43. Ground water pumping operations – EPI 46.</p> <p>44. No cover for transmission lines and substations/transformers.</p> <p>45. No cover for testing.</p> <p>46. Exclusion of Contractors Plant, Machinery and Equipment.</p> <p>47. EPI 56: Cofferdam, 50 years return period. Washing away of cofferdam not covered if caused by flood with a return period less than 50 years. Loss or damage caused due to failure of the cofferdam and consequences thereof are excluded if return period of the cofferdam is less than 50 years from the start of the project.</p> <p>48. Slope protection warranty clause</p> <p>49. Exclusion of Delay in Startup (DSU) / Advance Loss of Profit (ALOP) and Terrorism.</p> <p>and/or as more fully described within the Original Policy Wordings</p>
WARRANTIES	: <ul style="list-style-type: none"> 1. Operational pumping capacity of 1000 liter per minute to be available at each tunnel face. 2. Warranted that Tail race and Draft Tube Gates to remain closed for each unit until start of hot testing and commissioning of the Turbine; 3. Warranted that Main Inlet Valve (MIV) to remain closed until start of



	<p>hot testing and commissioning of the turbine.</p> <p>4. All Equipment's exceeding individual value of INR 50,000,000 needs to be maintained as per OEM specification and shall be hot tested in presence of manufacturer's presence at site, foregoing not limited to Turbines and Transformers</p> <p>5. Manufacturer to uphold their original warranty as stipulated in original contract post testing and commissioning.</p> <p>6. No cover for electro-mechanical works.</p> <p>7. No cover for hydro-mechanical works (<i>other than part Hydromechanical scope for Diversion Tunnel Gates</i>)</p> <p>8. Penstock/Head Race/Tail Race tunnel will be 100% radiographed or ultra-sonic tested and records maintained. Those components not being tested in a foregoing manner will be tested at 125% design pressure.</p> <p>9. No storage of material on the river bed.</p> <p>10. Failure of diversion tunnel leading to loss or damage to cofferdams, main dam and any works in the downstream area excluded.</p> <p>and/or as more fully described within the Original Policy Wordings</p>
PREMIUM (100%)	: INR 50,000,000
PREMIUM PAYMENT TERMS	: Premium Payment Clause LSW 3001 (120/30 days) & in adherence to IRDA India Regulations as per IRDAI/REIN/MSTCIR/MISC/87/5/2024 dated 31/05/2024 regarding "Collateral requirements for placement of reinsurance business with Cross Border Reinsurers (CBRs)".
REINSURANCE CONDITIONS	: This reinsurance will follow the terms and conditions of the original policy (ies) in all respect.
OTHER CONDITIONS	<ul style="list-style-type: none"> • NMA 464 – War and Civil war exclusion. • NMA 2921 – Terrorism exclusion endorsement. • Political Risk Exclusion Clause. • Nuclear Energy Risks Exclusion 1994 – NMA 1975(a) (Worldwide excluding USA/Canada). • Institute Radioactive Contamination, Chemical Biological, Biochemical and Electromagnetic weapons exclusion clause • – CL370. • Radioactive Contamination Exclusion – NMA 1622. • LMA 5401 – Property Cyber and Data exclusion. • Sanction clause (LMA 3100). • Fraudulent Claims Clause – LMA 5062 • Claims control clause. • Pollution Exclusion – NMA 1685 • Total Asbestos exclusion. • Reinsurers Liability Several and Not Joint (LMA 3333). • Communicable Disease exclusion clause – LMA 5394. • Toxic Mold Exclusion clause.



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	<ul style="list-style-type: none"> • Civil commotion excluded. <p>and/or as more fully described within the Original Policy Wordings</p>
LAW & JURISDICTION	<p>:</p> <p>This account shall be governed by and construed in accordance with Indian Law. Arbitral award shall be a condition precedent for any action in court. The seat of arbitration shall be Mumbai, India and provisions of the Indian Arbitration and Conciliation Act 1996 shall apply. The language of arbitration shall be English.</p>



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2. INFORMATION

Teesta V Package 6, Modification of diversion tunnel into tunnel spillway arrangement - Civil & HM works (Tunnel Spillway, Adit to GOC, GOC gate shaft, Inlet Bellmouth, Outlet concrete dyke and Energy Dissipation arrangement), for Teesta-V power station, Sikkim

Information seen and noted by reinsurers:

1. Project Brief
2. Letter of Award



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PREMIUM PAYMENT CLAUSE (Amended)

Notwithstanding any provision to the contrary within this contract or any endorsement hereto, in respect of non-payment of premium only the following clause will apply.

The (Re)Insured undertakes that 50% of the premium will be paid to (Re)Insurers by due date

If the above premium due under this contract has not been so paid to (Re)Insurers by due date (Re)Insurers shall have the right to cancel this contract by notifying the (Re)Insured via the broker in writing. In the event of cancellation, premium is due to (Re)Insurers on a pro rata basis for the period that (Re)Insurers are on risk but the contract premium shall be payable to (Re)Insurers in the event of a loss or occurrence prior to the date of termination which gives rise to a valid claim under this contract.

It is agreed that (Re)Insurers shall give not less than 30 days prior notice of cancellation to the (Re)Insured via the broker. If premium due is paid to (Re)Insurers before the notice period expires, notice of cancellation shall automatically be revoked. If not, the contract shall automatically terminate at the end of the notice period.

If any provision of this clause is found by any court or administrative body of competent jurisdiction to be invalid or unenforceable, such invalidity or unenforceability will not affect the other provisions of this clause which will remain in full force and effect.

LSW3001 Amended
September 2008

PREMIUM WITHHELD CLAUSE

To be endorsed



3. SECURITY DETAILS

REINSURER'S LIABILITY:	<p>LMA 3333 - (RE)INSURER'S LIABILITY CLAUSE</p> <p>(Re)insurer's liability several not joint</p> <p>The liability of a (re)insurer under this contract is several and not joint with other (re)insurers party to this contract. A (re)insurer is liable only for the proportion of liability it has underwritten. A (re)insurer is not jointly liable for the proportion of liability underwritten by any other (re)insurer. Nor is a (re)insurer otherwise responsible for any liability of any other (re)insurer that may underwrite this contract.</p> <p>The proportion of liability under this contract underwritten by a (re)insurer (or, in the case of a Lloyd's syndicate, the total of the proportions underwritten by all the members of the syndicate taken together) is shown next to its stamp. This is subject always to the provision concerning "signing" below.</p> <p>In the case of a Lloyd's syndicate, each member of the syndicate (rather than the syndicate itself) is a (re)insurer. Each member has underwritten a proportion of the total shown for the syndicate (that total itself being the total of the proportions underwritten by all the members of the syndicate taken together). The liability of each member of the syndicate is several and not joint with other members. A member is liable only for that member's proportion. A member is not jointly liable for any other member's proportion. Nor is any member otherwise responsible for any liability of any other (re)insurer that may underwrite this contract. The business address of each member is Lloyd's, One Lime Street, London EC3M 7HA. The identity of each member of a Lloyd's syndicate and their respective proportion may be obtained by writing to Market Services, Lloyd's, at the above address.</p> <p>Proportion of liability</p> <p>Unless there is "signing" (see below), the proportion of liability under this contract underwritten by each (re)insurer (or, in the case of a Lloyd's syndicate, the total of the proportions underwritten by all the members of the syndicate taken together) is shown next to its stamp and is referred to as its "written line".</p> <p>Where this contract permits, written lines, or certain written lines, may be adjusted ("signed"). In that case a schedule is to be appended to this contract to show the definitive proportion of liability under this contract underwritten by each (re)insurer (or, in the case of a Lloyd's syndicate, the total of the proportions underwritten by all the members of the syndicate taken together). A definitive proportion (or, in the case of a Lloyd's syndicate, the total of the proportions underwritten by all the members of a Lloyd's syndicate taken together) is referred to as a "signed line". The signed lines shown in the schedule will prevail over the written lines unless a proven error in calculation has occurred.</p> <p>Although reference is made at various points in this clause to "this contract" in the singular, where the circumstances so require this should be read as a reference to contracts in the plural.</p>
BASIS OF WRITTEN LINE	Percentage of Whole Lines Clause NMA2419, if applicable
SIGNING PROVISIONS	<p>Proportionate Signing:</p> <p>In the event that the written lines hereon exceed 100% of the order, any lines written "to stand" will be allocated in full and all other lines will be signed down in equal proportions so that the aggregate signed lines are equal to 100% of the order without further agreement of any of the (re)insurers,</p> <p>However:</p>



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	<ul style="list-style-type: none"> a) in the event that the placement of the order is not completed by the commencement date of the period of insurance then all lines written by that date will be signed in full; b) the signed lines resulting from the application of the above provisions can be varied, before or after the commencement date of the period of insurance, by the documented agreement of the (re)insured and all (re)insurers whose lines are to be varied. The variation to the contracts will take effect only when all such (re)insurers have agreed, with the resulting variation in signed lines commencing from the date set out in that agreement. <p>Disproportionate Signings: The (re)insured may elect for the disproportionate signing of (re)insurer's lines, without further specific agreement of (re)insurers, provided that any such variation is made prior to the commencement date of the period of insurance, and that lines written "to stand" may not be varied without the documented agreement of those (re)insurers; the signed lines resulting from the application of the above provision can be varied, before or after the commencement date of the period of (re)insurance, by the documented agreement of the (re)insured and all (re)insurers whose lines are to be varied. The variation to the contracts will take effect only when all such (re)insurers have agreed, with the resulting variation in signed lines commencing from the date set out in that agreement.</p>



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4. SLIP DEDUCTIONS

TOTAL SLIP : 22.5%
DEDUCTIONS