

1. SALIENT FEATURES

1.1 Project Location

State	Sikkim
District	East District
Stream	Rangpo
Vicinity	Rangpo village
Latitude	27 ⁰ 11'12" – 27 ⁰ 11'45" N
Longitude	88 ⁰ 33'16" – 88 ⁰ 36'45" E

1.2 Hydrology for “Bhasmey” Intake

Catchment area	km ²	508.3
Average annual inflow	10 ⁶ m ³	1'626
Average discharge	m ³ /s	50.9
Specific average discharge	m ³ /s/km ²	0.100
Minimum ecological water release in Rangpo River	m ³ /s	0.91
Flood discharge for river diversion (-Q ₁₀) dry	m ³ /s	400
Flood discharge for river diversion (-Q ₁₀) monsoon	m ³ /s	710
Design discharge for spillway arrangement (Q ₁₀₀₀)	m ³ /s	1570

1.3 Reservoir

Maximum normal reservoir level	m a.s.l.	461.20
Average normal reservoir level (½ active storage)	m a.s.l.	458.51
Minimum normal reservoir level	m a.s.l.	455.00
Extreme Maximum water level (max. Flood level)	m a.s.l.	467.00
Total storage volume	m ³	1'019'000
Active storage volume	m ³	575'300
Dead storage volume	m ³	443'700

1.4 Dam and Appurtenant Structures

Dam type	--	Symmetrical gravity
Crest elevation	m a.s.l.	467.20
Stream bed (talweg) level	m a.s.l.	441.00
Dam foundation level	m a.s.l.	434.00
Dam height from foundation level	m	33.2
Crest length	m	128.72
Dam volume	m ³	95'000
Max. Depth of grout curtain	m	22.0

Diversion facilities

Longitudinal cofferdam (Phase 1)		
- Crest elevation	m a.s.l.	448.0
- Length	m	223
Upstream Cofferdam (Phase 3)		
- Crest Elevation	m a.s.l.	449.0
- Length	m	97
Downstream Cofferdam (Phase 3)		
- Crest Elevation	m a.s.l.	445.0
- Length	m	91
Spillway type (incorporated into the dam)		Ungated Ogee Crest
Crest elevation	m a.s.l.	461.40
Crest length	m	4 x 10.0
Stepped spillway, step height	m	0.5 – 1.0
Bottom Outlet (incorporated into the dam)		
Sill elevation	m a.s.l.	442.00
Number of opening	--	2
Dimensions of opening (H x W)	m	4.00 x 5.50
Gate type		Radial
- Max. Head	m	25.0
Capacity (by exceptional reservoir level), each	m ³ /s	467.3
Stilling basin (at the toe of the dam)		
Sill elevation	m a.s.l.	436.50
Length	m	58.00
Width	m	43.00
Deviation of State Road		
- Length	m	520

1.5 Intake (Right Abutment)

Number of openings	--	1
Water inlet elevation	m a.s.l.	446.5
Nominal discharge	m ³ /s	55.0
Dimension of trash rack opening (H x W)	m	6.0 x 10.0
Gate number and type at the tunnel entrance	--	1/sliding
-Sill elevation	m a.s.l.	446.5
-Dimensions (H x W)	m	5.3 x 5.2
-Max. Head	m	20.5

1.6 Headrace Tunnel

Tunnel

Shape		circular
Length	m	5'132
Excavation Diameter	m	5.9 – 6.1
Internal Diameter	m	5.3
Velocity for nominal discharge	m/s	2.4
Slope	%	0.19 – 1.38
Nominal discharge	m ³ /s	55.0
Number of intermediate adits	--	1
Lining	--	100% concrete

Adit

Length	m	483
Excavation (H x W; D-shaped)	m	4 x 4
Lining	--	Concrete invert

1.7 Surge Shaft

Vertical Shaft

Top elevation	m a.s.l.	504.0
Bottom elevation	m a.s.l.	410.2
Height	m	89.8
Max. Water level in surge shaft	m a.s.l.	494.41
Min. Water level in surge shaft	m a.s.l.	420.46
Excavation diameter upper part	m	15.6
Excavation diameter lower part	m	16.0
Internal diameter	m	14.0
Lining	--	100 % concrete

1.8 Valve Chamber

Type		Outdoor
Dimensions (L x H x W)	m	13.1 x 14.25 x 13.0
Butterfly valve		
- Number	--	1
- Diameter	mm	3'400
Access Road		
- Length (approx.)	m	105

1.9 Surface Penstock manifold

Length	m	129.73
Internal Diameter	mm	3400
Velocity for nominal discharge	m/s	6.1

Nominal discharge	m/s	55.0
Number of fix points	--	4
Slope	o	approx. 35

1.10 Powerhouse

Type		Outdoor
Dimensions (L x H x W)	m	46.5 x 31.6 x 16.0
Turbine type	--	vertical axis
Number of units	--	2
Turbine setting elevation	m a.s.l.	346.60
Rated discharge per unit	m ³ /s	27.5
Turbine speed	rpm	375
Max. / Min. gross head	m	113.0 / 104.5
Average gross head	m	109.5
Installed capacity per unit	MW	25.5
Average annual peaking energy production	GWh	161.1
Average annual base load energy production	GWh	83.0
Firm peaking energy production	GWh	148.3
Firm base load energy production	GWh	66.10
Plant load factor	--	0.55
Inlet valve type		Spherical Valve
Number	--	2
Axis elevation	m a.s.l.	346.60
Diameter	mm	1900
Max. Head	m	113
Generator type		
Number	--	2
Nominal speed	rpm	375
Voltage/Frequency	kV/Hz	11/50
Load factor	cos φ	0.9
Transformer type	--	3-Phase, Oil filled
Location	--	Inside
Number	--	2
Unit capacity	MVA	32.5
Voltage ratio	kV/ kV	11/132

1.11 Tailrace Channel

Number	--	2
Length	m	50 each
Width	m	4.5 each
Slope	%	16.66
Nominal discharge per channel	m ³ /s	27.5
Outlet sill elevation	m a.s.l.	349.00
River bed elevation	m a.s.l.	348.10

1.12 Switchyard

Type	--	Outdoor
Voltage / busbars	KV / --	132 / 11
Area (L x W)	m	56 x 40.8

1.13 Estimated Cost

Pre-operative expenses	INR in crores	21.65
Civil works	INR in crores	158.17
E&M works	INR in crores	70.41
Total basic cost (excl. Transmission line cost)	INR in crores	250.28
Escalated cost for Civil and E&M works	INR in crores	18.49
Interest during construction & Financing Charges	INR in crores	28.99
Total (Generation works)	INR in crores	297.76
Cost per MW installed	INR in crores	5.83

1.14 Power Benefits

Energy generation in average year	GWh	244.1
Energy generation in dry year (approx. 90% dep.)	GWh	214.4

1.15 Financial Aspects

Cost of generation (Average for first five year plan) Per kWh at power house bus bars (including IDC) during 90 % dependable year		2.97
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1.16 Construction Period

Construction Period months		30
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