

## TECHNICAL VISIT: HYDRO POWER STATION, UKAI

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The Ukai Hydro Power Station is located at Ukai Dam on Tapi River in Tapi District. Hydro power station has four hydro turbine units, each of 75 MW with a total installed capacity of 300 MW. The Ukai Left Bank Canal (LBC) Hydro Power Station is located at Left Bank Cannel of Ukai Dam. There are two units of hydro turbine each of 2.5 MW with a total installed capacity of 5 MW. All the above units were made by BHEL.

The Hydro Power Station, Ukai visit organized on 06-03-2017 for 100 students of 3<sup>rd</sup> year Electrical Engineering Department & on 07-03-2017 for 95 students of 2<sup>nd</sup> year students of Electrical Engineering Department. Visit enabled the technical and practical enrichment of the students about the Hydro Power Station operations and systems, like Power Generation, Control Units, Switchgear, Duties of PWD Department (Irrigation Purpose) etc.





## UKAI HYDRO SALIENT FEATURES

### DAM

Construction cost of DAM	180.74 Cr	
Max. Dam Level	1990-91	346.17 Feet
Min. Dam Level	1979-80	268.30 Feet

### MAIN HYDRO

<b>Main Hydro</b> Total Cost	22.87 Cr	
Commissioning date of <b>Main Hydro</b> Units		
Unit # 1 (75 MW)	08-07-1974	
Unit # 2 (75 MW)	13-12-1974	
Unit # 3 (75 MW)	22-04-1975	
Unit # 4 (75 MW)	04-03-1976	
Max. Generation (for Monsoon Year)	1976-77	1261.217 Mus
Max. Generation (Monthly)	Sept-2013	221.267 Mus
Max. Generation (Daily)	25-09-1998	7.689 Mus
Generations Since Commissioning (Up to 05-03-2017)	30351.416 MUS	

- ❖ Ukai hydro power station has been declared 3<sup>rd</sup> best performing station in India during 2006-2007 year and awarded Bronze shield for the same by Ministry of Power, New Delhi.
- ❖ Previous record of generation (210.100 Mus) is break in September 2013 by 221.267 Mus.

### GENERATOR

1	Nos. of Generator	4 Nos
2	Sr. no. of Generator	3000107, 3000108, 3000109, 3000110 respectively
3	Type	G25 Vertical Umbrella Type Salient Pole Rated 83333 KVA, 0.9 p.f., 11KV ( $\pm 5\%$ ) 3 phase, 4370 AMPS. Rated KVAR 56000 at Zero leading P.F.
4	Make	Bharat Heavy Electrical Ltd.
5	Stator Windings: Slots	384, winding coils 384
	Joint 1) Series joint	264
	2) Pole to pole joint	108
	3) Bus Bar joints	12
	<ul style="list-style-type: none"> <li>❖ Stator resistance per phase at 20<sup>o</sup>=0.003415 ohm.</li> <li>❖ Field resistance at 20<sup>o</sup> C=0.15 ohm.</li> <li>❖ Rotor excitation at no load &amp; 100% voltage= 608 amp.</li> <li>❖ Rotor excitation at rated output &amp; voltage = 1052 Amp.</li> <li>❖ Excitation voltage = 180 v.</li> </ul>	
6	Speed	150 RPM
7	Overall dia.	4127.5 × 2 = 8255.0 mm
8	Heaviest package for shipment	
	❖ Thrust bearing housing size 04.34m long × 4.12 m width × 2.6 m high having weight 55 tones.	
9	Weight of generator side	275 MT
10	Heaviest assembly to be lifted by crane weighting 220 tones.	
11	Bearing	1 no – thrust bearing having 12 pads. 1 no – Generator guide bearing having 24 pads.

### SPILL WAY

1	Spill Way Channel	Length = 1524 Meter, Width = 259 Meter Depth = 18.29 Meter
2	Spill Way Gates	1) Numbers = 22 nos 2) Types = Radial Gates. 3) Area = 15.545 m × 14.783 m. 4) Weight = 100 Tones Each.
3	Discharge Capacity	49490 m <sup>3</sup> /sec. Maximum=59920 m <sup>3</sup> /sec

### TURBINE

1	Type	Reaction Type, Kaplan, Vertical Shaft, Feathering propeller type.
2	Make	Bharat Heavy Electricals LTD.
3	Head	1) 47.8 m (156.82 ft.) Rated Head. 2) 57.2 m (18.66 ft.) Max head. 3) 34.4 m (112.86 ft.) Min head.
4	Output power	1) 1,05,000 Metric HP 2) 1,20,750 Metric HP Max
5	Speed	150 RPM (clockwise rotation)
6	Run away Speed	1) 300 RPM with cam 2) 350 RPM Without Cam
7	Water Discharge	6000 cusec (101 m <sup>3</sup> /sec) at 75 MW.
8	Nos. of guide Vanes	24 nos.
9	Size of guide vanes	6660 mm × 19.4 mm
10	Main shaft dia.	900 mm
11	Runner hub dia.	3160mm
12	Runner blades	6 nos. Each having Weight of 5 tones & design to withstand 1700 tones hydraulic.
13	Spiral inlet dia.	6500 mm
14	Largest transport item of turbine.	Inner top cover half size 6.1m × 3.5m × 3.0m
15	Efficiency	98 % at the full water level.
16	Weight of turbine with shaft And runner disc	140 MT
17	Bearing:	Turbine guide bearing 1 no having 8 nos. pads.