



Tala Hydroelectric Project Authority
Welcomes
Executive Peer Exchange Participants
of
South Asia Regional Initiative for Energy

Hydropower Potential of Bhutan

River Basin	Identified + Developed	Gross Potential
Amochu/Toorsa	2,299 MW	2,800 MW
Wangchu/Raidak	2,740 MW	3,400 MW
Punatsangchu/ Sankosh	8,157 MW	10,100 MW
Mangdechu/Manas (West)	3,889 MW	4,900 MW
Drangmeychu/Manas (East)	6,692 MW	8,400 MW
Others	293 MW	400 MW
Total	24,070 MW	30,000 MW

Estimated Potential - 30,000 MW

Hydropower Potential of Bhutan Status of Development

Schemes	Identified + Developed
Schemes in Operation	1488 MW
Schemes under construction	1209 MW
Investigated/DPR Prepared	5140 MW
Under Investigation	1720 MW
Total	9557.68 MW

Development of Hydropower Potential

Scheme	Installed Capacity (MW)
Schemes Investigated	
Sankosh	4060 MW
Wangchu	900 MW
Bunakha	180 MW
Total	5140 MW
Schemes under Investigations	
Mangde chu	700 MW
Punatsangchu-II	1020 MW
Total	1720 MW

Development of Hydropower Potential

Scheme	Installed Capacity (MW)
Schemes in Operation	
Chukha	336 MW
Kurichu	60 MW
Basochu	62.5 MW
Tala	1020 MW
Other micro	10.13 MW
Total	1488.67MW
Schemes for construction	
Punatsangchu	1095 MW
Dagana	114 MW
Total	1209 MW

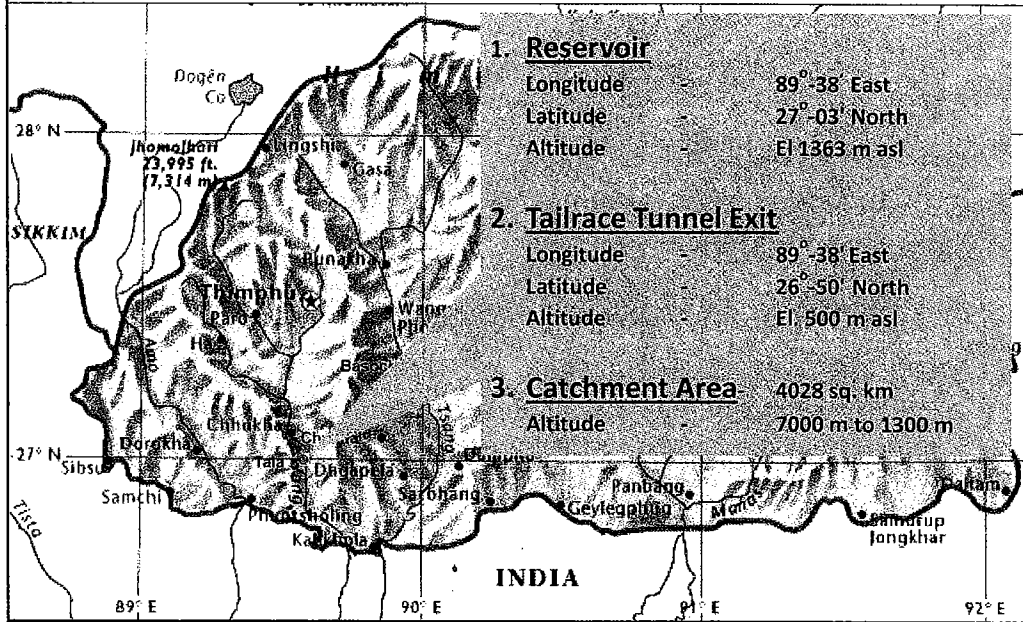
Tala H.E. Project (1020 MW)

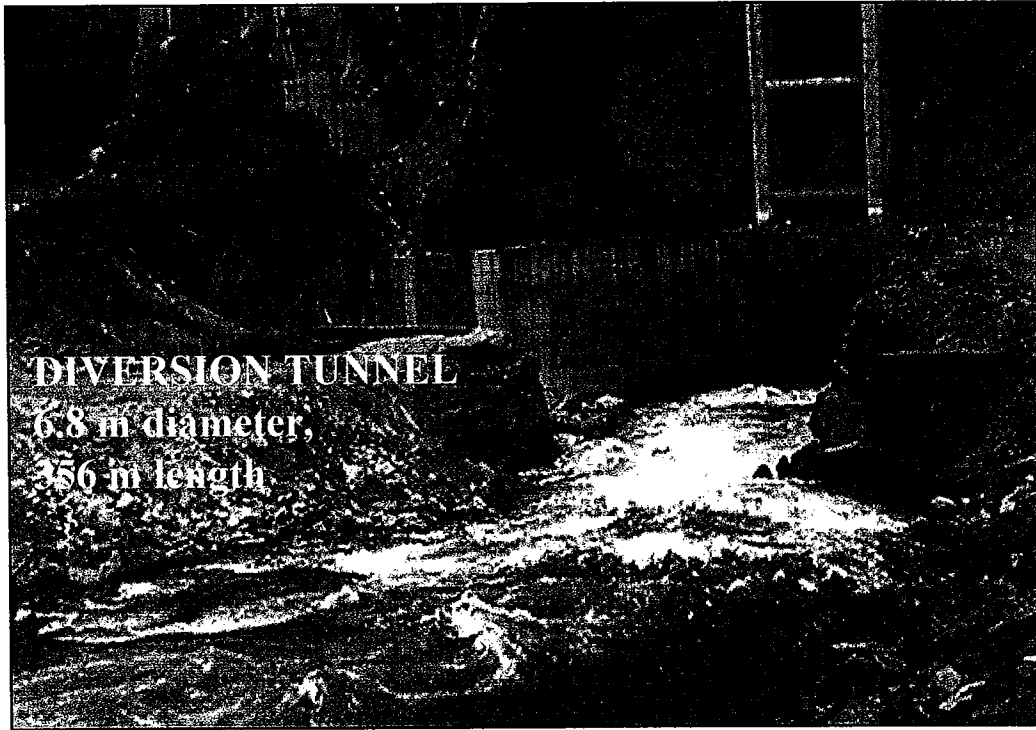
- **DPR by WAPCOS, CWC, & CEA - December 1993**
- **Agreement between RGoB & GoI - March 1996**
- **Project Cost - Rs./Nu. 42,355.00 Million**
- **Project Financing by the GoI**
 - **60% Grant**
 - **40% Loan****Loan bearing 9 % simple interest repayable in 12 installments**
- **Annual Generation - 4865 Million Units (Av. Year)**
- **Surplus Power being sold to GoI.**

Project Implementation

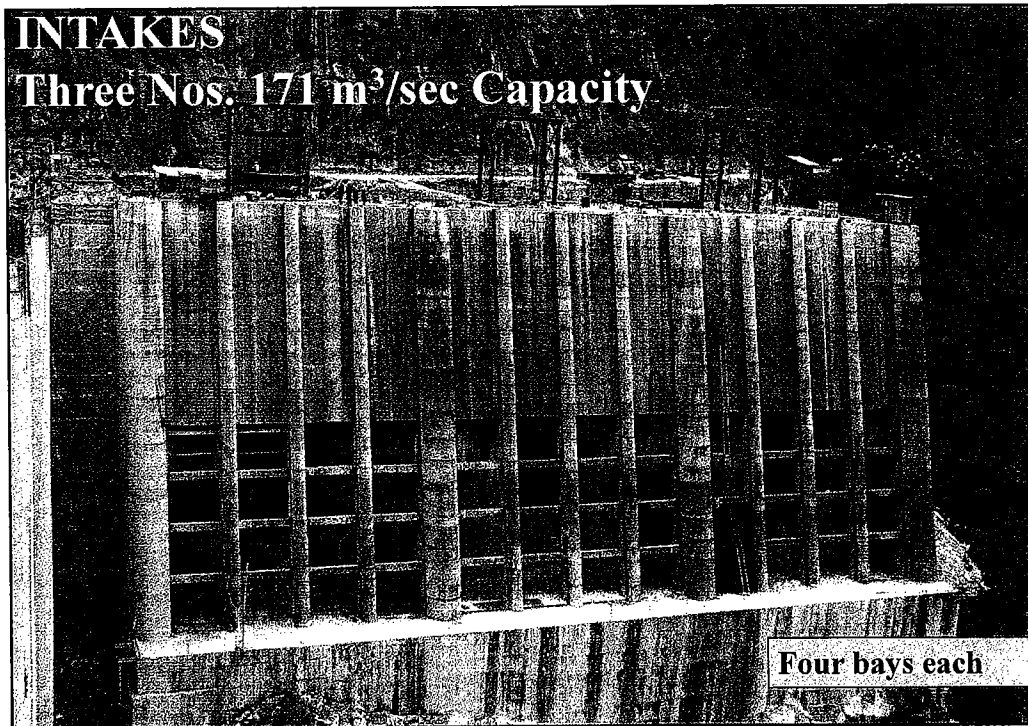
- **Tala Hydroelectric Project Authority (THPA) set up for Construction, O&M and Evacuation of Power**
- **Chairman & four Directors nominated by RGoB and three Directors nominated by GoI.**
- **Water and Power Consultancy Services (I) Ltd., (WAPCOS) appointed as Consultants**
- **Scheduled Completion Period - 8 Years (As per DPR)**
- **THPA to handover Project to RGoB two years after completion**

Tala Hydroelectric Project (1020 MW) - Location





DIVERSION TUNNEL
6.8 m diameter,
356 m length

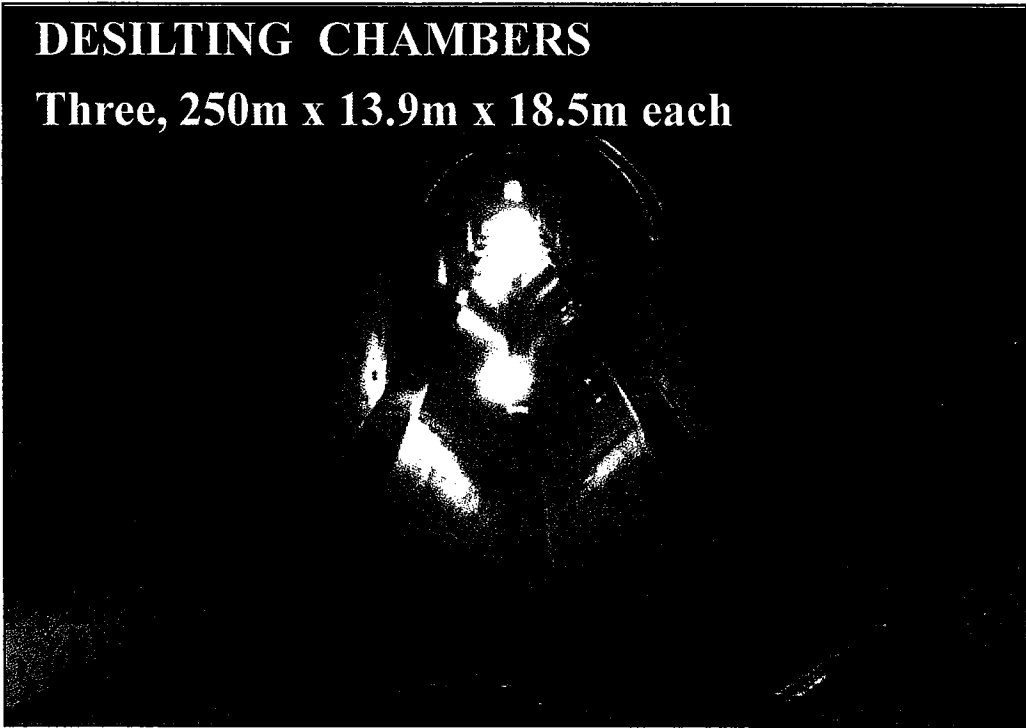


INTAKES
Three Nos. 171 m³/sec Capacity

Four bays each

DESILTING CHAMBERS

Three, 250m x 13.9m x 18.5m each



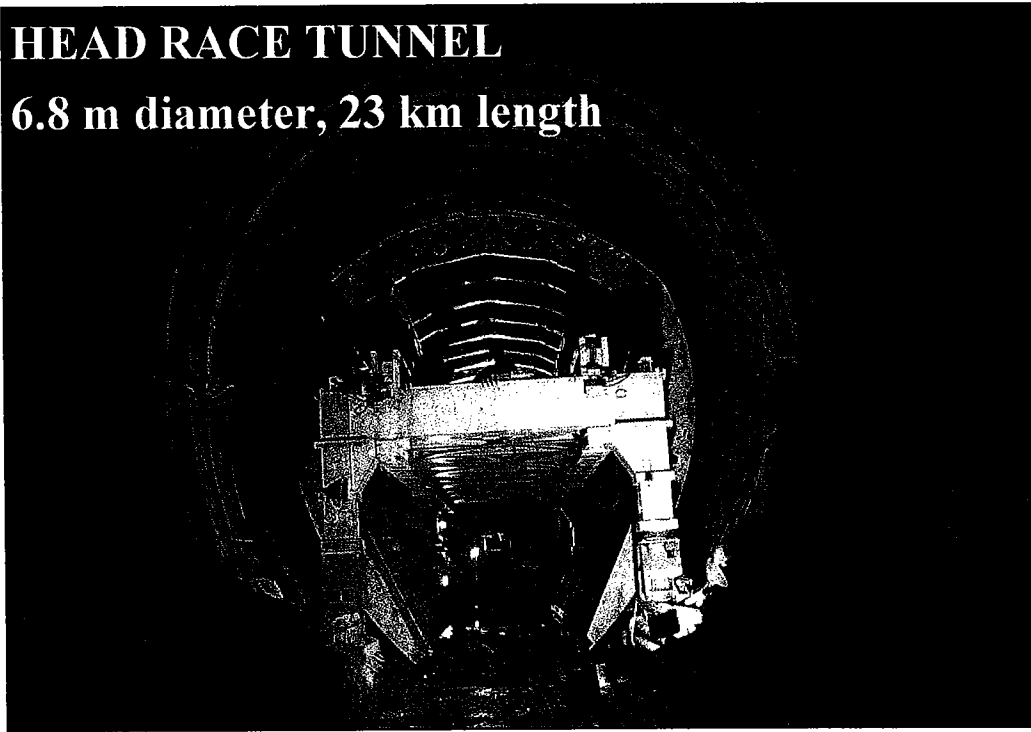
HEAD RACE TUNNEL

6.8 m diameter, 23 km length



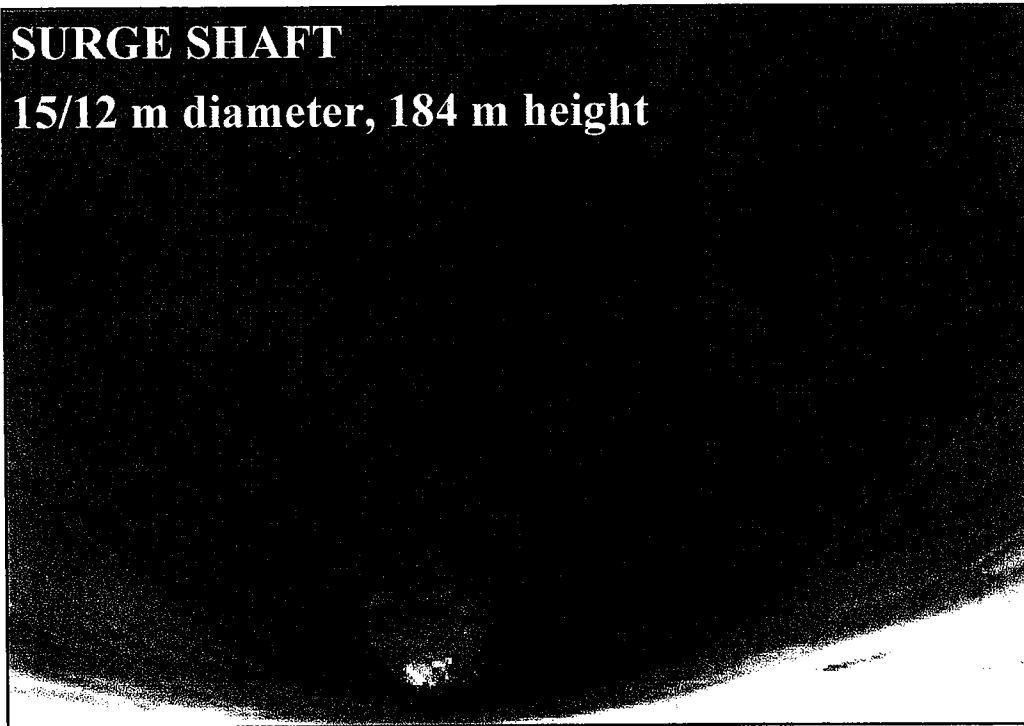
HEAD RACE TUNNEL

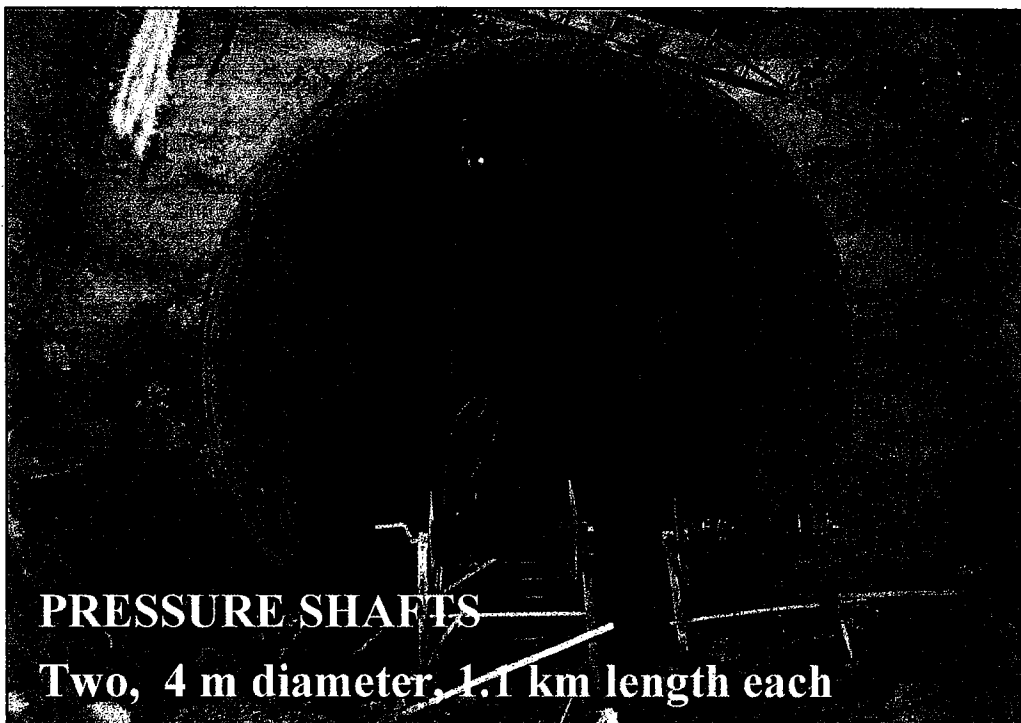
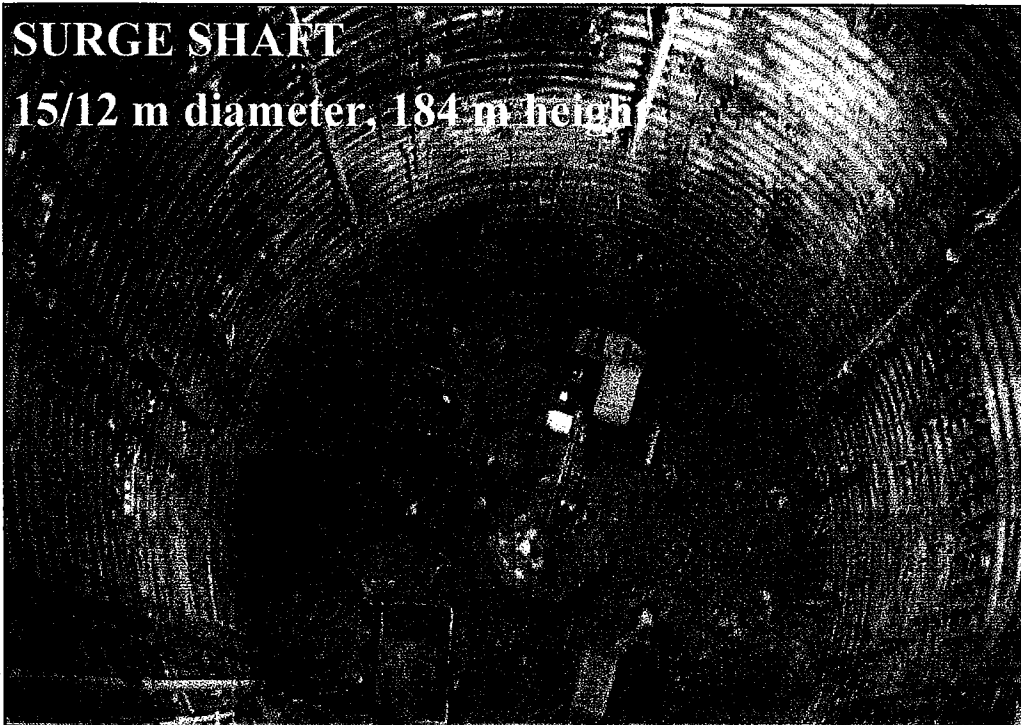
6.8 m diameter, 23 km length

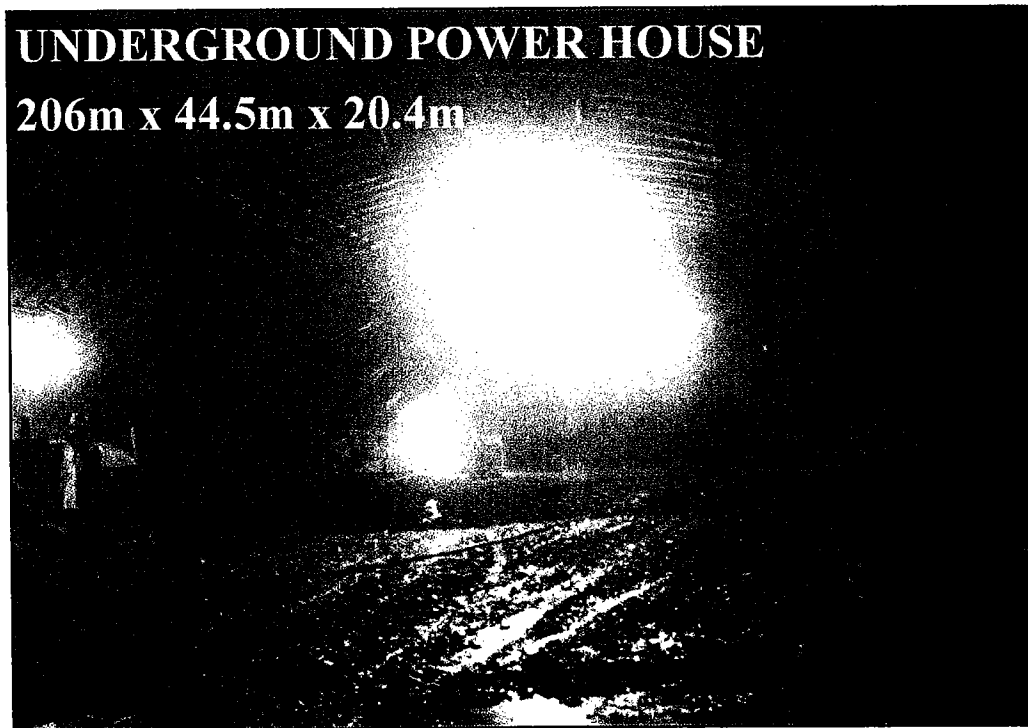
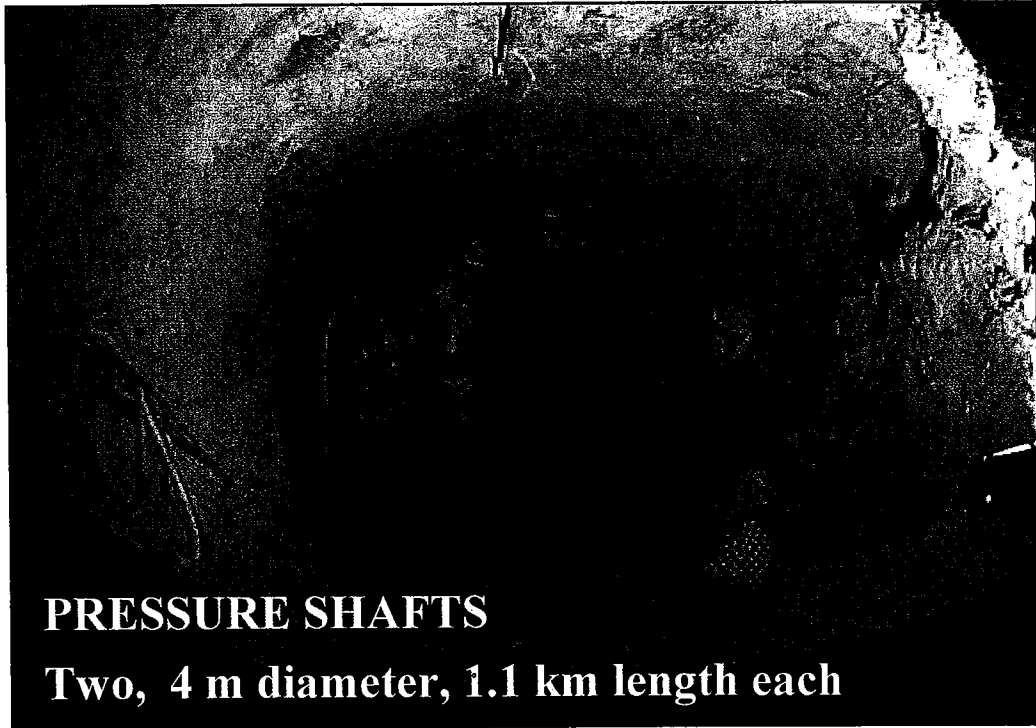


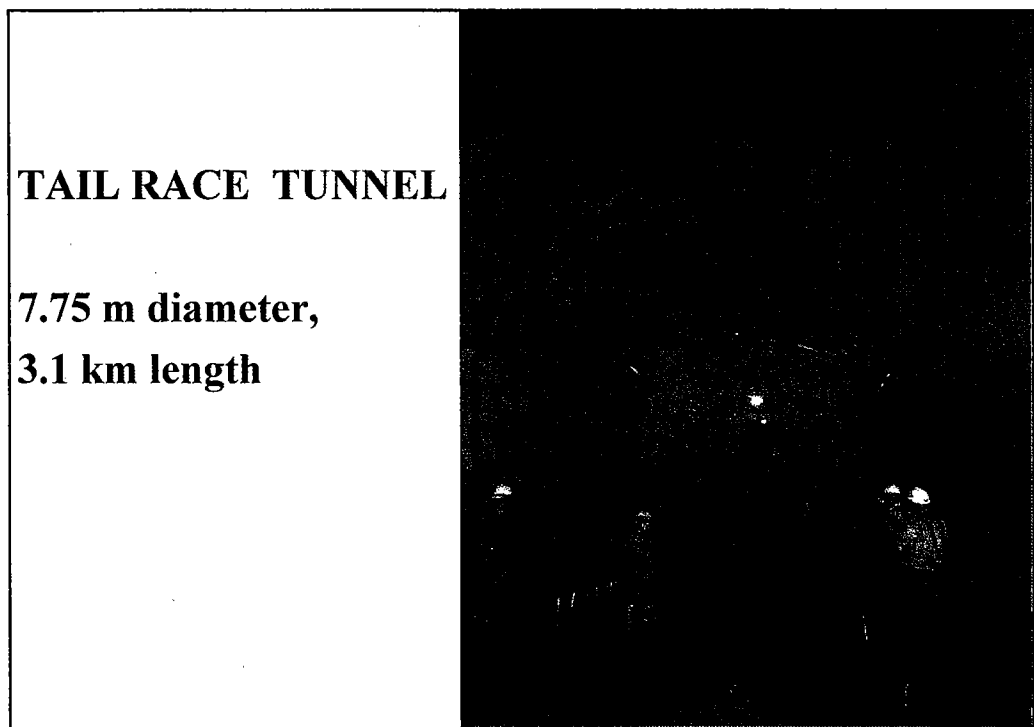
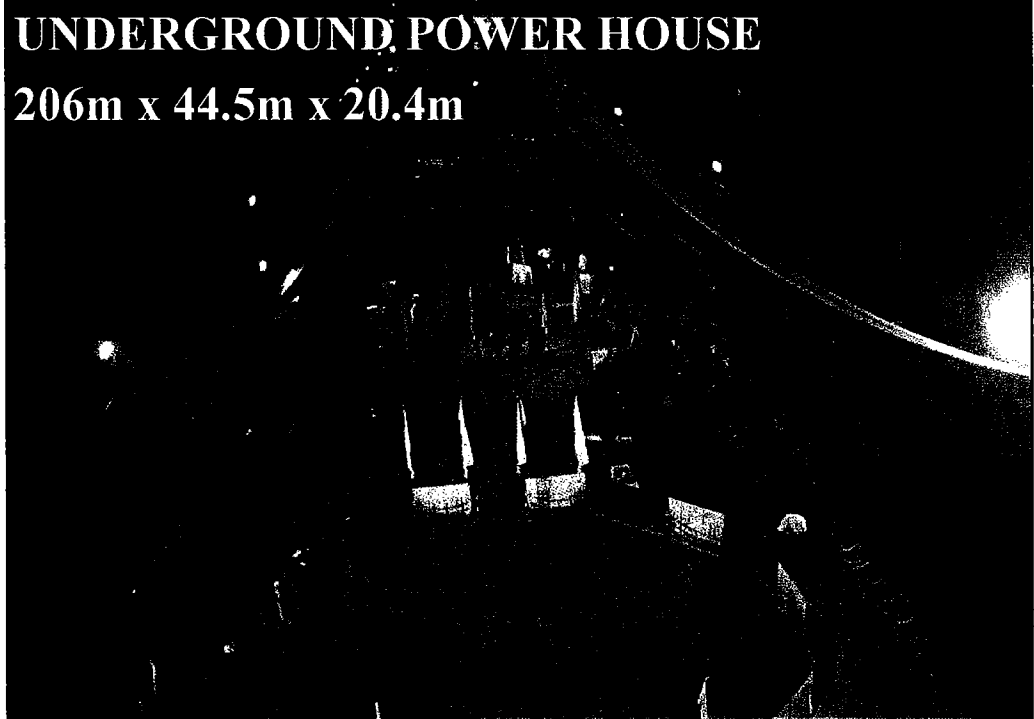
SURGE SHAFT

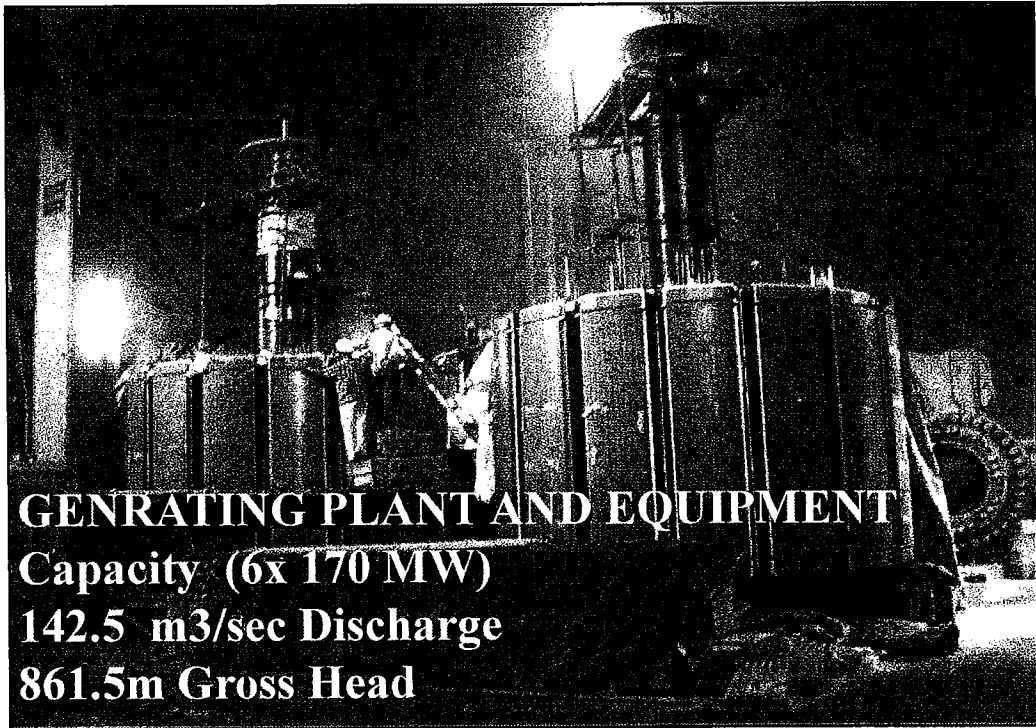
15/12 m diameter, 184 m height





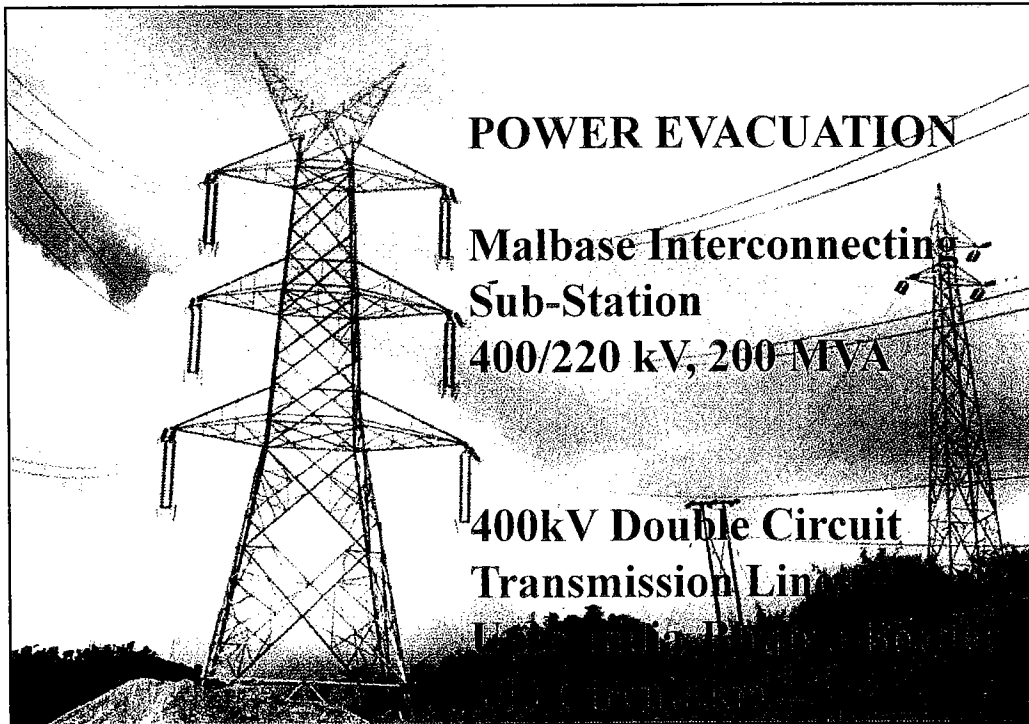






GENERATING PLANT AND EQUIPMENT

**Capacity (6x 170 MW)
142.5 m³/sec Discharge
861.5m Gross Head**



POWER EVACUATION

**Malbase Interconnecting
Sub-Station
400/220 kV, 200 MVA**

**400kV Double Circuit
Transmission Line**

Strategy Adopted for Accelerated Construction

- Review of DPR Stage proposals through an expert committee for introducing construction friendly measures.
- Diversion tunnel shifted from left bank to easily accessible right bank.
- Shifting of HRT adits to make equitable distribution of tunneling length from each face.
- Introducing additional adits for HRT, Pressure Shafts and TRT construction.
- Construction of accommodation for contractors before award of contracts.
- Providing construction power at sites before award of contracts.
- Procurement of one set of Tunneling/Construction equipment for each package before award of contracts.

Strategy Adopted for Accelerated Construction

- Firm arrangements for supply of key materials like Explosives, POL, Cement & Steel made before start of works.
- Construction of Main civil works in parallel with development of infrastructure (Concurrent Working Model).
- State-of-the-Art Tunneling equipment and Technology as suitable to Himalayan conditions has been adopted.
- Extensive instrumentation has been done to monitor behavior/health of various components.
- Sound Design and Engineering inputs are made available by the Consultants in time.
- Acceleration Measures taken to retrieve delays caused due to late accessibility, unprecedented rain of August 2000 & extremely difficult geological situations .

Consultancy Services

Water & Power Consultancy Services (India) Ltd. are providing design and engineering consultancy services to the Project in association with Central Water Commission, Central Electricity Authority, Central Water & Power Research Station, Central Soil and Materials Research Station and Survey of India.

Geological Survey of India and National Institute of Rock Mechanics are also associated with the Project.

As a part of consultancy services major activities were:

- **Precision surveys of the Project area.**
- **Frame more than 200 Tender/Bidding documents.**
- **Issue more than 8000 construction drawings for various components.**

Technical Co-ordination Committee

A Technical Co-ordination Committee (TCC) of high level experts from CEA, CWC, WAPCOS, THPA, and RGoB constituted by the THPA takes decisions/makes recommendations to the Authority in respect of important/intricate technical issues. TCC has held Eighteen Meetings so far.

Physical Progress

Infrastructure Development

i) Roads

Construction of 115 km of roads with 16 Bridges (13 of Class 70 R and 3 of Class 40 R) of 20m-62m spans.

ii) Construction Power

New 66/33/11/kV sub-stations	:	31 MVA
Augmentation of 33/11kV stations	:	7 MVA
33kV/11kV transmission lines	:	102 km

iii) Telecommunications

Telecommunication network	-	512 lines
Mobile sets	-	150

Infrastructure Development (contd.)

iv) Buildings

Temporary Colony at Tsimalakha (163 Units)-11800m² catering to construction stage of Dam complex.

Permanent Colony at Wangkha (67 Units) -5600m² for O&M stage of Dam Complex.

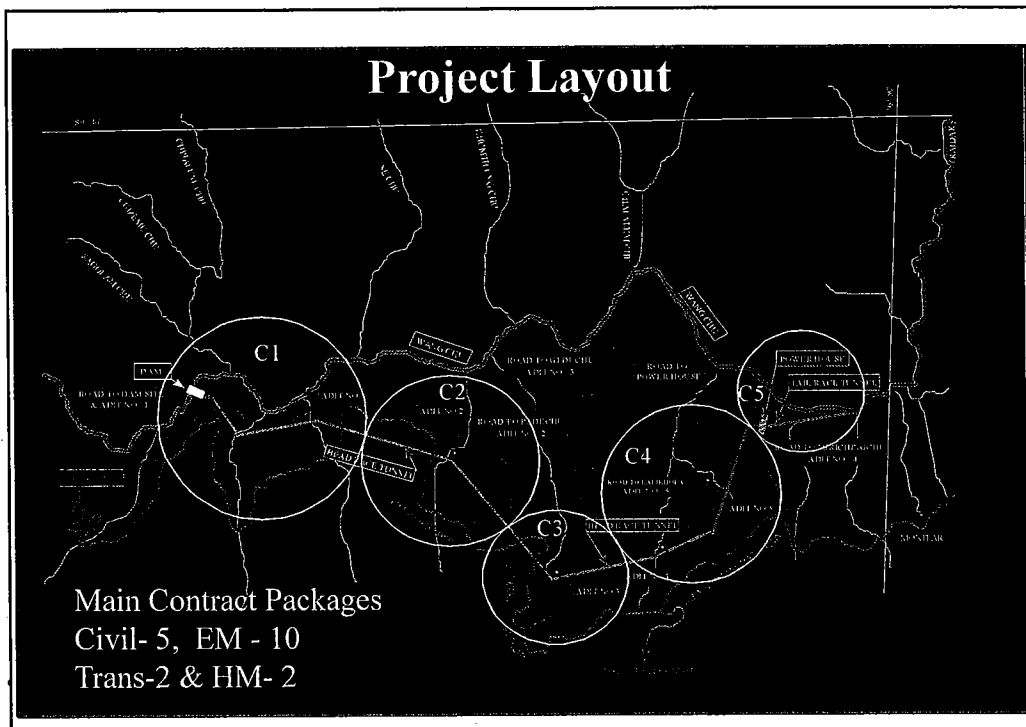
Permanent Colony at Gedu (345 Units) -58500 m² – Project Headquarters.

Permanent Colony at Sinchekha/Arekha (228 Units)25800 m² for O&M of Power House.

Permanent Colony at Phuentsholing (40 Units) 5400 m² for O&M of Transmission system.

Liaison Office, Thimphu (440 m²)

Site Facilities (3,500m²)



Main Civil Works

Contract Package # C-1 : Dam Complex

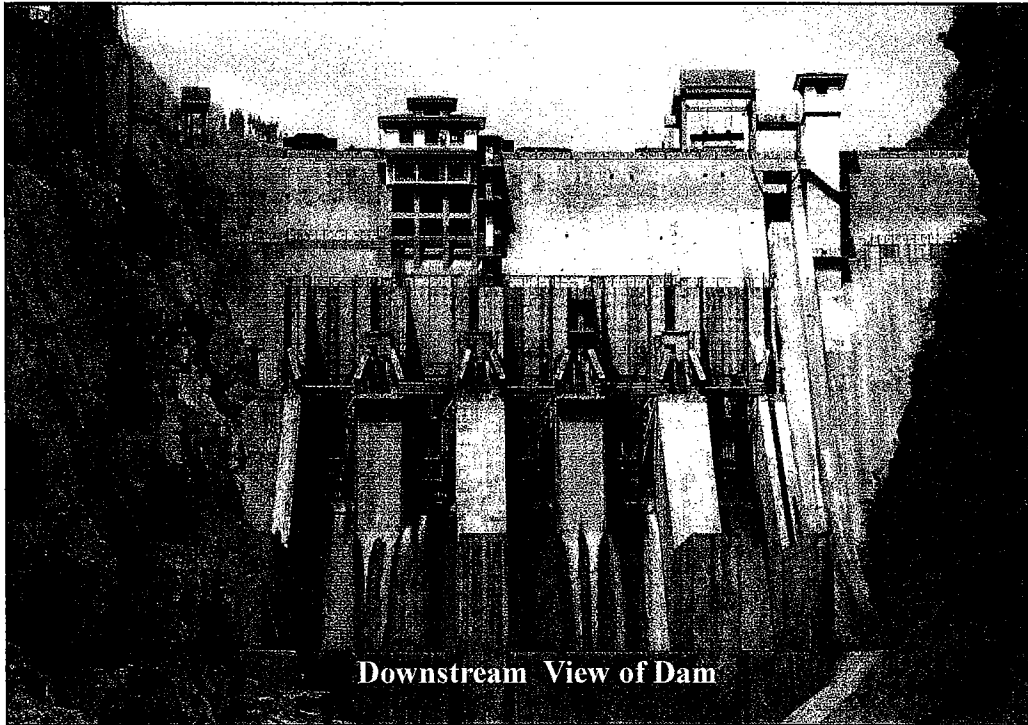
Agency : M/s Hindustan Construction Co. (HCC)

Completion Cost : Rs./Nu. 8250.00 Million

Date of Award/Start : 29 November 1998/01 March 1999

All the works of the package, namely diversion tunnel, concrete dam, intakes, three intake tunnels, three desilting chambers with adits, three outlet tunnels, 6.5 km of headrace tunnel with two adits, gate chambers, gate shafts and concrete plugs of the diversion tunnel, adits of the desilting chambers and the HRT stood completed on 27 April 2006 except for some finishing works.

Major part of the plunge-pool construction programmed to be executed after closure of the Diversion Tunnel spills to post-monsoon 2006.



Contract Package # C-2 : Headrace Tunnel

Construction of HRT from RD 6.50 km to RD 11.50 km

Agency	: M/s Jaiprakash Industries Ltd., (JIL)
Completion Cost	: Rs./Nu. 2400.00 Mlion
Date of Award /Start	: 01 October 1998/01 January 1999

All the works of the package, namely the Padechu adit and 5 km of the headrace tunnel including its adit plugging were completed on 31 October 2005.

Contract Package # C-3 : Headrace Tunnel

Construction of HRT from RD 11.50 km to RD 15.90 km

Agency : M/s Larsen & Toubro (L&T)
Completion Cost : Rs./Nu. 2030.00 Million
Date of Award/Start : 30 September 1998/ 30 December 1998

All the works of the package, namely 963m long Geduchu adit and 4.4 km of the headrace tunnel including its adit plugging were completed on 31 March 2005.

Contract Package # C-4 : Headrace Tunnel

Construction of HRT from RD 15.90 km to 23.10 km.

Agency : M/s Hindustan Construction Co.
Completion Cost : Rs./Nu. 4400.00 Million
Date of Award/Start : 30 September 1998/ 30 December 1998

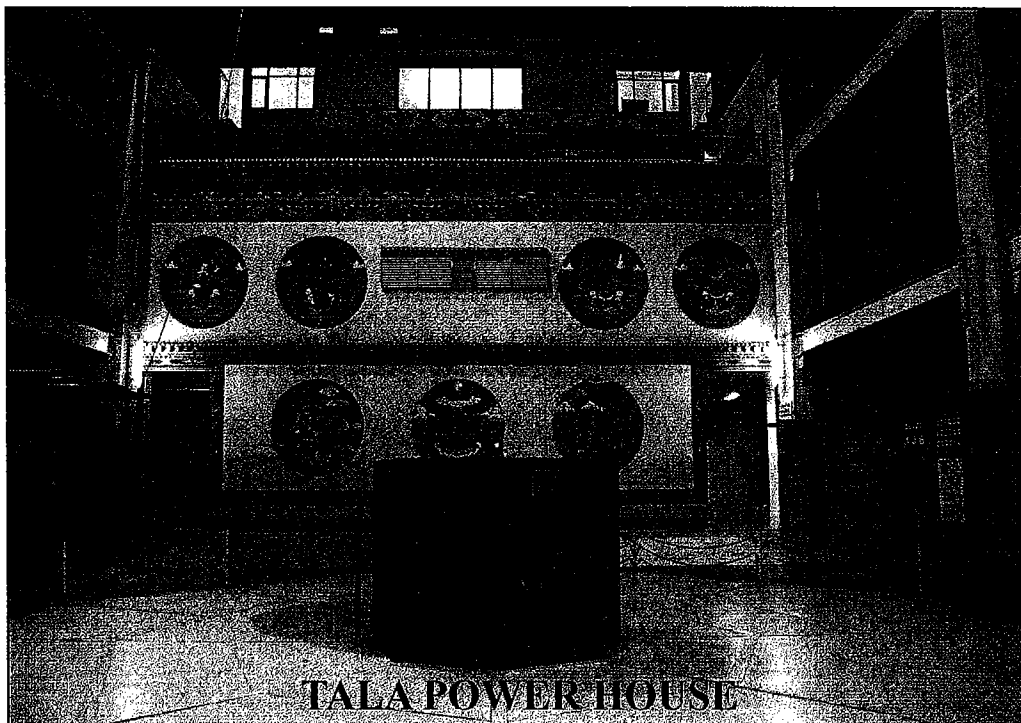
All the works of the package, namely the Mirchingchu adit, Kalikhola adit and 7.2 km of the headrace tunnel including its adits plugging were completed on 31 March 2006.

Contract Package # C-5 : Power House Complex

Construction of Surge Shaft, Pressure Shafts, Power House and Tail Race Tunnel.

Agency : M/s Jaiprakash Industries Ltd.
Completion Cost : Rs./Nu. 7550.00 Million
Date of Award/Start : 29 November 1998/01 March 1999

All the works of the package, namely surge shaft, pressure shafts, power house cavern, transformer hall cavern, pot-head yard and tailrace tunnel stood completed by October 2006 except some finishing items.



Key Materials Consumed

Cement	-	7,29,650 MT
Steel	-	98,606 MT
Explosives	-	4,563 MT
Stone Aggregates	-	27,40,458MT

Electro- Mechanical Works

i) Contract Package # EM-1 : Generating Plant & Equipment

Agency	: M/s BHEL
Completion Cost	: Rs./Nu. 4750.00 Million
Date of Award	: November 1999

Units Commissioning

First Unit (Unit VI)	31st July 2006.
Second Unit (Unit V)	7th October 2006.
Third Unit (Unit IV)	10th November 2006.
Fourth Unit (Unit II)	20th November 2006.
Fifth Unit (Unit I)	12th February 2007.
Sixth Unit (Unit III)	30th March 2007.

ii) Contract Package # EM-2 : EOT Cranes

Agency : M/s Hyderabad Industries Ltd.,
Kolkata

Completion Cost : Rs./Nu. 57.00 Million

Cranes erected and functional:

2 nos., 200/40T EOT cranes in Power House

1 no. 5T EOT crane in Transformer Hall

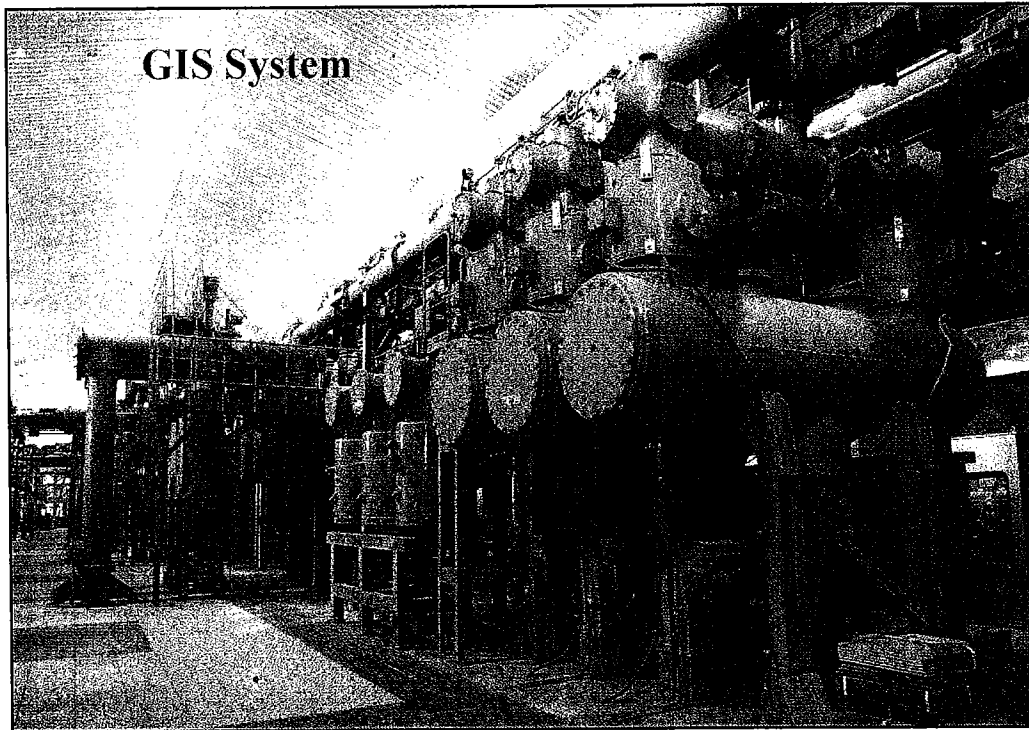
1 no. 75 T EOT crane in Valve Chamber

**iii) Contract Package # EM-3 : 420 kV Gas Insulated
Switchgear**

Agency : M/s Marubeni Corporation, Japan

Completion Cost : Rs./Nu.736.00 Million

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iv) Contract Package # EM-4 : Transformers and Shunt Reactor

Agency	:	M/s Bharat Heavy Electricals Ltd.
Completion Cost	:	Rs./Nu. 560.90 Million

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v) Contract Package # EM-5 : 400 kV XLPE Cables

Agency : M/s ABB Energiekabel GmbH,
Germany

Completion Cost : Rs./Nu. 370.60 Million

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vi) Contract Package # EM-6 : Pothead Yard Equipment

Agency : M/s BHEL

Completion Cost : Rs./Nu. 22.50 Million

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vii) Contract Package # EM-7 : Protection System

Agency : M/s Siemens
Completion Cost : Rs./Nu. 104.90 Million

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viii) Contract Package # EM-8 : 17.5 kV Isolated Phase Bus Ducts

Agency : M/s Controls & Switchgear Co. Ltd.,
Noida
Completion Cost : Rs./Nu. 133.30 Million

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ix) Contract Package # EM -9 : 11 kV & 415 V Switchgear

Agency : M/s GE Power Controls, Kolkata

Completion Cost : Rs./Nu. 81.90 Million

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x) Contract Package # EM-10 : PLCC Equipment

Agency : M/s ABB Ltd., Kolkata

Completion Cost : Rs./Nu. 27.20 Million

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Transmission Works

- i. Contract Package # TS-1
Construction of 400 kV Double Circuit transmission lines.**

Agency : M/s Larsen & Toubro Ltd., Chennai
Completion Cost : Rs./Nu. 1293.00 Million

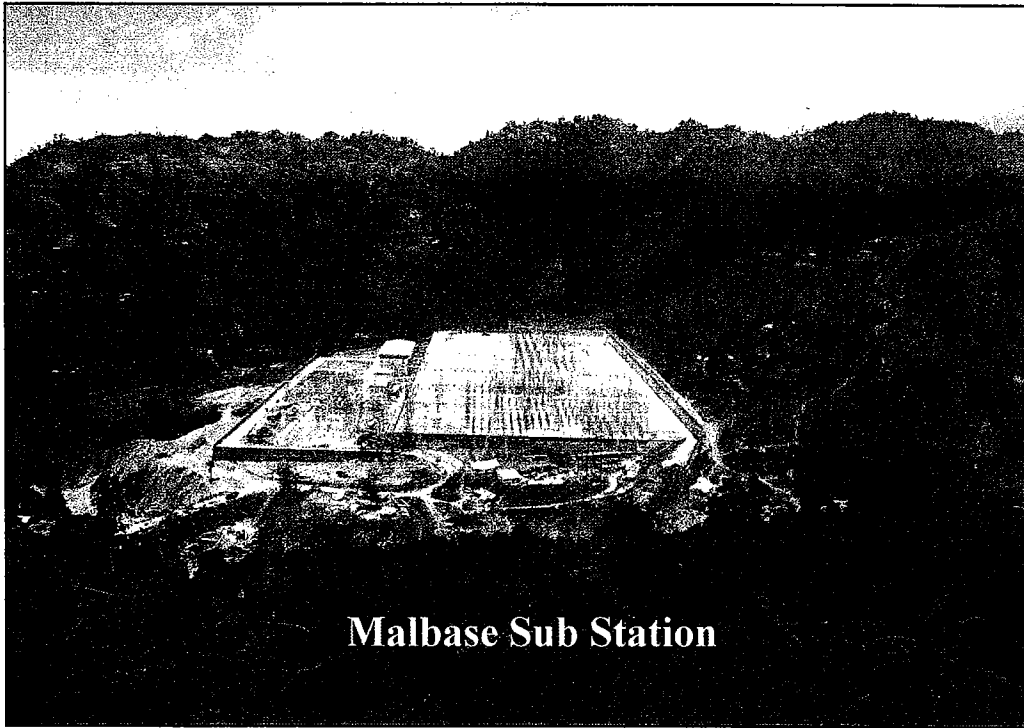
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Transmission system beyond Indo-Bhutan border constructed by
POWERGRID

- ii) Contract Package # TS-2: Construction of 400/220 kV
Interconnecting Sub-station at Malbase (Pasakha)**

Agency : M/s Compton Greaves, Kolkata
Completion Cost : Rs./Nu. 397.00 Million

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Hydro-Mechanical Works (HM#1)

**Design, Manufacture, Supply, Erection, Testing and Commissioning
of Gates & Hoists.**

Agency : M/s Texmaco, Kolkata
Completion Cost : Rs./Nu. 397.20 Million

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