



HYDRO POWER

Harnessing the
Power of Water



Kaleshwaram LIS, Telangana - India : BHEL has designed and manufactured one of the largest single-stage centrifugal pump-motor sets of the world

About BHEL

Established in 1964, BHEL is one of the largest & oldest engineering and manufacturing enterprises in India in the energy and infrastructure sectors. BHEL has a widespread network of 16 manufacturing facilities, 2 repair units, 8 service centres, 14 centres of excellence, 5 specialized institutes for carrying out advanced R&D in various engineering disciplines, and is currently executing projects at more than 150 sites across India and abroad. BHEL offers one-stop solutions backed by its core design, engineering and manufacturing strengths coupled with a committed pool of about 30,000 employees (including 9,000 skilled engineers), contemporary technologies and state-of-the-art manufacturing and testing facilities. The company undertakes projects and contracts in all modes including EPC, Supply, Supply & Supervision, Consortium partner, Contract Manufacturer, etc., as per customer requirement.

From making India self-reliant in power generation to setting up power-plants in Africa, CIS, South-East Asia and Far-East, BHEL has contributed close to 200 GW of power-generation capacity. BHEL has also been deeply involved in other industrial and strategic sectors offering our customers a comprehensive portfolio of products, systems and services in power (nuclear, hydro, solar and thermal), transmission (sub-stations, transformers, shunt-reactors, instrument transformers, switchgear), railways (rolling stock, propulsion, traction motors, transformers, etc.), defence, aerospace, oil & gas, battery energy storage systems & EV chargers and stand-alone products such as compressors, heat exchangers, motors, pumps, valves, etc., adhering to international standards. Besides a formidable presence in India, the company has a widespread footprint spanning 88 countries across all the inhabited continents of the world.



3x110 MW Kishanganga Power station in Jammu & Kashmir, India, commissioned by BHEL

BHEL: Leader in the Hydro Power Sector

- Supplied & commissioned 550+ Hydro sets with 32 GW+ capacity in India & abroad
- Supplied 45% of the total installed Hydro capacity in India
- Some of the world's highest capacity single-stage pump-motor sets (up to 145 MW) developed & manufactured for Palamuru Rangareddy LIS, Telangana, India
- Highest head Francis Turbine in India developed, manufactured & commissioned for Kameng HEP, Arunachal Pradesh, India
- Commissioned 47 pump-motor sets (3.3 GW) and 54 Pump-Motor sets (7.3 GW) under execution
- One-stop solution for Hydro Power Equipment
 1. Dedicated design, engineering, erection and commissioning teams
 2. Dedicated after-sales support



**ANNUAL MANUFACTURING CAPACITY
OF 2500 MW FOR HYDRO SETS**



Model Test Rig at Centre of Excellence for Hydro Machines at BHEL Bhopal, India

BHEL: Technology Edge

Centre of Excellence for Hydro Machines at Bhopal, Madhya Pradesh

- One-of-its-kind facility in India
- State-of-the-art facilities for R&D, design, development and testing of Hydro-Turbines



Detailed Project Engineering

- Strong engineering base with over 50 years of proven experience
- Facility for Computational Fluid Dynamics Analysis, Finite Element Analysis and Hydraulic Transient Analysis facility
- Expertise in Electronics systems like Static Excitation System, SCADA, SFC, etc.
- Dedicated teams for plant engineering, BOPs and site services

BHEL Offerings

Hydro Generators and Motors

BHEL has capability for engineering, manufacturing, installation and commissioning of custom-made Salient Pole Vertical Synchronous Hydro Generator up to 400 MW, Lift Irrigation Schemes (LIS) motor up to 200 MW, Fixed Speed Generator-Motor up to 300 MW, Bulb Generator up to 10 MW and Horizontal Generator up to 20 MW along with matching Static Excitation System/ Brushless Excitation System.

Hydro Generators and Motors : Capabilities

- Power Generation
 - Vertical Hydro Generators
 - Horizontal Generators
- Synchronous Motors for Lift Irrigation Schemes
- Reversible Motor-Generator (fixed speed) for Pump Storage Plant (PSP) Scheme
- Renovation, Modernisation and Upgrading of Old Machines (BHEL and non-BHEL)

Hydro Turbines and Pumps

We have the capability for engineering and manufacturing of custom-made conventional Hydro Turbines of Kaplan types up to 100 MW, Francis and Pelton types up to 400 MW, Bulb Turbines up to 10MW, Pump Turbines up to 250 MW, high capacity Pumps for Lift Irrigation Schemes (LIS) up to 200 MW and Turbines for small Hydro Power Plants.

Hydro Turbines and Pumps : Capabilities

- Francis Turbines (up to 400 MW)
- Kaplan Turbines (up to 100 MW)
- Pelton Turbines (up to 400 MW)
- Pumps for Lift Irrigation Schemes (up to 200 MW)
- Reversible Pump-Turbines for Pump Storage Plants (up to 250 MW)
- Butterfly & Spherical Valves
- Microprocessor-based Digital Governors
- Plant Layout & Mechanical BOPs



Exterior view of (Inset: Generator floor) 4 x 130 MW Parbati-III HEP, NHPC Ltd. In Himachal Pradesh, India



New CNC Hydro facility set-up in Bhopal Plant, India, for augmenting hydro manufacturing capacities

Manufacturing Facilities

Strong Manufacturing Base

- Hydro Turbine manufacturing facility spread over 1,00,000 square metres
- Dedicated shop floor for Hydro Generators
- Large-scale CNC Machining facility
- Large associated fabrication facility
- HVOF coating facility for Turbine components
- Large base of experienced ancillary units in close vicinity of all manufacturing units
- Hydro Generators: Large sized VPI plant for VPI winding
- Insulation Lab for Conducting Type Tests Like BDV, Impulse and Accelerated Ageing Test
- 7-axis Robotic Coil Taping Machine

Supporting Units

- Central Foundry & Forge unit for Shaft forgings
- Central Stamping & Fabrication unit for laminations of hydrogenerator



Largest manufacturing base for Hydro equipment in India





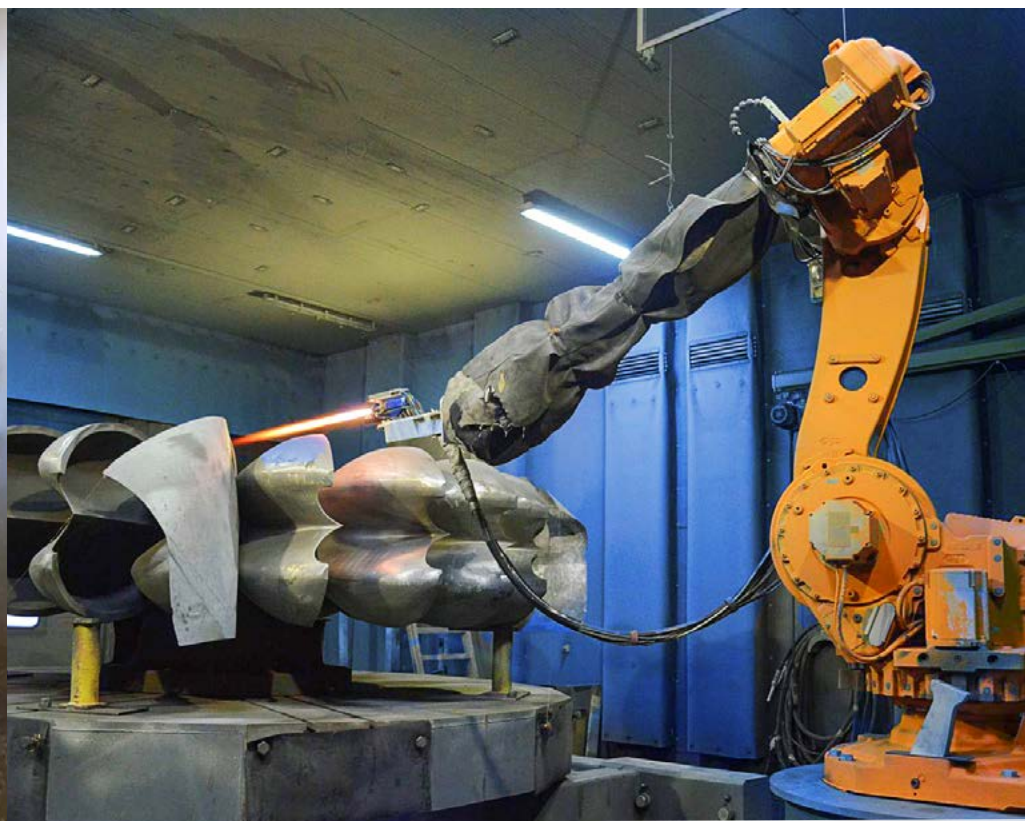
Hydro power plant at Bhutan, 720 MW HEP Mangdechhu designed, manufactured and commissioned by BHEL, was jointly inaugurated by Hon'ble PM (India), Sh. Narendra Modi and Hon'ble PM (Bhutan), Dr. Lotay Tshering in August 2019

Highest Rating Machines by BHEL

Description	Project	No. x Rating	Runner Dia.	Max. Head
Highest Unit Rating Kaplan Turbine	Polavaram Hydro Power House, Andhra Pradesh	12x80 MW	6850 mm	31.0 m
Highest Unit Rating Centrifugal Pump	Palamuru Rangareddy Lift Irrigation Scheme Stg 2 & 3, Telangana	9x145 MW	4460 mm	139.0 m
Highest Unit Rating Pelton Turbine	Parbati-II Power house, Himachal Pradesh	4x200 MW	3090 mm	845.0 m
Highest Unit Rating Francis Turbine	Arun-III Power House Nepal	4x225 MW	4460 mm	312.0 m
Highest Head Kaplan Turbine	Dudhganga Power House, Maharashtra	2x12 MW	2200 mm	62.0 m
Highest Head Pelton Turbine	Pykara Ultimate Stage Power house, Tamil Nadu	3x50 MW	2200 mm	1039.0 m
Highest Head Francis Turbine	Kameng Power House, Arunachal Pradesh	4x150 MW	3100 mm	531.0 m

Notable Machines Supplied by BHEL

S. no.	Description	Rating
1	Highest Capacity (vertical)	4x200 MW, 375 RPM for Parbati-II HEP , Himachal Pradesh
2	Biggest in Physical Size	6x150 MW, 136 RPM with a frame diameter of 13.4 m for Srisailem HEP , Andhra Pradesh
3	Heaviest Thrust Bearing load	1800 tons for 4x75 MW, 150 RPM for Ukai HEP , Gujarat
4	Highest Speed Machine (Vertical)	1x20 MW, 750 RPM for Kundah 'V' HEP , Tamil Nadu
5	Highest Capacity (Vertical) (Generator / Motor - JV)	6x200 MW, 136 RPM for Sardar Sarovar River bed , Gujarat
6	Highest Capacity (Horizontal)	4x12.5 MW, 600 RPM for Rammam , West Bengal
7	Bulb Generators (JV)	2 x 9 MW, 125 RPM for Mukerian HEP , Punjab
8	Highest Capacity Vertical Motor	7 x 139 MW, 214.3 RPM for Kaleshwaram LIS Pkg-8 in Telangana
9	Highest Speed (Horizontal)	3 x 1.5 MW, 1500 RPM for Gumma HEP in Himachal Pradesh
10	First 60 Hz Generator	1 x 61.2 MW, 360 RPM, 13.8 kV for Bihai, Taiwan
11	Highest Voltage rating	2 x 100 MW, 428.6 RPM, 15.8 kV for Namchien Hydro Power , Vietnam



5 axis Impeller Machine (Left) and Robotic HVOF Coating Facility (Right) at BHEL Bhopal



3x14 MW Salma Hydropower Project commissioned by BHEL in Afghanistan

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