



BHEL: Making in India since 1964

An Overview...



Bharat Heavy Electricals Ltd.



Contents

- 1 **Company Overview**
- 2 **National & International Presence**
- 3 **Products & Offerings**
- 4 **Engineering Capabilities and R&D**
- 5 **Major Manufacturing Units at BHEL**
- 6 **Financial Highlights**

Company Overview

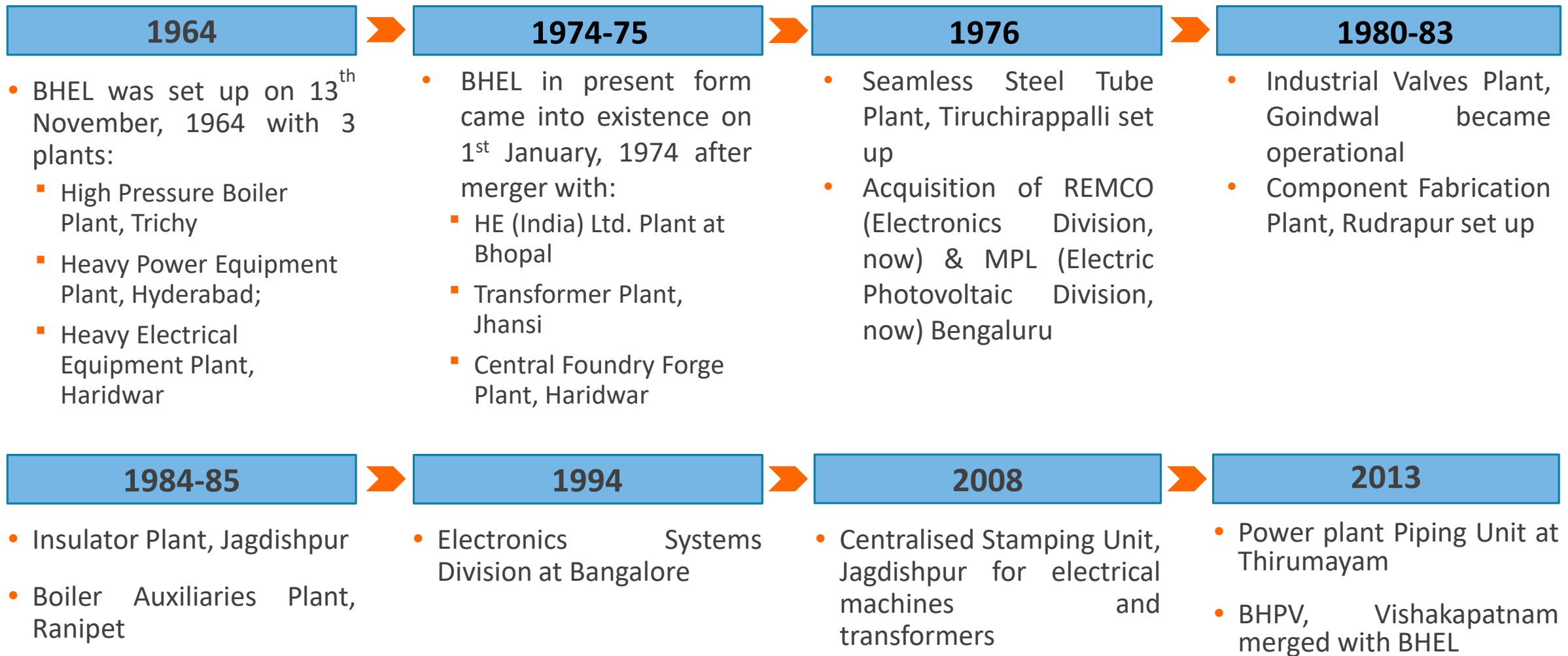
Company Overview



- Making in India since 1964, serving core sectors of economy
- One of the largest engineering & manufacturing enterprises of its kind in India
- Pan India presence: 16 Manufacturing units, 8 service centres, 150+ project sites
- 194+ GW power generating capacity installed for customers in India & abroad
- More than half of the electricity generated in the country comes from BHEL sets
- Only company associated with all 3 stages of India's Nuclear Power Program
- 2nd largest employer in Indian Capital Goods industry (30000+ workforce)
- References in 88 countries and all 6 inhabited continents
- R&D expenditure consistently more than 2.5% of turnover, 5200+ IP equity

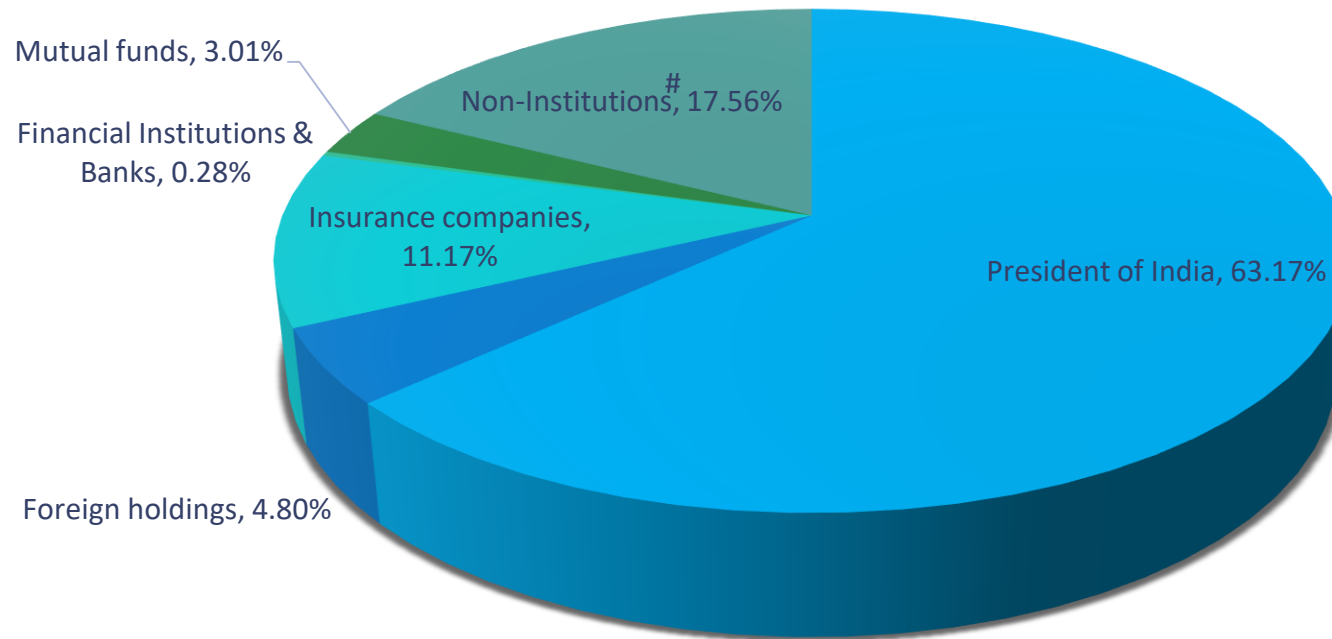


Evolution of BHEL *(Making in India since 1964)*



Shareholding Pattern

as on Sept 30, 2022



- President of India
- Foreign holdings
- Insurance companies
- Financial Institutions & Banks
- Mutual funds
- Non-Institutions

[#] includes Individual shareholders, NBFCs, employee trusts, overseas depositories etc.

Board of Directors



Dr. Nalin Shinghal
Chairman & Managing Director

Functional Directors



Subodh Gupta
Director (Finance)



Renuka Gera
Director (Industrial Systems & Products)



Upinder Singh Matharu
Director (Power & Additional Charge of Human Resources)



Jai Prakash Srivastava
Director (Engineering, Research & Development)

Independent Directors



Manish Kapoor



Raj Kamal Bindal



Dr. K Sivaprasad



Dr. Lekhasri Samantsinghar

Govt. Nominee Directors



Shashank Priya
Special Secretary & Financial Advisor, Ministry of Commerce & Industry

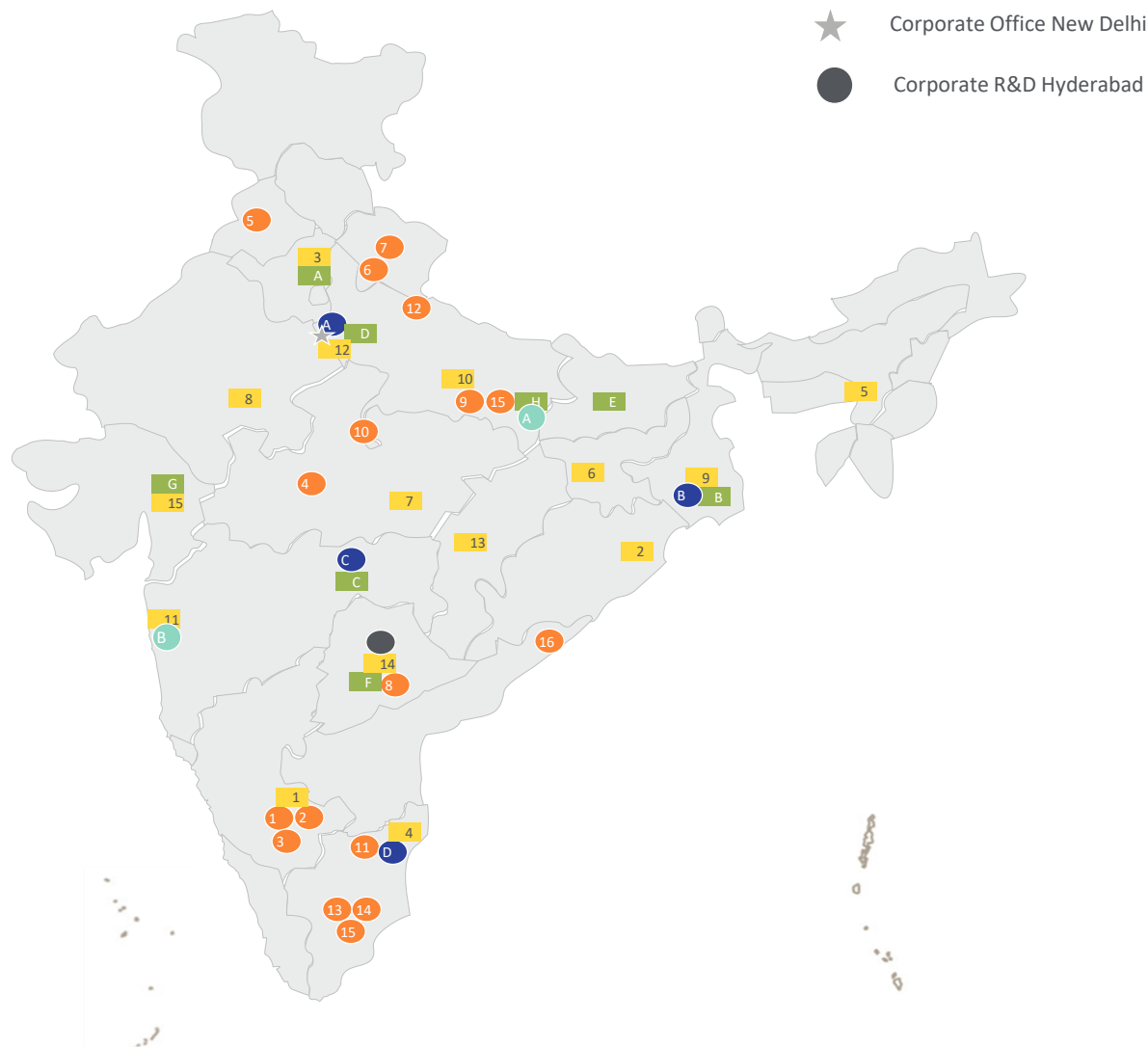


Vijay Mittal
Joint Secretary Ministry of Heavy Industries

as on 15th September, 2022

National & International Presence

All India presence



Business Offices

- 1 Bangalore
- 2 Bhubaneswar
- 3 Chandigarh
- 4 Chennai
- 5 Guwahati
- 6 Ranchi
- 7 Jabalpur
- 8 Jaipur
- 9 Kolkata
- 10 Lucknow
- 11 Mumbai
- 12 New Delhi
- 13 Raipur
- 14 Secunderabad
- 15 Vadodara

Manufacturing Units

- 1 Bangalore
 - EDN
 - EPD
 - ISG
- 2 Bhubaneswar
- 3 Chandigarh
- 4 Chennai
- 5 Guwahati
- 6 Ranchi
- 7 Jabalpur
- 8 Jaipur
- 9 Kolkata
- 10 Lucknow
- 11 Mumbai
- 12 New Delhi
- 13 Raipur
- 14 Secunderabad
- 15 Vadodara
- 16 HPVP Visakhapatnam

Service Centres

- A Chandigarh
- B Kolkata
- C Nagpur
- D Noida
- E Patna
- F Secunderabad
- G Vadodara
- H Varanasi

Repair Units

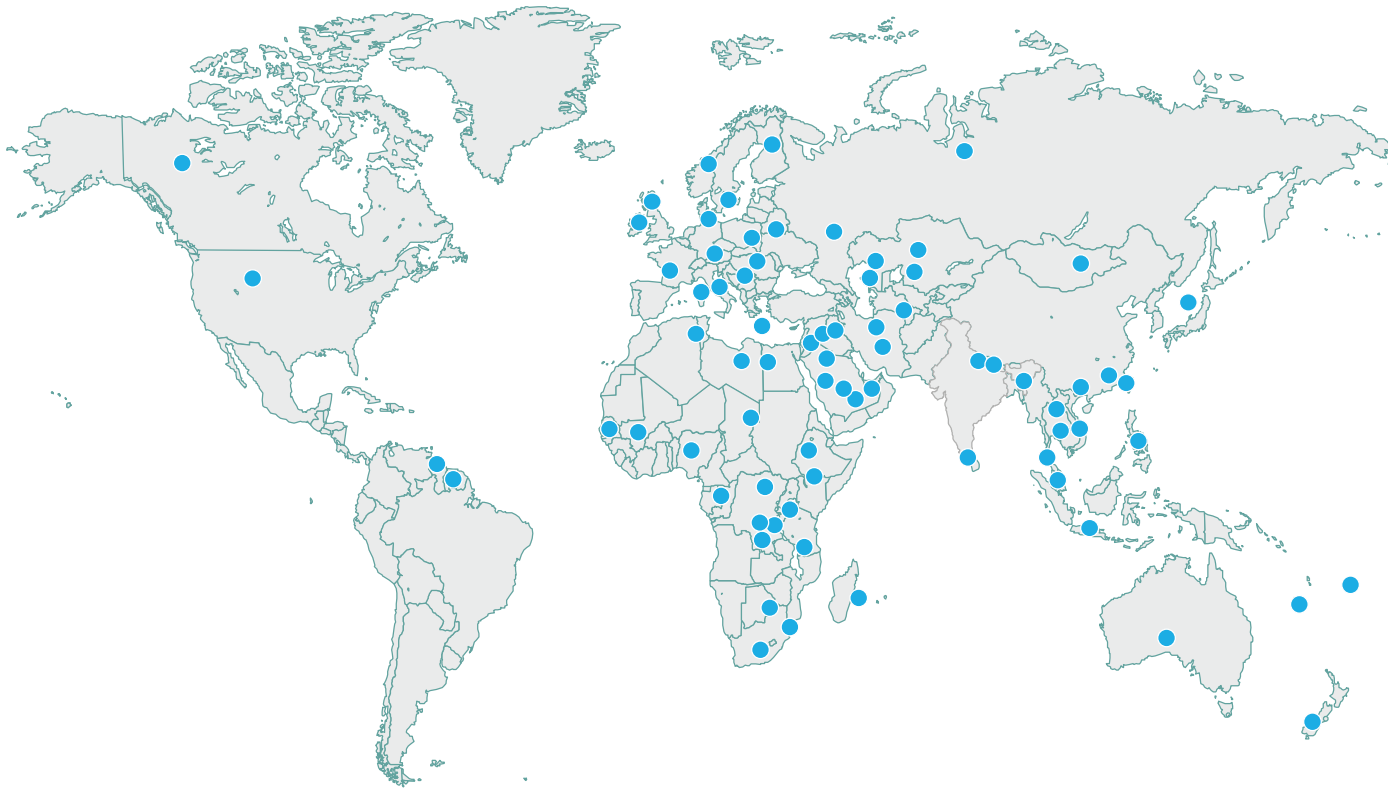
- A Varanasi
- B Mumbai

Regional Offices (Power Sector)

- A Noida (Northern Region)
- B Kolkata (Eastern Region)
- C Nagpur (Western Region)
- D Chennai (Southern Region)

Note: Map not to scale.

Global Footprints



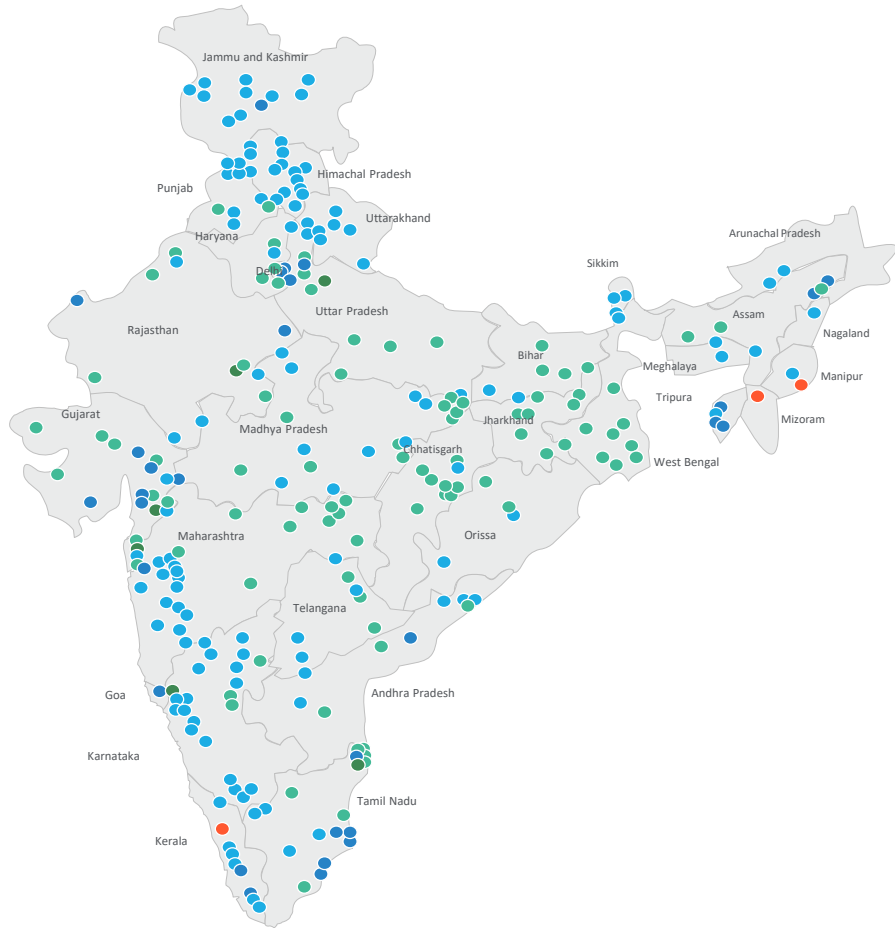
- Presence in all segments – **Thermal, Hydro, Oil & Gas, Solar, Transmission**
- **Reference in 88 countries**

- **First largest turnkey project export** by Indian co. – **Libya (1977)** – 2x120MW Tripoli (West)
- **~90% of power generating capacity in Bhutan installed by BHEL**
- **Consistent Performance** – **~17,000+ MW contracted** and **~11,000 MW executed**
- **Executing**
 - Largest ever export order of **2x660 MW Maitree STPP**, Bangladesh worth US \$1.5 billion
 - **Largest hydro project** of Nepal – **4x225 MW Arun-3**

Note: Map not to scale.

With majority share in country's installed base and generation

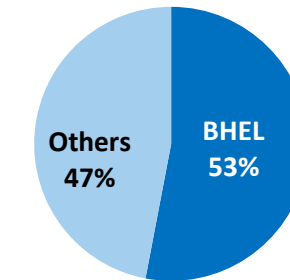
BHEL supplied coal, gas, nuclear, diesel & hydro projects across India



- Coal
- Hydro
- Gas and CCP
- Diesel
- Nuclear

Share of India's Installed Generation Capacity⁽¹⁾ (as on March 31, 2022)

Total Capacity⁽¹⁾: 3,11,987 MW



(1) Coal, Gas & CCP, Diesel, Nuclear & Hydro; Based on Capacity at the time of installation

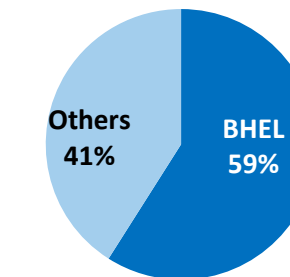
BHEL's Electric Utility Installed Base in India

(As on March 31, 2022)

	GW
Coal	132
Gas and CCPP	8
Diesel	0.2
Nuclear	3.3
Hydro	21
Total	~165*

Share of Generation (Coal & Lignite) (During FY 2021-22)

Total generation - 1,078.5 BU



Note: Map not to scale.

Products and Offerings

We serve core sectors of the economy – with a comprehensive portfolio of products, systems and services...

Power

Execution of power projects from concept to commissioning

Offerings:

- Thermal: up to 1000 MW BTG ratings
- Emission control equipment-FGD, ESP, SCR
- Gas: gas turbines & generators upto 299 MW
- Hydro: EM Package up to 400 MW
- Nuclear: SG & TG sets upto 700 MWe

Transmission

Wide range of transmission systems & products including EHV & UHV

Offerings:

- Power transformers
- Instrument transformers
- Shunt reactors
- Switchgear
- Capacitors
- Control & Protection equipment
- HVDC terminals
- Flexible AC transmission

Transportation

Wide range of traction propulsion equipment for all types of rolling stock

Offerings:

- Locos, EMU & metro coaches
- Electric rolling stock – AC & DC
- Electrics for urban transportation system
- Propulsion equipment for EMU/ Locomotive

Defence & Aerospace

Strategic equipment for Indian defence forces for over 20 years

Offerings:

- Super Rapid Gun Mount
- Turret Casting For T-72 Tanks
- Integrated Platform Management System (IPMS) for Naval Ships
- Compact Heat Exchanger For LCA (Tejas)
- Space Grade Solar Panel
- Space Grade Li-ion Battery



We serve core sectors of the economy – with a comprehensive portfolio of products, systems and services...

Captive Power & Process Plants

EPC of power plant for captive usage by industries, process plants of down stream Oil & Gas

Offerings:

- Captive Power Plants & Process units – EPC
- Down stream Oil & Gas – equipment like columns, vessels, heat exchangers etc

Industrial Products & Systems

Wide Range Of Industrial Products

Offerings:

- Oil Rigs
- Well Head & X-mas Tree Valves
- Fabricated Equipment & Boiler Feed Pumps
- Compressors
- AC Machines
- Valves

Energy Storage Solutions

Focus on opportunities in electric mobility, battery storage & railway track electrification

Offerings:

- Energy Storage System
- Power Conditioning System
- Energy Management System
- Complete Containerized Solutions
- Electric Vehicle Chargers
- Electric Power Train
- Lithium Ion Battery Packs

Renewable Energy

EPC solutions for ground mounted, roof top and floating solar PV power plants

Offerings:

- Solar cells and modules
- Power Control Unit (PCU) for solar PV plants
- Passive Solar Tracking modules



A leader in Indian Power sector – Concept to commissioning

1000+ generating units commissioned; 18,500+ MW Captive Power Plants commissioned

THERMAL



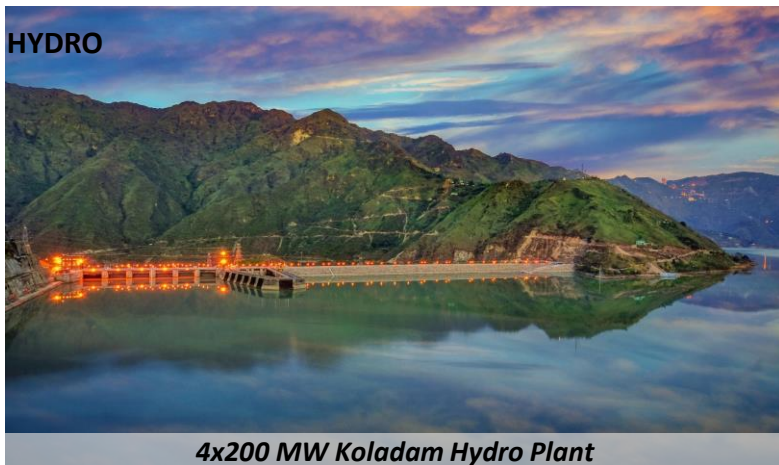
Major offerings:

- Thermal sets
up to 1000 MW ratings
- Emission control equipment
ESP, FGD, SCR
- Gas turbines & generators
upto 299 MW rating
- Hydro EM Package
upto 400 MW
- Nuclear SG & TG sets
upto 700 MWe
- Captive power plants
- Solar power plants

GAS BASED



HYDRO



NUCLEAR



Thermal Business - A Market Leader



2x660 MW Super critical power plant at Suratgarh, Rajasthan



600 MW Western Mountain CPPP, Libya

More than 50% of installed capacity & 55% of power generation comes from BHEL sets

Major offerings:

- EPC solutions from concept to commissioning for coal-based power projects with subcritical & supercritical technologies up to 1,000 MW rating.
- State-of-the-art emission control equipment for coal-based plants for lower carbon footprint
- Pioneer in domestic manufacture and supply of Flue Gas Desulphurisation (FGD) System for SO_x control
- Selective Catalytic Reduction (SCR) system for NO_x control for coal-based plants
- Gas turbines and matching generators ranging upto 299 MW (ISO) rating
- Spares for BHEL & non-BHEL sets
- Remote Monitoring & Diagnostic Systems (RMDS)



Hydro Business

~90% of hydro power generating capacity in Bhutan installed by BHEL

Major offerings:

- Turnkey Contract with custom-built conventional hydro turbines of Kaplan upto 100 MW, Francis and Pelton types upto 400 MW
- Custom made salient pole vertical synchronous hydro generator upto 400 MW
- Pump turbines with matching motor-generators upto 250 MW
- High capacity pumps along with matching motors for Lift Irrigation Schemes (upto 200 MW)
- Fixed speed generator-motor upto 300 MW and turbines for small hydro power plants.
- Microprocessor based Digital Governing system for all types of Hydro Power plants
- Renovation, Modernization and uprating of Hydro power plants
- Spherical (rotary) valves, butterfly valves and auxiliaries for hydro stations



1.2 GW+ total solar portfolio; One of the largest EPC player in floating solar segment in the country



50 MW Solar Plant, Ananthpur



100 MW Floating solar plant at NTPC Ramagundam

Major offerings:

- EPC solutions from concept to commissioning of Solar PV Plants with or without BESS (Battery Energy Storage System).
- Ground mounted, Roof Top, Canal top and leader in floating solar power plants.
- Solar-based irrigation and drinking water pumps
- Solar Inverters for utility as well as traction applications
- Loose Solar PV Cells and Modules meeting Domestic Content Requirement (DCR) of MNRE
- Commissioned world's first Solar PV Plant for Rail Traction (1.7 MW)



Nuclear Business

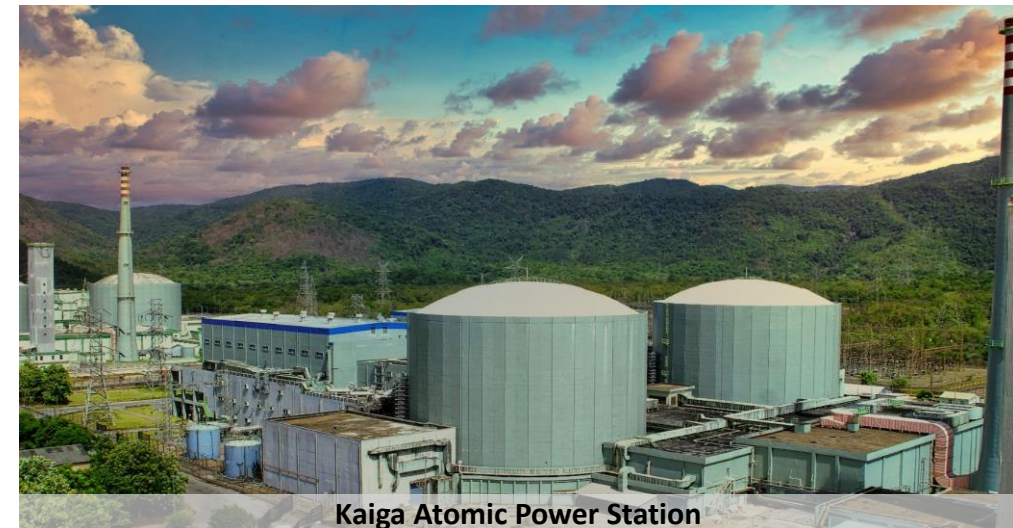
The only company associated with all 3 stages of India's Nuclear Power Program ; Only Indian company with design & engineering experience

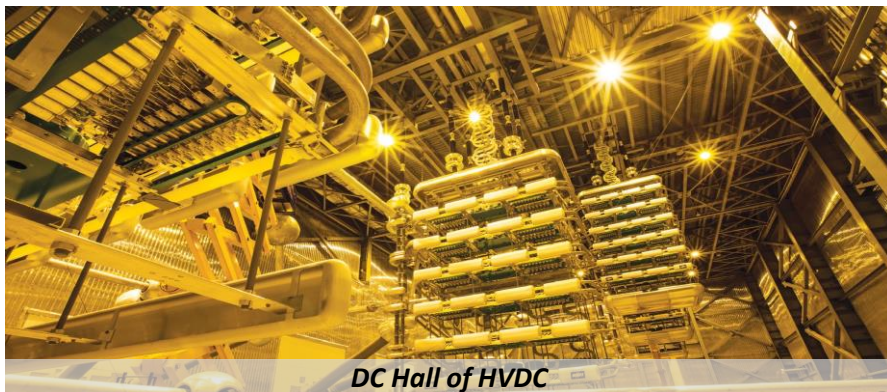
Major Offerings:

- EPC of TG Islands
- Capability for TG sets 220/ 235/ 500/ 540/ 700 MWe both on primary & secondary side
- Steam Generator, Reactor Headers, Turbine Generators sets
- Moisture Separator Reheater (MSR), Heat Exchangers, Condensers

Highlights:

- Major player in nuclear power with 12 out of 22 sets installed in the nation contributing ~48% (3.2 GWe) to installed nuclear capacity





7,00,000+ MVA transmission equipment supplied

Supply of wide range of transmission systems & products including EHV & UHV

Major offerings:

- Turnkey transmission solutions
- Power transformers upto 1200 kV
- Instrument transformers
- Control & Protection equipment
- Flexible AC Transmission System (FACTS) Solution
- Shunt reactors
- Gas Insulated Switchgear (GIS) upto 420 kV
- Capacitors
- HVDC terminals
- Sub-stations



Transportation Business

Majority of locomotives & EMUs of Indian Railways carry traction equipment manufactured by BHEL

Major offerings:

- Locos, EMU & metro coaches
- Traction and propulsion equipment for Locomotives and EMUs, Semi-high speed trains & metro
- Electrics for urban transportation system
- IGBT based traction power converter systems



India's first ever air-conditioned AC EMU train equipped with BHEL's propulsion equipment



BHEL manufactured first WAG 9H loco at BHEL Jhansi



Defence & Aerospace Business

Sole supplier of main gun on Indian Warships ; Strategic equipment supplier for Indian Defence forces for over 30 years



INS Kolkata – an Indian Navy warship equipped with BHEL make Naval Gun (SRGM)

Major offerings for Navy:

- Main Guns for warships
- Integrated Platform Management System
- Equipment for strategic assets

Major offerings for Aerospace:

- Compact Heat Exchanger For LCA
- Space Grade Solar Panels
- Space Grade Li-ion Battery
- Hardware for satellite propellant tanks

Major offerings for Army:

- Turret Casting For T72 Tanks
- Thermo-pressed components for tanks



Light Combat Aircraft(LCA), designed indigenously for the Indian Air force uses BHEL make heat exchangers



Industrial Offerings

Supplying equipment to core sector of economy

Wide Range of Products:

- Oil Rigs; Well Head & X-mas Tree Valves
- Boiler Feed Pumps
- Electrical Machines
- Mechanical Packages e.g. fire heaters, heat exchangers, reactors etc.
- Centrifugal Compressors, Motors, Valves, etc.
- EPC for refineries –LSTK order for process unit for Downstream Oil & Gas sector from IOCL, Paradip for Sulphur Recovery Unit (525TPD) under execution

Highlight:

- 33,000+ AC machines- supplied, largest Indian manufacturer;
- 410+ Compressors & 90 Oil drilling Rigs Supplied;
- 13,000+ Well Heads & Christmas Tree valves supplied



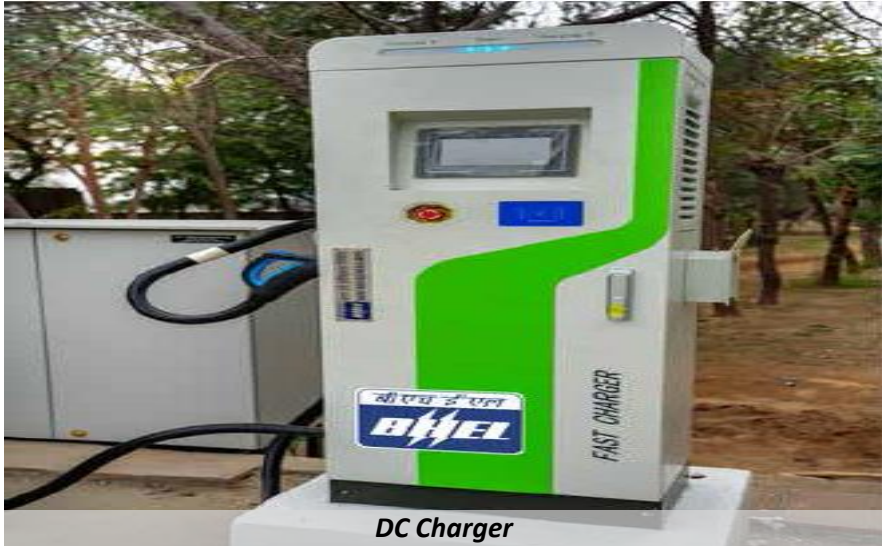
Oil Rig at ONGC Ankleshwar (Model: EV-2000)



*Re-heater for ONGC Hazira
(17MMKcal/hr. atmospheric column feed)*



EV Infrastructure



Major offerings

- **Energy Storage System**
 - Power Conditioning System
 - Energy Management System
 - Complete Containerized solutions
- **Electric Mobility**
 - E-vehicle charging station
 - E-buses
 - EV components – power train and battery packs



New Horizons

• Coal to Chemicals

- Indigenously developed **Fluidized Bed Gasification Technology** (Coal to Syngas)
 - suitable for high ash Indian coals
 - demonstrated through 168 TPD (tons per day) gasification plant at Trichy
- Indigenously designed, installed and **demonstrated 0.25 coal to methanol pilot plant** using 1.2 TPD Fluidized bed gasifier pilot plant at Hyderabad (98-99.5% purity)

• Hydrogen Economy

- Electrolysers, EPC, Storage, Fuel cell



Engineering and R&D Capabilities

Engineering and R&D Capabilities

Well equipped in system and product engineering in thermal, nuclear, hydro, oil & gas, renewables, transmission, transportation, defence & aerospace etc.

Engineering & Manpower

- **9,000+** skilled engineers, across various engineering streams like civil, electrical, mechanical, chemical, industrial, ceramics etc.
- Dedicated **EPC engineering centers** at PE&SD (Hyderabad) and PEM (Noida) & ISG (Bengaluru)
- Product development & System engineering groups at **16** manufacturing units for wide range of products
- Equipped with state-of-the-art IT and design and engineering tools such as IPMS, SDD, SPP&ID, PDMS, SP3D, ANSYS
- 14 Centre of Excellence

Product Level Engineering

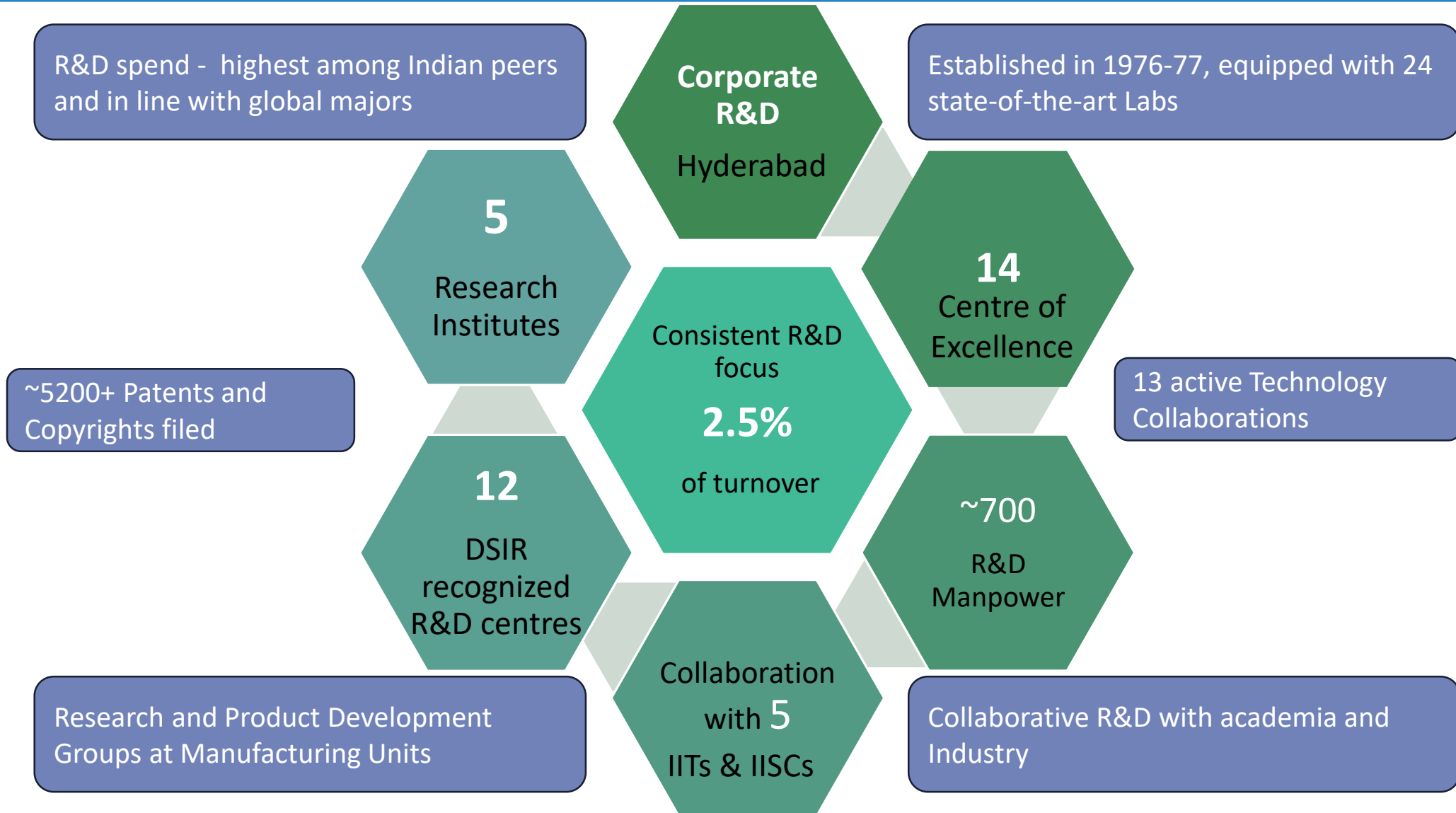
- Turbine, Generators & other power plant equipment
- Super Rapid Gun Mounts (**SRGM**)
- Centrifugal Compressors
- Regenerative braking system for conventional rolling stock
- Circulating Fluidized Bed Combustion (**CFBC**) boilers
- Industrial Motors, Motors for hazardous applications
- Locos, EMU & metro coaches
- Compact Heat Exchanger For LCA and many more

EPC/System Level Engineering

- Thermal – Coal, lignite, gas, FGD
- Hydro – E&M Package
- Solar – Floating, Rooftop, Land
- Nuclear – Turbine Island
- Captive Power Plants & Process unit for oil & gas

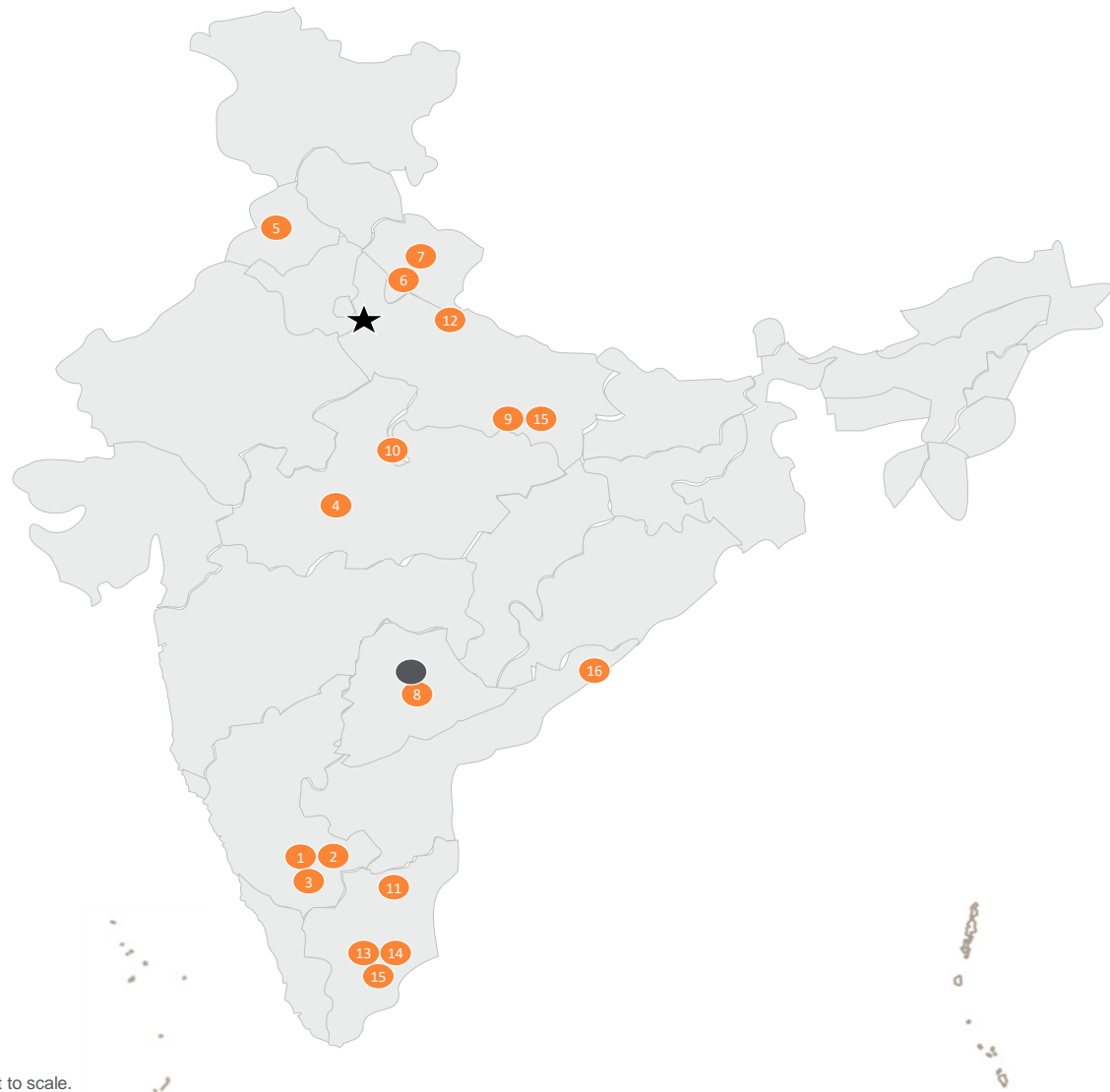


Innovations supported by robust R&D structure



Major Manufacturing Units

Manufacturing Units



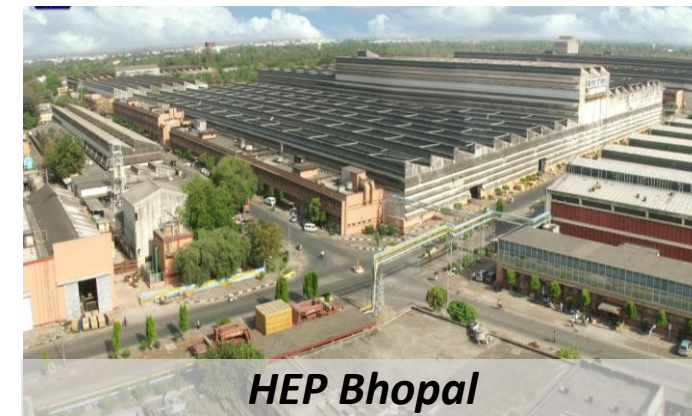
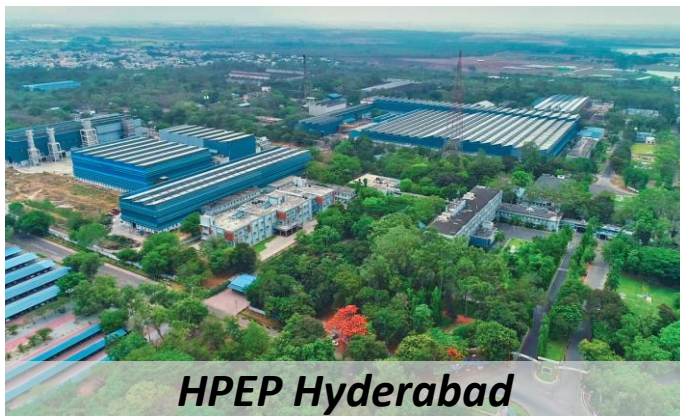
Manufacturing Units

- 1 Bangalore
 - EDN
 - EPD
 - ISG
- 2
- 3
- 4 HEP Bhopal
- 5 IVP Goindwal
- 6 Haridwar
 - CFFP
 - HEEP
- 7
- 8 HPEP Hyderabad
- 9 FSIP Jagdishpur
- 10 TP Jhansi
- 11 BAP Ranipet
- 12 CFP Rudrapur
- 13 Tiruchirappalli
 - HPBP
 - SSTP
- 14
- 15 PPPU Thirumayam
- 16 HPVP Visakhapatnam

- ★ Corporate Office New Delhi
- Corporate R&D Hyderabad

Note: Map not to scale.

Bird's-eye view of major Manufacturing Units



Haridwar - Heavy Electrical Equipment Plant (HEEP)



HEEP Haridwar



Steam Turbine manufacturing

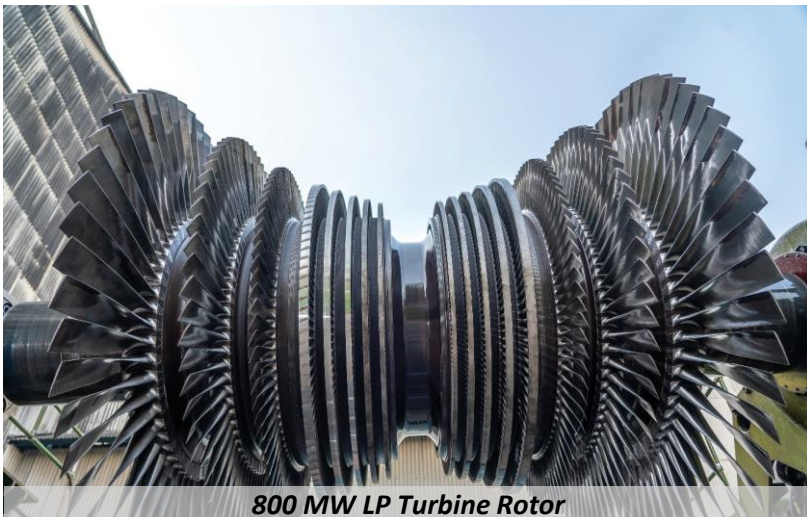
- Engineering and manufacturing of supercritical turbines, auxiliaries & matching generators up to 1000 MW rating along with testing facilities.
- Manufacturing of Super Rapid Gun Mount for Defence Naval ships
- Heavy Duty Precision Machining and Fabrication
- World Class Blade Manufacturing facility comprising of CNC 5-Axis Milling Machines for Turbine Blades of high alloy steels and Inconel, up to 1000 mm length.
- NDT, Material Research, Generator Research, Electrical Calibration Lab

Highlights:

- Technology for Bimetallic (Nickel alloys and high Chrome steel) Turbine Rotor and Casing established successfully for AUSC Project
- In-house development of High Pressure Turbine module for 300 MW Advanced Heavy Water Reactor Nuclear set (BARC)
- Technology development for complete re-winding of imported 600 MW Generator Stator and Rotor at Unit-2 of 2X600 MW Kalisindh project.



Haridwar – Central Forge and Foundry Plant (CFFP)



- Manufacture and supply of castings & forgings for Power Plant Equipment in Plain Carbon Steel, Alloy Steel, Super Critical and Stainless Steel materials

Highlights:

- World's Heaviest Casting (50 MT-single pouring) with IN625 Super Alloy for AUSC Mission Project developed successfully
 - Low Temperature High Impact castings (35 J at -20 Deg. C or 27 J at - 40 Deg. C)
 - Manufacturing of Titanium Boron Stabilized Steel Bars (up to 565 Deg. C)



Jhansi - Transformer Plant (TP)



Transformer manufacturing bay



Electric locomotive under manufacturing

- Centre for various types of locomotives for Railways & Industry
 - Mainline electric loco
 - WAG 9H (6000 HP)
 - WAG7 (5000 HP)
 - Diesel-Electric Shunting locos upto 1400 HP
- Various types of transformers
 - Power and Industrial applications - upto 400 kV
 - ESP Rectifier transformers up to 95 kV – 1400 mA
 - Traction transformers of 25 kV - up to 7775 kVA
 - AC-EMU Transformers of 25 kV – up to 1578 kVA
 - Dry-type Transformers of 33 kV up to 15 MVA
 - Instrument Transformers up to 220 KV



Bhopal - Heavy Electrical Plant (HEP)



700 MWe Nuclear Turbine HP Casing



Hydro Generator

- Manufacturing and testing of transformers (765 kV and 1200 kV class)
- Large Electric Motors (MW range – lift irrigation and industrial application)
- Switchgear upto 33 kV range
- Industrial Traction Machines
- Hydro Turbines and Generators
- Steam turbines upto 500 MW
- UHV test lab (capacity of testing equipment up to 1200 kV class and converter Transformer upto 800 kV DC class)
- Hydro machines test lab (equipped with Universal Test bed capable testing of Turbine, Pumps & Reversible Pump Turbines)

Highlights:

- Development of largest rating 11.8 MW ID FAN motor in CACW construction.
- 700 MWe Nuclear Turbine : HP Casing- Manufactured for the first Time in India for Rawatbhata Nuclear Plant
- HP Heaters for super critical plant for Tata Power (800 MW CGPL at Mundra)



Hyderabad - Heavy Power equipment Plant (HPEP)



125 Ton Vacuum Balancing Tunnel



Advanced Class Gas Turbines Test Facility

- Heavy Duty Gas turbines (26 – 299 MW)
- Turbine & Generators for industrial applications
- Large size pumps, heat exchangers, coal mills
- Compressors
- On-shore Oil Rig
- Major test facilities for
 - Advanced class gas turbine (73MW -300 MW)
 - 125 Ton Vacuum balancing tunnel

Highlights:

- India's highest rated Gas Turbine (ISO rating 299 MW, Manufactured, tested and supplied)
- Complete in-house design, manufacture and testing of Gearbox for Steam turbine application
- Compressor weighing 110 Tons designed, manufactured and supplied with 1100 mm diameter impellers and rotor weight of 6.6 Tonnes



Vishakapatnam - Heavy Plates and Vessels Plant (HPVP)

- Pressure Vessels, Tower Columns , Fired heaters & reactors for Oil & Gas sector
- Boilers up to 200 MW and HRSG
- Centre for Aerospace Grade Compact Heat Exchangers
- Cryogenic Vessels & Equipment for process industries



Distillation Column



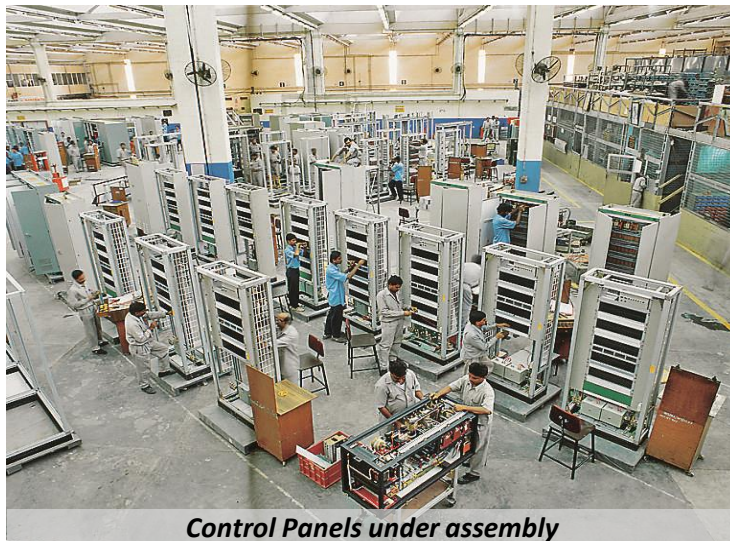
Pressure Vessel



Heat Exchanger for Tejas (AS-9001 accredited)



Bengaluru – Electronics Division (EDN); Electronics System Division (ESD)



- Semiconductor Device manufacturing for industrial applications
(Power thyristors, diodes etc.)
- Digital control systems for power plants for industrial applications
- State of the art facility for Li-Ion cell manufacturing - space grade
- Space grade solar arrays
- Traction converters locos, MEMU, semi-high speed trains
- Propellant Tank Pressure Vessel parts to Liquid Propulsion Systems Centre (LPSC) for Chandrayaan-3
- State-of-the-art solar cell and modules manufacturing
(Solar PV cells - 105 MW/annum and PV modules - 226 MW/annum)

Highlights:

- High density Li ion cells manufactured for ISRO – import substitution for satellite launch vehicles and satellites



Trichy - High Pressure Boiler Plant, Seamless Steel Tube Plant, Power Plant Piping Unit



Steam Generator and Reactor Header for 700 MW Nuclear Power Plant



New-age material AUSC Components

- Steam Generators (up to 800 MW)
- Nuclear Steam Generators (up to 700 MWe)
- Seamless steel tubes
- Valves
- Piping (critical piping, pipe beds, line pipes for utility, industrial, oil exploration applications)
- Ongoing developments:
 - Primary side Nuclear Power equipment
 - Advanced Welding Research
 - R&D on Gasification and Combustion of Fuels

Highlights:

- Nuclear steam generator of 24m length weighing 220 MT
- In-house development of valves for higher rated operating parameters (2" to 38" of pressure rating - 800 class to 4500 class)



Ranipet - Boiler Auxiliaries Plant (BAP)



ESP commissioned at Simhadri STPS, Andhra Pradesh



Roll Forming Line

- Centre for manufacture & supply of Emission control equipment (ESP, FGD)
- Air Preheater
- Industrial fans – primary air fan, secondary air fan, Induced draft fans, for thermal power plants
- Gates and Dampers
- Machining of Titanium based fuel tanks for space applications

Highlights:

- Indigenous development of largest Air Preheater (35 VIM T 2300)
- 50m tall Gate Testing Facility for conducting tests of gates for plants up to 1000 MW
- Fan Testing Station capable of testing fans for Power plants up to 1000 MW



Financial Highlights

Financial Performance – Last 5 years

(in Rs. Cr)	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22
Revenue from operations	28,813	30,423	21,459	17,308	21,211
EBITDA	2,626	2,810	348	(2,765)	1,106
PAT	807	1,209	(1,473)	(2,717)	410
Order book Outstanding	1,18,000	1,08,680	1,08,443	1,02,090	1,02,542



Awards & Recognitions



BHEL has been conferred with Business Innovation Awards 2021



BHEL received the Golden Peacock Innovative Product/ Service Award 2021



BHEL adjudged Clarivate South and South East Asia Innovation Award 2021



BHEL was conferred by the Institute of Chartered Accountants of India “ICAI Award for excellence in Financial reporting” for the financial year 2020-21



CMD, BHEL conferred with CEO with HR Orientation award by World HRD Congress



BHEL has Won Asia's Best CSR Practices Award for its CSR Project – Heal A Soul



BHEL has been selected amongst the top 200 Sustainable Companies

THANK YOU