



**Bharat Heavy Electricals Limited**

**India's Flagship Engineering & Manufacturing Company**





## BHEL AT A GLANCE

**Great Legacy**

**Indian Engineering and Manufacturing Giant**

**Pan India Presence**

**Global Footprint**

**Rich Experience**

**Innovation**

**Skilled Manpower**

- Indian engineering company with global presence
- Over 50 years of experience

- Single source of multiple solutions for energy, industry and infrastructure segments
- Catering to all energy types – coal, hydro, nuclear, gas and solar with entire range and ratings
- Serving core sectors like transmission, industrial systems and products, transportation, e-mobility & battery energy storage, renewable energy, oil & gas, water and defence & aerospace

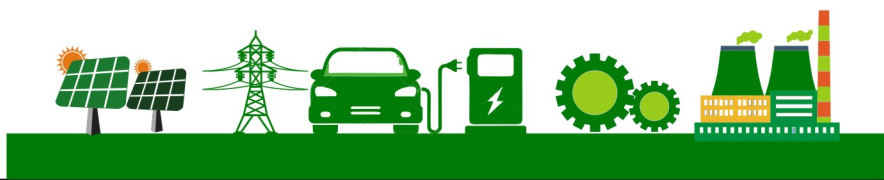
- 16 manufacturing units + 2 repair units + 8 service centres + 4 regional offices in India
- Infrastructure to deal with > 150 project sites (across India and abroad)
- 1 subsidiary + 3 active joint ventures

- References in over 84 countries
- Executing 24 overseas projects spread over 16 countries for around 7,000 MW
- About 17,000 MW overseas projects contracted

- >190 GW capacity installed globally
- >32,000 AC machines supplied
- >390 electric locos and >340 diesel shunters supplied to railways and industries
- >1.2 GW solar PV portfolio
- >6,40,000 MVA transmission equipment supplied

- Highest investment on R&D and innovation in the Indian engineering field
- Filing patents/copyrights applications regularly

- One of India's largest employers in the engineering sector
- About one-third of manpower includes engineers with qualifications, experience and skills spanning a wide range of technology areas

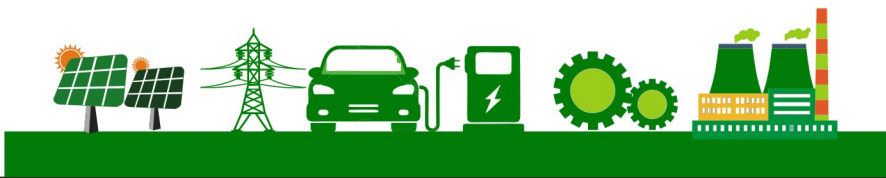


# POWER

BHEL is one of the few companies in the world having capability to manufacture the entire range of power plant equipment and has proven turnkey abilities for executing power projects from concept-to-commissioning.

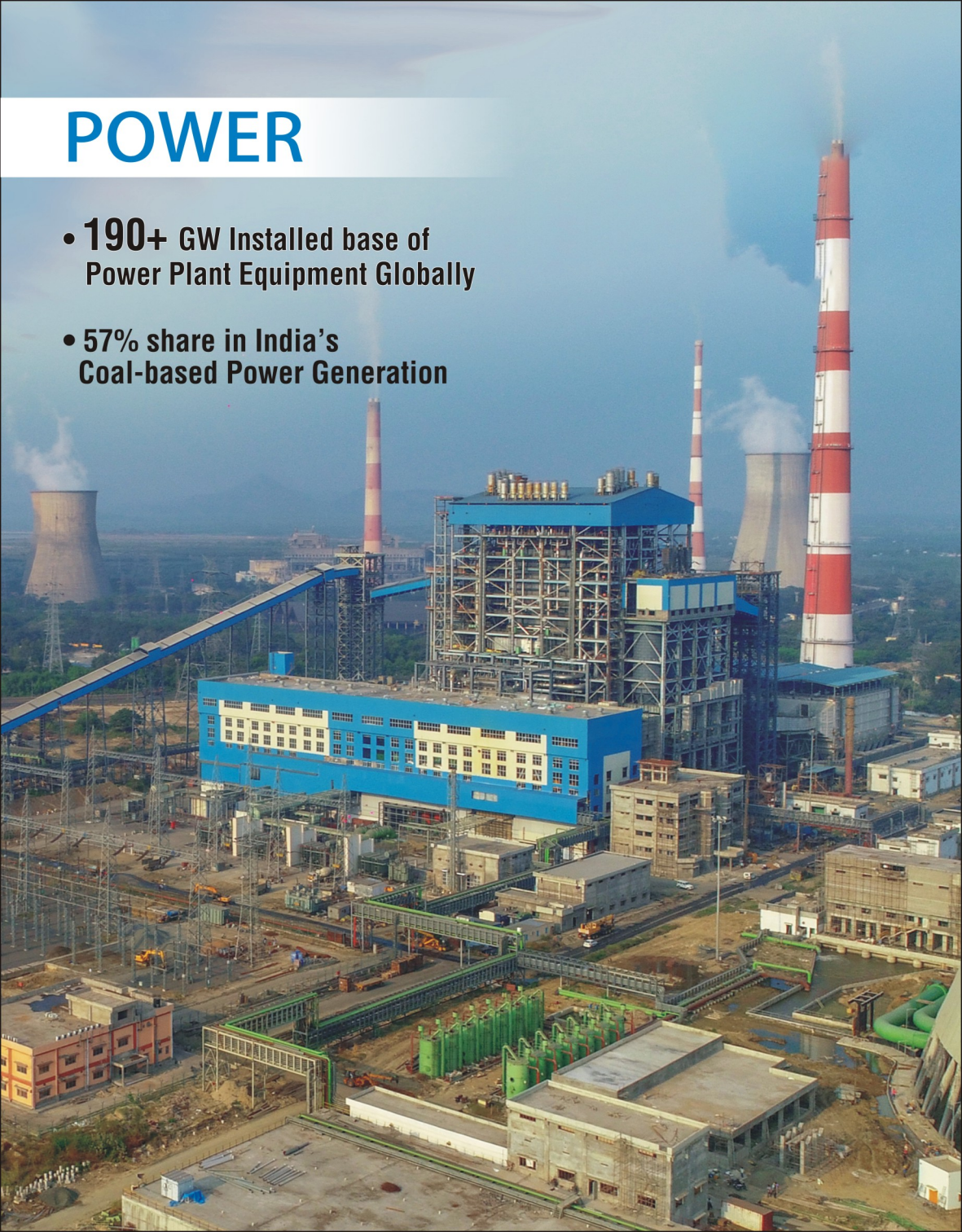
## Key offerings:

- Boilers, steam turbines, generators and auxiliary equipment for coal fired plants up to 1,000 MW unit size
- Emission control equipment including flue gas desulphurisation (FGD) systems for SO<sub>x</sub> emission control, high efficiency electrostatic precipitators (ESP) for particulate emission control and boiler modification and selective catalytic reduction (SCR) systems for NO<sub>x</sub> emission control
- Renovation and retrofitting of ESP by augmentation of collection area to meet particulate matter emission norms
- NO<sub>x</sub> control through in-furnace combustion modification to meet latest emission norms.
- Study and implementation of flexible operation of thermal sets
- Customized hydro sets with Francis, Pelton and Kaplan type turbines for different head and discharge combinations for generation with unit rating up to 400 MW
- Hydro pump-motor sets up to 150 MW rating for lift irrigation schemes (LIS)
- Advanced class gas turbines and generators up to 299 MW unit size (ISO) rating, tailored to meet specific needs, for both open and combined cycle operation
- Nuclear turbine-generator sets ranging from 220 MWe to 700 MWe ratings and primary side equipment like steam generators, reactor headers and heat exchangers
- Plant performance improvement through renovation, modernization, uprating, residual life assessment, health diagnostics and life extension of plants
- Remote monitoring and diagnostic services
- Supply of spares and services (including for Non BHEL sets) to help utilities in maintaining plant availability and reliability
- Holistic support for operation and maintenance of power plant equipment



# POWER

- **190+ GW** Installed base of Power Plant Equipment Globally
- **57% share** in India's Coal-based Power Generation



# TRANSMISSION

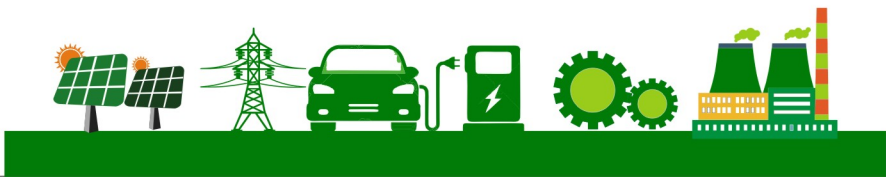
BHEL is the leader in the field of power transmission in India offering a wide range of transmission systems and products conforming to international quality standards. BHEL has a rich experience of more than four decades in setting up of EHV & UHV substations, switchyards both AIS and GIS types ranging from 33 kV to 765 kV for utilities and industries covering a vast array of applications from concept to commissioning on EPC basis.

## Key Offerings:

- HVAC power transformers up to 1200kV, HVDC converter transformers up to 800kV, current transformers up to 400kV, capacitive voltage transformers up to 1200kV, electro-magnetic voltage transformers up to 220 kV, special transformers including dry type Transformers up to 15 MVA
- FACTS devices like fixed series compensation (FSC), static VARcompensation (SVC), IGBT based static compensators (STATCOM), thyristor controlled shunt reactor (CSR) up to 400 kV, phase shifting transformer (PST) for EHV & UHV applications
- Series & shunt reactors up to 765 kV, thyristor valves and controls for HVDC application, power capacitors
- Gas insulated switchgear up to 400kV, vacuum circuit breaker (3.3 kV - 33 kV)
- Control & relay panels, substation automation system (SAS), SCADA/bay control unit/merging unit complied with IEC 61850 protocol
- Disc insulators up to 1200 kV AC (530kN) and 800 kV DC (420kN), hollow porcelain insulator up to 765 kV, long rod composite insulators up to 765 kV AC (210kN) and  $\pm 800$  kV DC (420kN), solid core insulators up to 400 kV

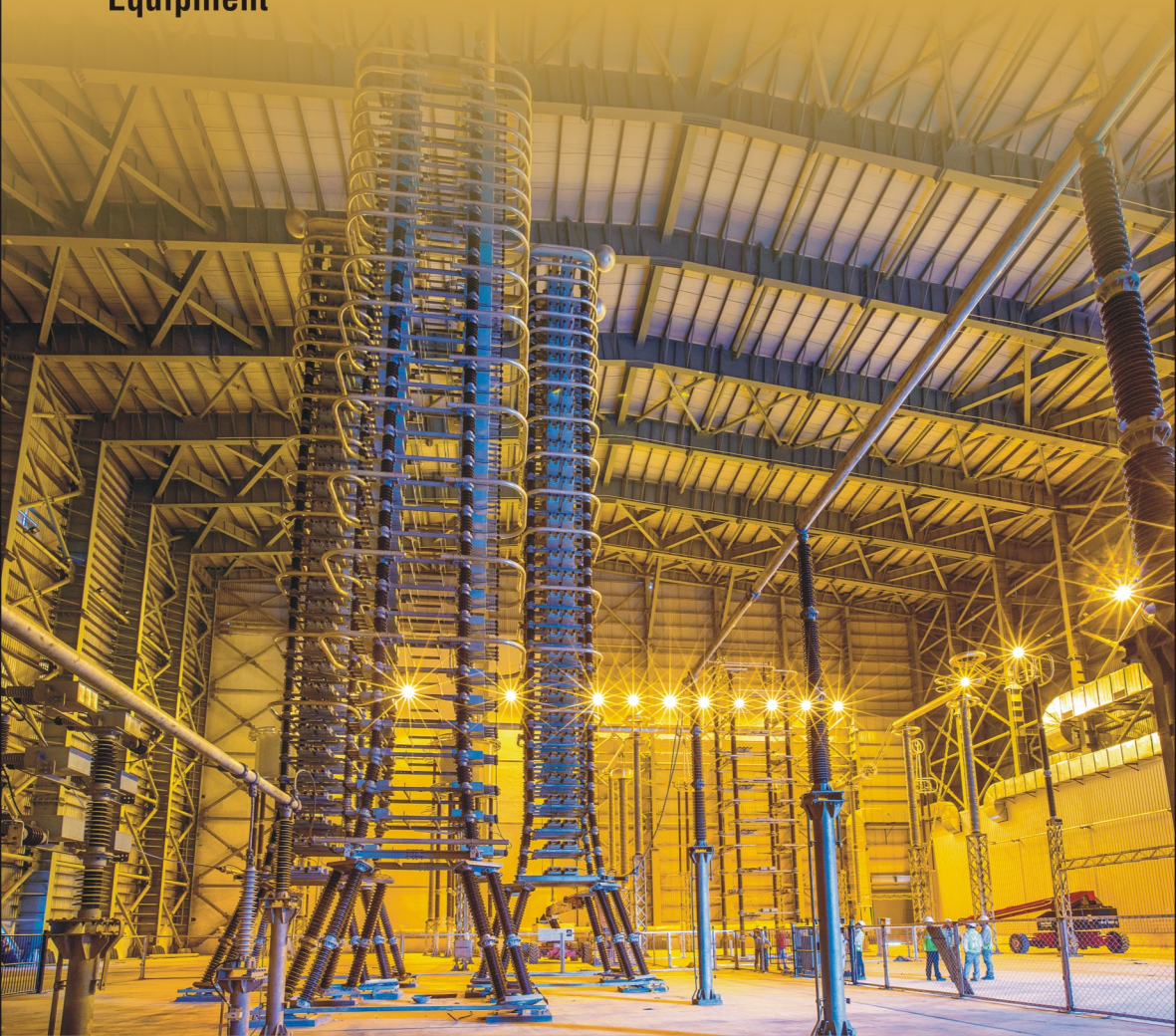
## Key Highlights:

- Supplied and commissioned 1200 kV transformer, 1200 kV CVT for India's first 1200 kV test station
- Designed, manufactured, installed and successfully commissioned India's first and the only 400 kV phase shifting transformer (PST) at Kothagudem plant in Telangana state
- Executed  $\pm 800$  kV, 6,000 MW North-East Agra ultra-high voltage multi-terminal DC (UHVDC) transmission project (world's largest multi terminal HVDC system).



# TRANSMISSION

- 40+ Years EPC Experience in Power Transmission
- Commissioned 200+ Electrical Substations and 5 Major HVDC Projects
- Supplied 6,40,000+ MVA Transmission Equipment



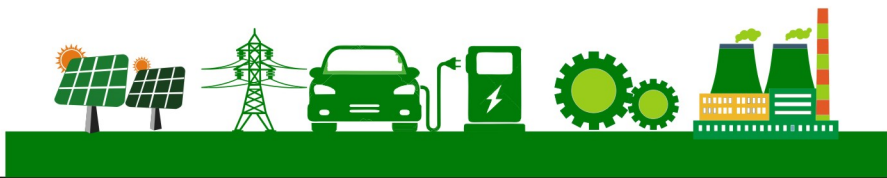
# INDUSTRY

BHEL supplies all major equipment for a number of industries including oil & gas exploration, metallurgical & mining, pipelines, petrochemicals, chemicals, automobiles, steel, aluminium, refinery, cement, fertilizer, sugar, paper and textiles.

**The range of products broadly includes:**

- AC machines
- Centrifugal compressors
- Heat exchangers
- Pressure vessels, columns, reactors
- Fired heaters
- Cryogenic air separation plants
- Gas turbine based co-generation and combined cycle power plants
- Steam turbine based captive power plants
- Complete range of steam generators for process industries
- Diesel engine based power plants
- Electrostatic precipitators, fabric filters
- Boilers (all types) – PF, CFBC, AFBC, gas/oil-fired, HRSG, WHRB, strokercolumns
- Pumps
- Pulverisers
- C&I systems

**32000+ AC Machines supplied by  
BHEL – the largest Indian manufacturer**



# INDUSTRY

**Most of the Process Industries in India are equipped with BHEL-supplied Centrifugal Compressors (390+)**



BHPCL MAITREE  
BOOSTER PUMP  
2.1 660 MPa  
W-1055204800

W1055204800  
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# TRANSPORTATION

BHEL is the largest supplier of propulsion equipments and controls to Indian Railways, which operates the third largest railway network in the world. More than 50% of Indian Railways' rolling stock is equipped with BHEL supplied traction equipment.

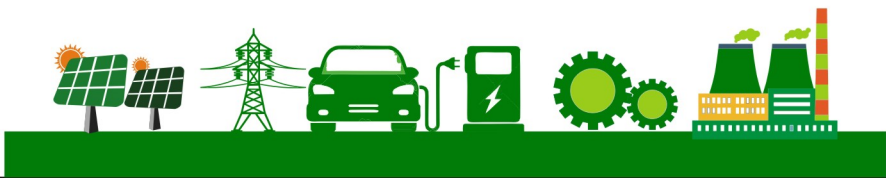
## Key Offerings:

- Complete rolling stock i.e. mainline 25kVA AC locomotives up to 6000HP
- Diesel electric shunting locomotives from 350 HP to 3000 HP and track machines
- Electrical traction equipment for all types of railway rolling stock
- Poised for catering to the demand of metro coaches for urban transportation and high speed trains

## Key Highlights:

- Providing clean energy solutions through breakthrough innovations for railway rolling stock applications
- 1st to develop regeneration system for conventional electric locomotives resulting in about 20% energy saving
- Developed composite converter for passenger electric locomotives
- India's first air-conditioned ACEMU equipped with BHEL's electrics running successfully on Mumbai Suburban Network

**Over 30% of IGBT-based Locomotives in Indian Railways equipped with BHEL-supplied IGBT Propulsion Equipment**



# TRANSPORTATION

**Largest supplier to Indian Railways for Rolling Stock Propulsion Equipment and Locomotives**



# RENEWABLES

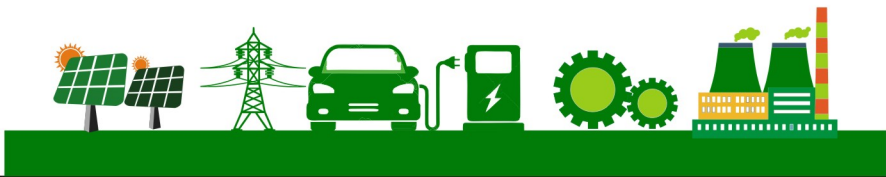
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BHEL has been in the field of photovoltaics (PV) for more than three decades.

## Key Offerings:

- EPC solutions from concept to commissioning for grid interactive and off-grid PV power plants (ground mounted, rooftop, floating solar, canal top) and solar pumps
- Crystalline silicon PV cells and PV modules
- SCADA (supervisory control and data acquisition system)
- Solar inverters (630 kW/1250 kW)
- Switchgear panels (all kV ratings)
- Power transformers (15 MVA and above)
- Passive solar tracking system

**35+ years of Experience in  
Solar Energy Systems**



# RENEWABLES

**1.2  
GW+**

with 219 MWp  
Floating Solar  
Portfolio

**105  
MW**

Cell Manufacturing  
Capacity

**226  
MW**

Module  
Manufacturing  
Capacity



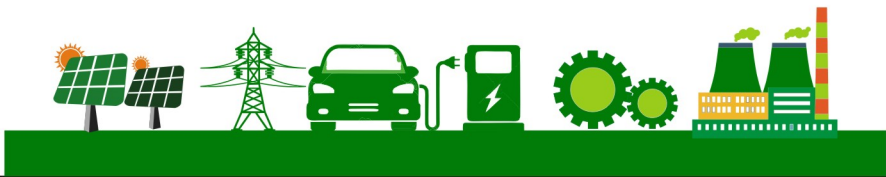
## OIL & GAS

BHEL is in the field of design, manufacture and service of various types of onshore rigs for over three decades.

### Key Offerings:

- On-shore deep drilling rigs up to a depth of 9,000 meters
- Mobile rigs up to a depth of 3,000 meters
- Work-over rigs up to a well- depth of 6,100 meters
- On-shore drilling rig equipment like draw-works, rotary-table, travelling block, swivel, mast and sub-structure, mud systems and rig electrics to leading oil & natural gas exploration companies of India
- Well heads & X-Mas tree valves up to 10,000 psi rating for onshore as well as offshore applications
- Refurbishment and upgradation of oil rigs

**90 numbers Oil Drilling  
Rigs supplied**



# OIL & GAS

**52 numbers Oil Drilling Rigs  
Refurbished and Upgraded**



# WATER

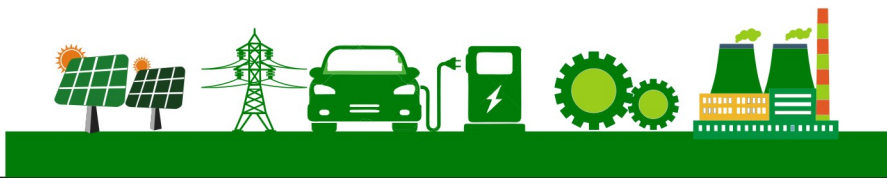
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BHEL has been in the field of water management for over two decades and had setup its first sea water reverse osmosis plant (SWRO) in 1999 for public utility.

## Key offerings:

Complete water management solutions for power plants, industries and municipal applications with different treatment technologies including:

- Pre-treatment plant (PT)
- Desalination plant
- De mineralization plant (DM)
- Membrane based treatment systems
- Effluent treatment plant (ETP)
- Sewage treatment plant (STP)
- Zero liquid discharge system (ZLD)
- Tertiary treatment plant (TTP)
- Eco-friendly solutions for water bodies purification and rejuvenation



# WATER

**Complete Water Management Solutions from  
Concept to Commissioning and Beyond**



# DEFENCE & AEROSPACE

BHEL is a reliable supplier of strategic equipment and services for the Indian defence sector for over three decades with proven track record, adherence to quality, reliable supplies and life time product support.

In field of aerospace, BHEL has long term associations with reputed organization like ISRO, HAL, ADA, NAL and GTRE for various programmes. BHEL has been supporting the Indian space programmes of ISRO for two decades.

## Major Products being manufactured by BHEL include:

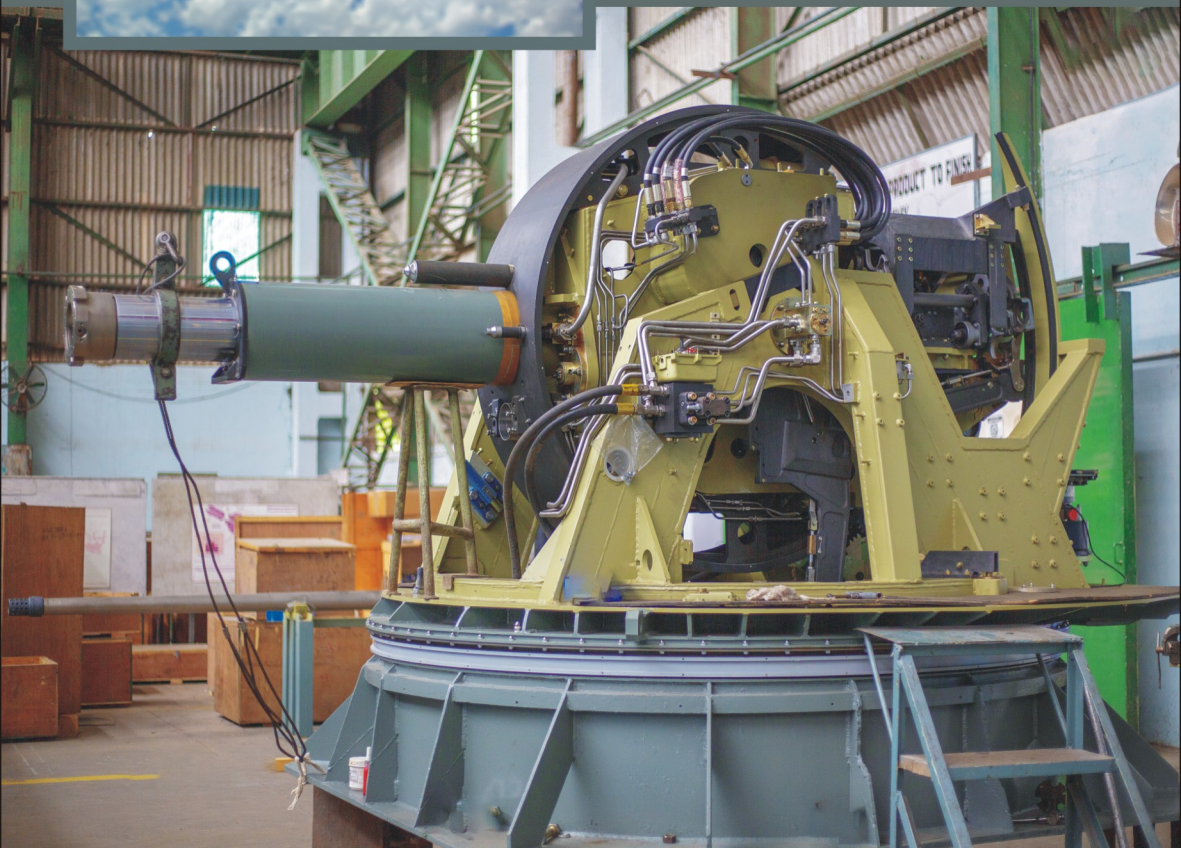
- **Defence**
  - Super rapid gun mount for naval ships
  - Integrated platform management system for naval ships
  - Turret castings for tanks
  - Thermo-pressed components for tanks
  - Castings & forgings for defence applications
  - Strategic equipment
  - Gun control system for main battle tank (MBT) – Arjun
- **Aerospace**
  - Heat exchangers for Tejas military aircraft for HAL
  - Hot forming of titanium shells/domes for ISRO
  - Space grade solar panels for ISRO
  - Space grade Li-ion batteries for ISRO
  - Thin walled titanium domes – parts of propellant tanks for ISRO
  - Aluminium alloy propellant tanks, water tanks and feedlines for launch vehicles of ISRO



# DEFENCE & AEROSPACE



*IAF's light combat aircraft 'TEJAS' equipped with compact heat exchangers designed, developed and manufactured by BHEL*



*Super Rapid Gun Mount (SRGM) for Naval Ships under assembly*

## E MOBILITY

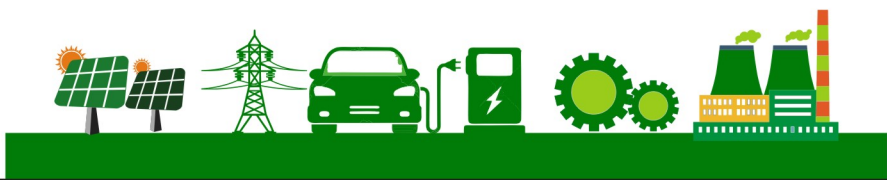
BHEL, one of the pioneers in the field of electric vehicles, has been contributing to the nation's EV mission since 1987 and supplied more than 300 battery powered road vehicles (BPRV).

### Key Offerings:

- Electric bus (12/9/7 meter)
- EV chargers (AC / DC)
- Solar based EV charging station
- Li-Ion battery packs
- PMSM motors for Evs
- Induction motors for Evs
- EV motor controllers
- Central monitoring system (CMS)
- Fuel cell as range extender

BHEL supplied BPRVs (with lead acid battery technology) completed 15 years on road at Taj Mahal complex, Agra – A testimony to the technical competence of BHEL's engineering team, proven quality and reliability.

**BHEL has acquired Unique Capabilities  
to deliver state-of-the-art Products and  
Solutions in the field of E-Mobility**



# E MOBILITY

*BHEL designed and developed 12-meter Electric Bus*



*Solar based EV Charging Stations set up on  
Delhi-Chandigarh Highway by BHEL*

# RAILWAY ELECTRIFICATION

BHEL offers engineering, procurement and construction solutions encompassing design, engineering, supply, project planning, quality control and field execution of rail track electrification works.

## Key Offerings:

- EPC based solutions for rail track electrification works

# BATTERY ENERGY STORAGE SOLUTIONS

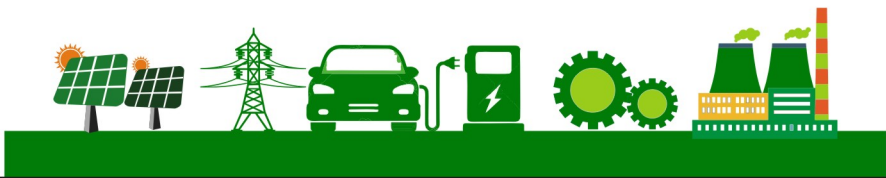
BHEL offers battery energy storage solutions, to support the infirm power delivered by a SPV system or standalone battery energy storage system connected with grid, with features like energy time shifting, power smoothing, frequency regulation, anti-islanding and VAR support.

## Key Offerings:

- Grid connected/off grid with solar plants or standalone systems

## Key Highlights

- BHEL commissioned 1 MWh battery energy storage system (BESS) with in-house developed PCS (power conditioning system) and energy management system (EMS) featuring three different types of battery chemistries – lithium ion battery, flow battery and advanced lead acid battery
- The BESS has been integrated with 500KW solar power plant and connected with grid



# BATTERY ENERGY STORAGE SOLUTIONS



*1 MWh Grid Connected Battery Energy Storage System (BESS) installed at BHEL Corp R&D*

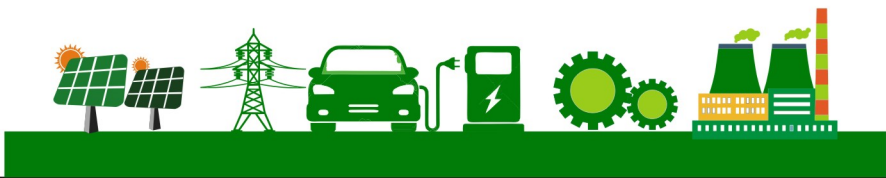
# INNOVATION

BHEL, along with NTPC and IGCAR is developing Advanced Ultra Supercritical (AUSC) technology – a pioneering effort of national importance for high efficiency coal-fired power plants with reduced emissions.

Entrusted with the task of designing and manufacturing the power cycle equipment, BHEL has achieved significant milestones with engineering of the project (Phase-1) nearing completion, including the design of major equipment. In Phase-2, a 1x800 MW technology demonstration plant is planned to be setup at NTPC-Sipat.

Among many others, one of the unique achievements in this journey is the successful pouring of casting of approximately 50 T for alloy-625, world's heaviest casting poured for any application.

## AUSC – A Clean, Green Technology for Coal-based Power Generation



# INNOVATION



*Creep Testing Machines for testing of Advanced Materials for AUSC Power Plant Applications.*



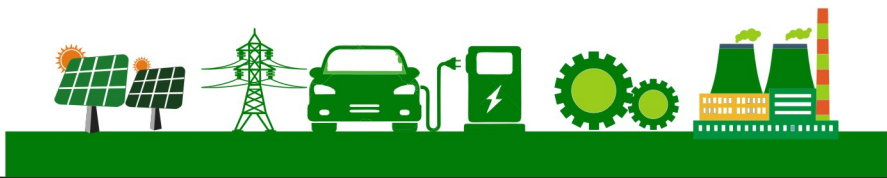
*BHEL has successfully fabricated mock up Thick-Walled Superheater Header for AUSC Boilers with Advance High Temperature Materials*

# SUSTAINABLE DEVELOPMENT

For almost fifty years of its existence, BHEL has been leveraging technology and innovation for providing products, systems and services to its customers and enable them to use resources with better efficiency and productivity.

BHEL's equipment are known for:

- Lower auxiliary power consumption
- Superior boiler efficiency
- Better plant heat rate and plant load factor (PLF)
- Lower life-cycle cost



# SUSTAINABLE DEVELOPMENT



# **BHEL's** *Global Footprints*

## **NORTH AMERICA**

Canada  
United States of America

## **SOUTH AMERICA**

Chile  
Suriname  
Trinidad & Tobago

## **EUROPE**

Belarus  
Belgium  
Bulgaria  
Cyprus  
Estonia  
Finland  
France  
Georgia  
Germany  
Greece  
Ireland  
Italy  
Malta  
Poland  
Romania  
Russia  
Sweden  
Switzerland  
Turkey  
Ukraine  
U.K.

## **AFRICA**

Algeria  
Benin  
Chad  
Comoros  
D.R. Congo  
Egypt  
Eswatini  
Ethiopia  
Ghana  
Kenya  
Libya  
Malawi  
Mauritius  
Mozambique  
Nigeria  
Rwanda  
Senegal  
South Africa  
Sudan  
Tanzania  
Togo  
Uganda  
Zambia  
Zimbabwe

*with presence in* **84 countries**  
*in all six inhabited continents*



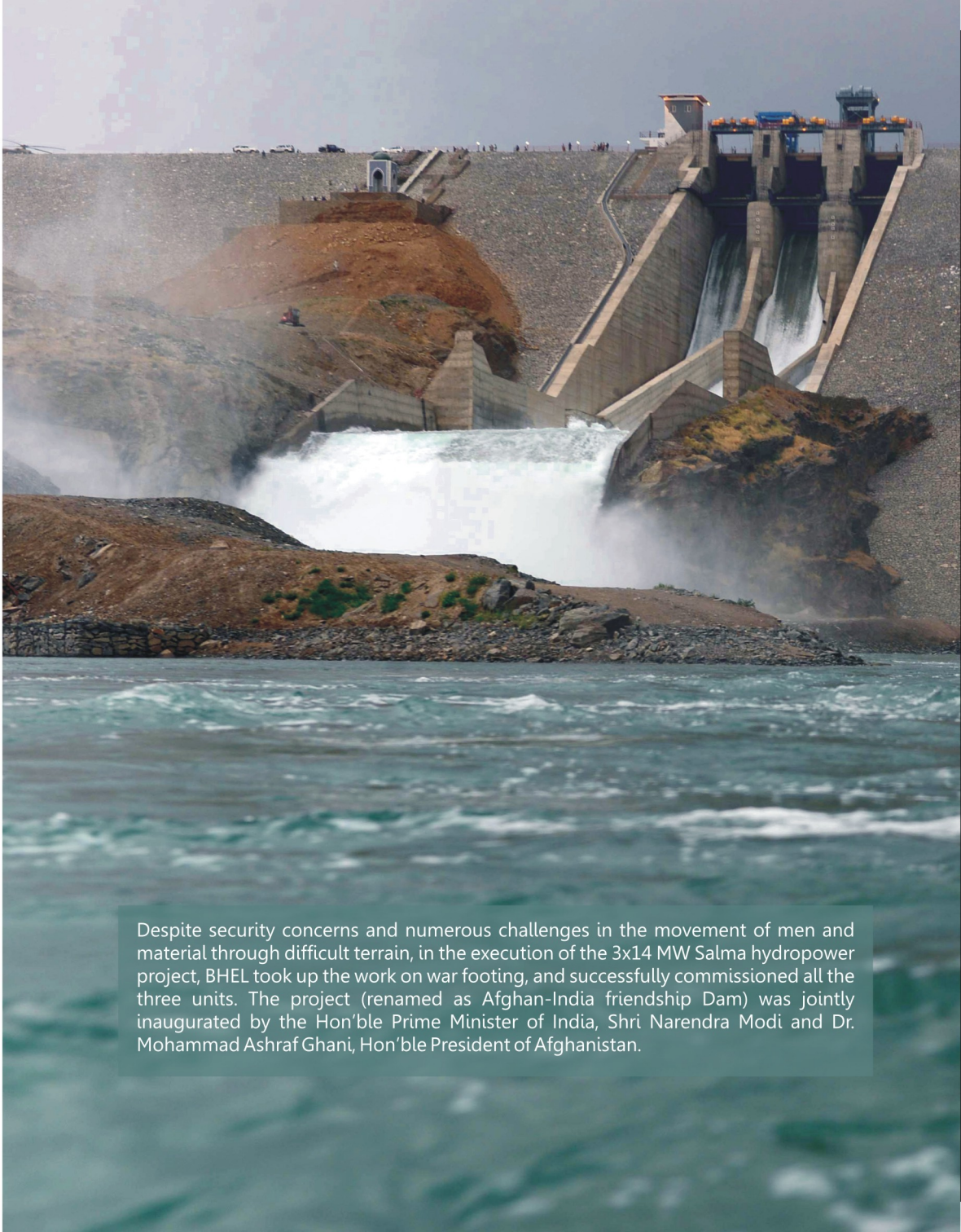
## ASIA

Afghanistan  
Azerbaijan  
Bangladesh  
Bhutan  
China  
Hong Kong  
Indonesia  
Iran  
Iraq  
Japan  
Jordan  
Kazakhstan  
Kuwait  
Laos  
Malaysia

Myanmar  
Nepal  
Oman  
Philippines  
Saudi Arabia  
Singapore  
South Korea  
Sri Lanka  
Syria  
Taiwan  
Tajikistan  
Thailand  
U.A.E.  
Vietnam  
Yemen

## OCEANIA

Australia  
New Caledonia  
New Zealand  
Samoa



Despite security concerns and numerous challenges in the movement of men and material through difficult terrain, in the execution of the 3x14 MW Salma hydropower project, BHEL took up the work on war footing, and successfully commissioned all the three units. The project (renamed as Afghan-India friendship Dam) was jointly inaugurated by the Hon'ble Prime Minister of India, Shri Narendra Modi and Dr. Mohammad Ashraf Ghani, Hon'ble President of Afghanistan.

هند دوستی افغان - هند  
د افغانستان - هند دوستی بند  
**AFGHAN-INDIA FRIENDSHIP DAM**



**For enquiries and further information:**

### **POWER SECTOR**

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### **INDUSTRY SECTOR**

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### **TECHNOLOGY LICENSING & JOINT VENTURES**

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## **Bharat Heavy Electricals Limited**

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