

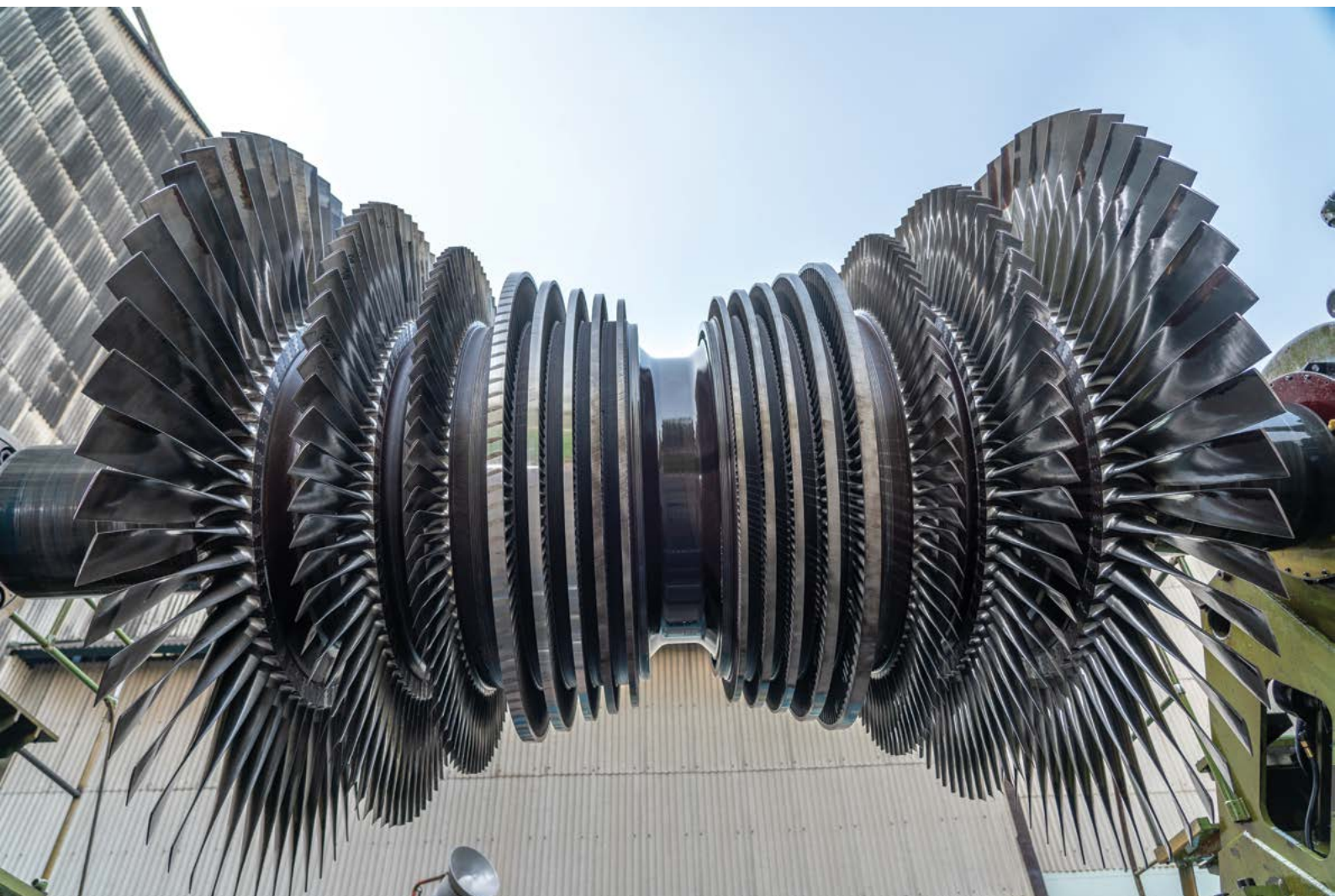
PRODUCT PROFILE

Inspiring Innovation
Engineering Dreams

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 89 countries across all the inhabited continents of the world.



BHEL's Product and Service Profile includes design, manufacturing and installation in the following major segments:

THERMAL POWER PLANTS

- ▶ EPC and Turnkey contract for Thermal Power Plants
- ▶ Steam Generators, Steam Turbines, Turbo Generators along with regenerative feed cycle upto 1000 MW capacities for steam-cycle and upto 350 MW for combined-cycle fossil fuel applications
- ▶ Air and water cooled Condensers, Condensate Extraction Pumps, Boiler Feed Pumps, Duplex Heaters, Valves and Heat Exchangers - meeting requirement of TG Sets upto 1000 MW
- ▶ Residual Life Assessment (RLA) studies, Energy Efficient Renovation and Modernization (EE R&M) and Life Extension (LE) of old thermal power plants

- Capability to burn a variety of fuels (both gaseous and liquid) along with mixed firing in different combinations of fuels
- Low exhaust emission levels upto 15ppm of NOx with Dry Low NOx (DLN) combustors & noise reduction.

HYDRO POWER PLANTS

- ▶ EPC & Turnkey Contract with custom-built conventional hydro turbines of Kaplan type (up to 100 MW), Francis and Pelton types (up to 400 MW) with matching generators
- ▶ Pump turbines with matching motor-generators upto 250 MW
- ▶ Bulb turbine with matching generators upto 10 MW
- ▶ High capacity pumps along with matching motors for Lift Irrigation Schemes (up to 200 MW)
- ▶ Mini/ Micro and small hydro power plants up to 25 MW rating
- ▶ 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
- ▶ Balance of Plant & System Integration

NUCLEAR POWER PLANTS

- ▶ Reactor side components like Steam Generators, Reactor Headers, End Shields, special purpose Heat Exchangers, Pressure Vessels, Motors etc. for Nuclear Power plants.
- ▶ TG island equipment of PHWRs (Pressurized Heavy Water Reactors), FBRs (Fast Breeder Reactors) and AHWRs (Advanced Heavy Water Reactors) including 'EPC' solutions covering Steam Turbine, Turbo Generators, MSRs (Moisture Separator Reheaters), other heat exchangers and pumps.

SOLAR POWER SYSTEM

- ▶ EPC solutions of Solar PV Power Plants:
 - Grid Interactive systems with & without BESS (Battery Energy Storage System)
 - Standalone systems
 - Roof Top systems
 - Hybrid systems

GAS-BASED POWER PLANTS

- ▶ Gas turbines and matching generators ranging from 25 MW to 299 MW (ISO) rating with following features:
 - Gas turbine based co-generation and combined- cycle systems for industry and utility applications



- Canal Top Systems
- Floating Solar power plants
- Solar based water pumping systems

DESALINATION AND WATER TREATMENT PLANTS

- ▶ Complete Water Management Solutions for Power Plants, Industrial applications and Municipal applications with different treatment technologies:
 - Pre Treatment Plants (PT)
 - Desalination Plants
 - Demineralization Plants (DM)
 - Membrane Based Treatment Systems
 - Electro Deionization plants
 - Effluent Treatment Plants (ETP)
 - Sewage Treatment Plants (STP)
 - Zero Liquid Discharge (ZLD) System
 - Cooling water treatment plants
 - Tertiary Treatment Plants

SYSTEMS AND SERVICES

- ▶ Power Generation Systems
 - Turnkey power stations/ EPC contracts
 - Combined-cycle power plants
 - Cogeneration systems
 - Captive power plants
 - Modernization and renovation of power stations and RLA studies.
 - Flexible Operation solution of fossil fuel power plants
 - Software packages including simulators for utilities
 - Erection, commissioning, support services, spares management and consultancy services for all the above systems.

INDUSTRIAL SYSTEMS

- ▶ Coal Handling Plant and Ash Handling Plant including Civil & Structural, Mechanical, Electrical works and Automation systems
- ▶ Mine Winder systems
- ▶ Electrics, Drives, Controls & Automation Systems for Processing & Compacting of Raw Materials, Iron Making, Primary & Secondary Steel Making, Casters & steel Finishing like Mills & process Lines for both long products & flat products
- ▶ Raw Material Handling System including Civil & Structural, Mechanical, Electrical and Automation systems for Steel and other industries
- ▶ Electrics & Automation Systems for High Current Rectifiers of Smelters and Processing Mills for Aluminum Plants
- ▶ Automated Storage & Retrieval Systems (ASRS)

Detailed Product Profile is as follows :

STEAM GENERATORS

- ▶ Steam generators for utilities, ranging from 30 to 800 MW capacity, using coal, lignite, oil, natural gas or a combination of these fuels; capability to manufacture boilers with ultra supercritical parameters upto 1000 MW unit size
- ▶ Steam generators for utilities, with Advanced Ultra Supercritical (AUSC) parameters of 310 ata and 710 °C / 720 °C.
- ▶ Circulating Fluidized Bed Combustion (CFBC) steam generators, with supercritical parameters upto 660 MW unit size for utilities
- ▶ Fuel Flexible boilers capable of all combination of blending / co-firing diverse qualities of imported/ Indian coals, blending of lignite, petcoke, etc.
- ▶ Capability for manufacturing and supply of Steam Generators and Reactor Headers for Nuclear Power Plant as per ASME Sec.-III NB



Class-1 requirements

- ▶ Steam generators for industrial applications of the following types ranging from 40 T/hr to 450T/hr capacity, using coal, natural gas, industrial gases, biomass, lignite, oil, petcoke, bagasse or a combination thereof
 - Pulverized coal / lignite fired boilers
 - Stoker fired boilers
 - Bubbling Fluidized Bed Combustion (BFBC) boilers
 - Circulating Fluidized Bed Combustion (CFBC) boilers
 - Heat-Recovery Steam Generators (HRSG)
 - Chemical recovery boilers for paper industry, ranging from capacity of 100 to 1000 T/Day of dry solids
- ▶ Expertise and capability in implementing the Biomass co-firing with coal in boilers
- ▶ Complete solutions for flexible operation of boilers

STEAM GENERATOR AUXILIARIES

- ▶ **Air Preheaters**
 - Tubular Air Preheaters
 - Rotary regenerative Air-Preheaters (different types like Bisector, Tri Sector and Quad Sector)
- ▶ **Particulate Emission Control**
 - Electrostatic precipitators with outlet emission as low as 15 mg/Nm³ (efficiency up to 99.97%)
 - Bag Filters for utility and industrial applications
 - Mechanical Dust Collector
 - Ammonia Flue Gas Conditioning System

▶ Fans

- Axial reaction fans of single stage and double stage for clean air application and dust laden hot gases applications up to 200°C, with capacity ranging from 40 to 1300 m³/s and pressure ranging from 400 to 1,500 mmwc
- Axial impulse fans for both clean air and flue gas applications up to 200°C, with capacity ranging from 25 to 600m³/s and pressure from 300 to 700 mmwc
- Single and double-suction radial fans (plate aerofoil bladed) for clean air and dust-laden hot gases applications up to 400°C, with capacity ranging from 4 to 660m³/s and pressure ranging from 200 to 3000 mmwc

▶ Pulverizers

- Bowl Mills of slow and medium speed (for both pressurized & suction environment) with capacity from 10 T /Hr to 120 T/ Hr
- Ball Tube Mills from 30 T/ Hr to 110 T/ Hr
- Wet Ball Mills (upto 50 T/Hr) for FGD Applications

▶ Guillotine Gates & Dampers

- Guillotine gates with electric/ pneumatic actuator. 100% leak proof with seal air (Maximum Width/Height): Type-1: 7m/14.5m, Type-2: 14.6m/4.5 m, Type-3: 11.5m/6.5m
- Bi-plane dampers with electric/ pneumatic actuator. 100% leak proof with seal air (Maximum Width/Height): Type-1: 7m/14.5m, Type-2: 12m/10.5 m
- Louver dampers (open close/ regulating) with electric/ pneumatic actuator (Maximum Width/Height): Type-1: 6.5m/ 14.5 m, Type-2: 12m/10.5m
- Control dampers (regulating) with electric/ pneumatic actuator (Maximum Width/ Height): Type- 1:6.5m/14.5m, Type-2: 12m/10.5m



► Steel Chimneys

- Steel Chimneys for flue gas exhaust applications with maximum height of 80m and Inner Diameter up to 6.5m

► Flue Gas Desulphurization (FGD) systems

- Wet Limestone & Seawater based FGD systems
- Absorber – DCFS Technology (Double Contact Flow Scrubber)
- Wet Limestone FGD – Single & Twin Tower Absorber
- Seawater FGD – Grid Tower Absorber
- Absorber with & without Gas to Gas Heater
- FGD with SO₂ efficiency of 99.9%

► Selective Catalytic Reduction (SCR) systems

- SCR System (Honeycomb & Plate type) with anhydrous Ammonia/ Aqueous Ammonia/ Urea reagent for NO_x emission control

► Selective Non- Catalytic Reduction (SNCR) systems

- Selective Non- Catalytic Reduction (SNCR) systems with Urea & Ammonia handling systems

SOOT BLOWERS

- Long Retractable Soot Blowers (LRSB) for travel upto 12.2m
- Furnace Temperature Probe (FTP) for travel length up to 10m
- Long Retractable Non-Rotating (LRNR) soot blowers with forward blowing for Air Pre heaters
- Rotary Soot Blowers
- Rack type Long Retractable Soot Blowers
- Ash discharge valve for CFBC boiler application
- Soot Blowers with sequential PLC, control

panel and integral starter

VALVES

- High and Low-pressure Turbines Bypass Valves & hydraulic system for utilities and industrial application
- High and medium-pressure Valves, Cast and Forged Steel Valves of Gate, Globe, Non-Return (Swing- Check and Piston Lift-Check) types for steam, oil and gas duties upto 950 mm diameter, maximum pressure class 4500 (791 kg/cm²) and 650 °C temperature
- Hot reheat and cold reheat Isolating Devices upto 900 mm pipe size class 1500 and steam temp upto 650°C
- High capacity Spring Loaded Safety Valves for set pressure upto 372 kg/cm² and temperature upto 630°C,
- Automatic electrically operated pressure relief valves for set pressure upto 320 kg/cm² and temperature upto 610°C
- Safety relief valves for set pressure up to 421 kg/cm² and temperature upto 537° C
- Reactive cum absorptive type vent Silencers maximum diameter of 2700 mm
- Direct Water Level Gauges
- Angle Drain Valves - Single & Multi Stage for Turbine Drain Application
- Severe Service Control Valves for Re-Heater & Super Heater Spray Lines
- Quick Closing Non return Valves for Extraction lines and Power Assisted Non Return valves, upto 900mm diameter, 158 kg/cm² pressure and 540°C temperature
- Knife edge gate valve of size 1300 mm & 1400 mm diameter for FGD applications



PIPING SYSTEMS

- ▶ Power cycle piping, Constant load Hangers, Variable spring Hangers, Hanger components, Low Pressure piping including circulating water piping for power stations upto 1000 MW capacity including Super Critical sets
- ▶ Piping systems for Nuclear Power Stations, Combined Cycle Power Plants & Industrial boilers and process industries
- ▶ Prefabricated piping/ duct spools to cater to refinery segment complying with National Association of Corrosion Engineers (NACE) requirements

SEAMLESS STEEL TUBES

- ▶ Hot-finished and cold-drawn seamless steel tubes with a range varying from outer diameter of 21 to 133 mm and wall thickness of 2 to 12.5 mm, in carbon steel and low-alloy steels to suit ASTM/ASME and other international specifications
- ▶ Rifled tubes (ribbed) with a range varying from tube outer diameter of 38.1 to 63.5 mm and wall thickness of 5.6mm to 7.1mm, in carbon steel and low-alloy steels to suit ASME and other international specifications
- ▶ Spiral finned Tubes with a range varying from tube outer diameter of 31.8 to 114.3 mm and wall thickness of 2.4mm to 9.5mm and with fin height of 12.5mm to 21mm and fin density ranges from 40 to 240 fins per meter, in carbon steel and alloy steels to suit ASME standards

PRESSURIZED FLUIDIZED BED GASIFIER (COAL TO CHEMICALS)

- ▶ Oxy-blown 30 bar Syngas production of Unit Size of 5000 TPD from Coal to meet applications for
 - IGCC
 - Hydrogen/ Ammonia/ Ammonium Nitrate
 - Methanol/DME Production

STEAM TURBINES

- ▶ Steam Turbines upto 1000 MW rating for thermal sets and upto 700MWe ratings for Nuclear Power Plants
- ▶ 15000 HP Turbines for Marine Propulsion

TURBOGENERATORS

- ▶ Turbogenerators of higher rating upto 1000 MW for Thermal and Nuclear Power Plants and upto 195 MW for Combined Cycle plant

INDUSTRIAL SETS

- ▶ Steam Turbine based Captive Power Plants
 - Steam Turbine-Generator (STG)/ Boiler/ Boiler-Turbine-Generator (BTG)/ Engineering-Procurement-Construction (EPC): Unit rating up to 200 MW
 - Non Reheat upto 120 MW unit rating
 - Reheat from 70 MW to 200 MW unit rating
- ▶ Steam Turbine to Mechanical drives like Compressors, Pump, Blowers etc.
- ▶ Gas Turbine based Captive Power Plants GTG/ HRSG/ EPC: 26 MW (Fr-5) to 126 MW (Fr-9E)

CASTINGS AND FORGINGS

- ▶ Heavy castings and forgings of creep resistant alloy steels, stainless steel and other grades of alloy steels meeting stringent international specifications for components of sub critical, supercritical and Ultra- super critical technology

CONDENSER AND HEAT EXCHANGERS

- ▶ **Surface Condenser**
 - For thermal power plants up to 1000 MW
 - For Nuclear power plants up to 700 MWe
 - 12.5 MW Marine applications
 - Industrial Condensers



- ▶ Feed Water Heaters (HP Heaters, LP Heaters, Drain Coolers, Duplex Heater, De-Super Heaters, etc.)
 - Thermal: 7 to 600 MW (sub-critical) & 350-1000 MW (super critical with single stream)
 - Moisture Separator & Reheater (MSR) and other Feed Water Heaters for Nuclear Power Plants (236 MWe, 500 MWe & 700 MWe Nuclear sets)
- ▶ **Live Steam Reheater (LSR)**
 - 500 MW Fast Breeder Reactor (FBR) Nuclear sets
- ▶ **Auxiliary Heat Exchangers for Turbo and Hydro Generators**
 - Air Coolers (Frame & Tube Type)
 - Oil Coolers (Shell & Tube Type and Plug in Type)
 - Hydrogen Coolers (Frame & Tube Type)
- ▶ **Auxiliary Heat Exchangers for Transformers**
 - Oil Coolers (Shell & Tube Type Single Tube or Concentric Double Tube Type) (Frame & Tube Type)
- ▶ **Auxiliary Heat Exchangers for general application**
 - Water - Water Coolers (Shell & Tube Type)
- ▶ **Gland steam condensers**
 - Industrial applications upto 7 MW to 150 MW
 - Thermal Plants upto 1000 MW
 - Nuclear Plants upto 700 MWe
- ▶ **Air-cooled heat exchangers for GTG** up to 126 MW (Fr-9E), and Compressor applications of all ratings
 - Steam jet air ejectors for condensers up to 150 MW
 - Deaerators from 7 MW to 1000 MW
 - Gas coolers for compressor applications
 - Oil coolers- STG upto 150 MW, GTG upto 126 MW (Fr-9E)

- Generator Air coolers upto 150 MW STG and GTG up to 250 MW (9 FA)
- ▶ D₂O and Moderator Heat Exchangers for Nuclear primary cycle

PUMPS

- ▶ Pumps for various utility power plant applications up to a capacity of 1000 MW:
 - Boiler feed pumps (motor or steam turbine driven) and Boiler feed booster pumps.
 - Condensate extraction pumps including Drip Pumps
 - Circulating water pumps (Cooling Water Pumps)
 - Concrete Volute Cooling Water Pumps
 - Pumps for Secondary Side of Nuclear Power Plants
 - Slurry Recirculation Pumps for FGD Applications upto 500 MW

COMPRESSORS

- ▶ Complete range of Centrifugal compressors (driven by Steam Turbine, Electric Motor and Gas Turbine) along with auxiliary systems for all major compression applications in various industries like Refineries, Fertilizers, Petrochemicals, Oil & Gas, Steel, Power and Natural Gas Transportation sectors
- ▶ Offers Compressor packages for capacity up to 3,00,000 m³/Hr for various gases like Air, CO₂, Syngas, N₂, H₂, NH₃, Natural Gas, Wet Gas, Propylene and other services
- ▶ Horizontally split type up to 40 bar design pressure
- ▶ Vertically split type up to 350 bar design pressure
- ▶ Oxidation Blowers for FGD Applications



SOLAR PHOTOVOLTAICS

- ▶ Mono/ Multi Crystalline Solar cells (156mm)
- ▶ Mono/ Multi Crystalline PV Modules (upto 330 Wp)
- ▶ Power Conditioning Unit (upto 1.25 MW)
- ▶ Power Transformers (15 MVA and above)
- ▶ Passive Solar Tracking System
- ▶ Space grade solar panels

AUTOMATION AND CONTROL SYSTEMS

- ▶ Automation and Control Systems for
 - Steam Generator/ Boiler Controls including Boiler Protection
 - Steam Turbine Controls
 - Boiler Feed Pump (BFP) Drive Turbine Control
 - Station Control and Instrumentation/ DCS
 - Offsite /Off base controls/ Balance of Plant Controls
 - Ash Handling Plant (AHP)
 - Coal Handling Plant(CHP)
 - Water System for power plant
 - Mill Reject System (MRS)
 - Condensate On-Load Tube Cleaning system (COLTCS)
 - Gas Booster Compressor (GBC)
 - Condensate Polishing Unit (CPU)
 - Heating, Ventilation & Air conditioning (HVAC)
 - Fuel Oil Unloading System (FOUS)
 - Hydro Power Plant Control System
 - Gas Turbine Control System
 - Nuclear Power Plant Primary Cycle Control Centre Instrumentation Package (CCIP)

- Nuclear Power Plant Turbine & Secondary Cycle control system
- Power block of solar thermal power plant
- Industrial Automation
- Sub-Station Automation (SAS)
- Non-FST HVDC control panels
- Electrical Control System (ECS) for Refineries
- Energy Management System (EMS) for Power Plant
- Electrical Interface System for MV/LV Switchgear

TRANSMISSION SYSTEMS CONTROL

- ▶ EHV & UHV Sub-stations/switchyards both AIS & GIS type ranging from 33 kV to 765 kV
- ▶ HVDC transmission systems
- ▶ Flexible AC Transmission System (FACTS) solutions
 - Fixed Series Compensation(FSC)
 - Static VAR Compensation (SVC)
 - STATCOM
 - Controlled Shunt Reactor (CSR)
 - Phase Shifting Transformer (PST)
 - Converter Valves and controls for HVDC & FACTS

SOFTWARE SYSTEM SOLUTION

- ▶ Performance Analysis, Diagnostics & Optimization (PADO) for Thermal Utilities
- ▶ Performance Calculation & Optimization system and Real Time Performance Data Monitoring system



- ▶ Open Platform Communications (OPC) connectivity from DCS to third party systems
- ▶ Enterprise Asset Management System (EAMS)
- ▶ Operator Training Simulator
- ▶ Remote Monitoring & Diagnostic System (RMDS)

sector (hydro station/ thermal power plant/ other substations)

- 420 kV Gas Insulated Bus ducts

SWITCHGEAR

- ▶ Medium Voltage Vacuum Switchgear for indoor and outdoor applications for voltage ratings upto 36 kV and Gas insulated switchgears upto 420 kV

Indoor switchgears

- Upto 12 kV, 50 kA, 4000 Amp for thermal, nuclear, hydro and combined cycle Power Plant Projects
- Upto 36 kV, 31.5 kA, 2500 Amp for Industries, solar power plants and refineries
- Compact switchgear 12 kV, 25 kA, 1250 Amp for distribution system

Outdoor Vacuum circuit breakers

- 12 kV, 26.3 kA, 1250 Amp for distribution segment
- 36 kV, 26.3 kA, 2000 Amp for distribution segment
- 25 kV (52kV class), 20 kA, 1600 Amp for track side railway application

Gas insulated switchgears

- 36 kV, 40kA, 2500 Amp for Refineries, Urban Distribution & Industries (Single Busbar & Double Busbar Designs)
- 420kV, 40kA, 3150 Amp for transmission

ON LOAD TAP CHANGERS (OLTC)

- ▶ On Load Tap Changer upto 765 kV class Transformer & Off Circuit Tap Switch upto 765 kV class Transformer for various application like Power Transformer, Furnace Transformer, Station Transformer, Rectifier Transformer etc.

LT SWITCHGEAR & BUS DUCTS

- ▶ Bus-ducts with associated equipment to suit generator power output of utilities of upto 800 MW capacity
- ▶ 415 V LT Switchgear for Thermal Power Plant, Hydro, Nuclear, Captive Power Plant (CPP) & Steel industry

TRANSFORMERS & REACTORS

- ▶ Power transformers for voltage upto 1200 kV
 - Generator transformers (upto 600 MVA, 420 kV, 3 Ph / 400 MVA, 765 kV, 1 Ph / 500 MVA, 420 kV, 1 Ph)
 - Autotransformers (upto 1000 MVA, 400 kV, 3 Ph / 600 MVA, 400 kV, 1 Ph / 500 MVA, 765 kV, 1 Ph / 1000 MVA, 1200 kV, 1 Ph)
- ▶ Converter Transformers / Smoothing Reactors (upto 600 MVA, ± 800 kV) / (upto 254 MVar, ± 500 kV) for HVDC transmission
- ▶ Shunt Reactors (upto 150 MVar, 420 kV, 3 Ph / 110 MVar, 765 kV, 1 Ph)
- ▶ Controlled Shunt Reactors (up to 200 MVar, 420 kV, 3 Ph / 200 MVar, 420 kV, 1 Ph / 200 MVar, 765 kV, 1 Ph) for Flexible AC Transmission system applications



- ▶ Phase Shifting Transformers (upto 500 MVA, 400 kV, 3 Ph/ Upto 500 MVA 400 kV 1 Ph) for transmission lines
- ▶ Instrument transformers
 - Current transformers upto 400 kV
 - Electro-magnetic voltage transformers upto 220 kV
 - Capacitor voltage transformers (33K V to 1200 kV)
 - 24kV PR class Current Transformer for HVDC Projects
- ▶ Special Transformers
 - Rectifier transformer (upto 120 kA, 132 kV)
 - Furnace transformer (upto 33 kV, 100 MVA)
- ▶ ESP transformers up to 95 kVp, 1600 mA
- ▶ Dry type transformers upto 15 MVA 36 kV
- ▶ Composite Monitoring System for Power Transformers

CAPACITORS

- ▶ H.T. Capacitors
 - Motors Capacitors for Power factor correction (3.3 to 11 kV delta connected Capacitor banks)
 - Shunt, Series & SVC (Static VAR compensation), Harmonic filter & HVDC applications (3.3 kV to 500 kV, 1 Ph/ 3 Ph capacitor banks)
- ▶ Capacitor Divider for CVT
- ▶ Coupling Capacitor (33kV to 800 kV, 4400pF to 13200 pF) for transmission lines
- ▶ Surge Capacitor for protection of Generators & Transformers (11kV to 40 kV)

- ▶ Roof Capacitor for traction locomotive
 - Capacitor Divider for CVT upto 1200 kV
 - Coupling Capacitor for PLCC upto 800 kV
 - Fuse-less capacitor

BUSHINGS

- ▶ Oil Impregnated Paper (OIP) condenser bushings 52 to 500 kV for transformer applications
- ▶ 25 kV Locomotive bushings
- ▶ Wall Bushings upto 245 kV

CONTROL GEAR

- ▶ Electronic controllers for ESPs in industries/ power plants
- ▶ Digital Static Excitation control system (2000 A, 400 V DC with redundant thyristor stacks & DC field breaker)
- ▶ Large current rectifiers with PLC Based digital controls
- ▶ Control & Protection Panels (upto 400 kV) For EHV Transmission projects
- ▶ SCAP, Thyristor, RAPCON and STATCON Panels.

INSULATORS AND CERAMICS

- ▶ **Porcelain Insulators**
 - High-tension Porcelain Disc insulators for AC/ DC applications, ranging from 70kN to 420 kN electro-mechanical strength for clean and polluted atmospheres, Suitable for application upto 1200kV AC & ± 800 kV HVDC transmission line & Sub-stations.
 - Hollow insulators upto 765 kV for Transformers and SF6 circuit breakers.



- Solid core insulators upto 400 kV for Bus Post & Isolators for substation applications.
- ▶ Composite Long Rod Insulators
 - Upto ± 800 kV, 420 kN for HVDC application
 - Upto 765 kV, 210 kN for HVAC application.
 - Traction Insulators Stay arm, Bracket and 9 Ton Insulators for Indian railways.
- ▶ Ceramic Lining (CERALIN) wear resistant material for Thermal Power Plant & Ash Slurry Application.
- ▶ Industrial and Special Ceramics
 - EWLI –Electronic Water Level Indicators used in Boiler Drum Water Level Monitoring (BHELVISION system)
 - Ceramic and Tungsten Carbide Flow Beans for Christmas tree valves.
 - Grinding Media for Pulverizing in Thermal Power Plant.
- ▶ AC Machines for Hazardous Area Application (Fixed speed or with VFD)
 - Flame-proof squirrel cage Induction motors (Ex 'd') (150 kW to 1300 kW)
 - Non-sparking squirrel cage Induction motors (Ex 'n') (150 kW to 22000 kW)
 - Increased safety squirrel cage Induction motors (Ex 'e') (150 kW to 4000 kW)
 - Pressurized Squirrel cage induction motors (Ex 'p') (150 kW to 22000 kW)
 - Pressurized Synchronous machines (Ex 'p') (1000 kW to 25000 kW)
- ▶ Industrial Alternators (Steam turbine, Gas turbine and Diesel engine driven) (3000 kVA to 25000 kVA)
- ▶ Vertical Motors for Primary Coolant Pumps for nuclear power plants
- ▶ Induction Generators (300 kVA to 6000 kVA) for mini/ micro hydro plant.

ELECTRICAL MACHINES

- ▶ AC Machines for Safe Area Application
 - Squirrel cage induction motors -150 kW to 22000 kW
 - Slip ring induction motors - 150 kW to 10000 kW
 - Synchronous machines - 1000 kW to 25000 kW
 - Variable speed Motors- 150 kW to 22000 kW (Squirrel cage motors)
 - Variable speed Motors - 1000 kW to 15000 kW (Synchronous motors)
- ▶ 2 Pole Air cooled Steam/ Gas Turbine driven Generators (3 MW to 160 MW)
- ▶ 4 Pole Air cooled Steam/ Gas Turbine driven Generators (3 MW to 40 MW)
- ▶ 2 Pole Hydrogen cooled Steam/ Gas Turbine driven Generators (36 MW to 270 MW)
- ▶ 200kW HTSC Motor for Marine applications
- ▶ Permanent Magnet Based Generators upto 5 MW
- ▶ Gas Turbine generators upto 270MW
- ▶ Alternators for industrial applications with single bearing upto 2 MW



RAIL TRANSPORTATION

Transportation Systems

- ▶ AC electric locomotives (upto 6000 HP, 25 kV AC)
- ▶ AC-DC dual voltage electric locomotives
- ▶ AC EMU (Electric Multiple Units) Coaches
- ▶ Metro Coaches
- ▶ Traction Propulsion Systems for:
 - 9000 HP IGBT based AC Locomotives
 - 6000 HP IGBT based AC Locomotives
 - 3-phase IGBT based AC Electric Multiple Units (EMUs)
 - Air-conditioned ACEMU
 - ACEMU electrics for DC drives
 - 1600HP IGBT based DEMU (Diesel Electric Multiple Unit)
 - 3-phase IGBT based MEMU (Mainline Electric Multiple Unit)
 - 1600HP Multi-Genset Locomotive
- ▶ Regeneration system for DC Propulsion system of WAG7 Locomotive of Indian Railways
- ▶ Diesel Electric Tower Car
- ▶ Diesel-Electric Shunting Locomotives (up to 1400 HP)
- ▶ Battery powered Locomotive
- ▶ OHE recording-cum-test car
- ▶ Dynamic track stabilizers
- ▶ Rail cum Road vehicle

Transportation Equipment

- ▶ Traction Converter & Auxiliary Converter
- ▶ Vehicle Control Electronics
- ▶ Hotel Load Converter
- ▶ Composite Converter Comprising Traction Converter and Hotel Load Converter
- ▶ Traction Transformer
 - Upto 5400 kVA for conventional locomotives
 - Upto 9000 KVA for 3 phase drive locomotives.
 - Upto 1200 KVA conventional AC EMU/ MEMUs
 - Upto 1578 kVA for 3 phase EMU
- ▶ 3- phase AC Traction Motors (upto 1200 kW) for Locomotives & EMUs
- ▶ DC Traction Motors (upto 630 kW) for Locomotives & EMUs
- ▶ AC Traction Alternators (upto 3860 kW) for Locomotives & EMUs
- ▶ DC Traction Generators upto 2000 kW
- ▶ DC Blower motors (upto 50kW) for dynamic braking system
- ▶ Motor Generator sets (upto 25 kW) for auxiliary requirements
- ▶ Traction gears and pinions for Locomotives & EMUs
- ▶ Wagon (upto 28 axle, 296 Ton)
- ▶ Railway Track Electrification



DEFENCE AND AEROSPACE

- ▶ Super Rapid Gun Mount (SRGM) 76/62 for naval ships
- ▶ Integrated Platform Management system (IPMS) for naval ships
- ▶ Integrated Bridge System (IBS)
- ▶ Static Main Motor Generator (SMMG)
- ▶ Rotary Main Motor Generator with Controls (RMMG)
- ▶ Permanent magnet based reserve propulsion motor and drive.
- ▶ Frequency converters (PM based and conventional motor based) with controls
- ▶ Training Simulator for Vehicles, platforms, radars, weapons, missiles and Computer Based Training (CBT) for all defence and para-military forces
- ▶ Thermopressed Components for Tank Armor including Turret Casting for T-72 Tanks
- ▶ 2 kW Liquid Cooling System for Jammer which comprises four modules namely ACM Module, Pump Module, PCM Module and Electronic Control Unit
- ▶ Casting and Forgings for ships
- ▶ Onboard Compact Heat Exchangers for various fighter aircraft platforms
- ▶ Fuel Tanks and other components for Launch Vehicles and Satellites
- ▶ Permanent Magnet Frequency converters with drive unit
- ▶ Reserve Propulsion motor with drive unit
- ▶ Compact Brushless Alternators
- ▶ Space grade Batteries

ENERGY STORAGE SYSTEM & E- MOBILITY

- ▶ Charging Infrastructure for Electric Vehicles
- ▶ Battery Energy Storage System including Power Conditioning Unit (PCU) and SCADA

OIL FIELD EQUIPMENT

- ▶ Oil Rigs – On-shore drilling rigs with AC-VFD and AC-SCR technology for drilling upto depths of 9,000 meters, work-over rigs for servicing upto depths of 6,100 meters, mobile rigs for drilling upto depths of 3,000 meters, complete with matching draw-works and hoisting equipment including:
 - Mast and substructure
 - Rotating equipment: Draw works; Rotary; Swivels; Travelling Blocks
 - Independent Rotary drive unit
 - Dead Line anchor
 - Mud System including pumps
 - Triplex Mud pumps 5000 PSI Working Pressure
 - Mud processing equipment: Degasser, Desander
 - Sucker Rod Pump (Beam Pump Structure & Pumping Unit Gear Reducer)
 - Refurbishment and upgradation of Oil Rigs
 - 3-phase Oil rig motor up to 1150 HP
 - Oil rig motors upto 1000 HP (Draw works, mud pump, drilling)
 - Oil rig alternators upto 1750 kVA
 - AC/ DC Power Control Room for E760, E1400, E2000 & E3000 Rig



- AC Power Pack upto 1430 kVA for DG sets
- AC Control Module
- DC Control Module
- Driller's Console upto 3 mud pumps, IRD & draw work control & monitoring, load rating (0-1800 A, 0-1000 V)
- Mobile Lighting Tower, Rig Lighting Tower
- AC- VFD Controls for AC Rigs
- STATCOM for power Factor improvement in AC SCR Rigs
- ▶ Well heads and X-mas Trees upto 10,000 psi, Mud Line Suspension, Choke and Kill Manifold, CBM Wellheads, DSPM H- Manifold Assembly, Mud valves
- ▶ Pressure Vessels, Columns, Reactors/ Separators, Heat Exchangers
- ▶ Fired Heaters
- ▶ Purge Gas Recovery Unit
- ▶ Gear Box
 - Accessory & Load Gear Box for Gas Turbine Application
 - Gearbox for Steam Turbine Application
 - Gearbox for Boiler Feed Pump Drive Turbine (BFP DT) Application
 - Gearbox for Air Cooled Condenser (ACC) fan Application
 - Gearboxes for Sucker Rod Pump (SRP) Application
 - Gearbox for Independent Rotary Drive (IRD)
 - Gearbox for AC Draw works
 - Gearboxes for Super Rapid Gun Mount (SRGM) Application

FABRICATED EQUIPMENT AND MECHANICAL PACKAGES

- ▶ Cryogenic Air Separation Units
- ▶ Cryogenic storage tanks, Mounded storage systems and storage spheres





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For enquiries and further information

POWER SECTOR

BHEL House, Siri Fort,
New Delhi-110049, India
Tel: (+91-11-66337851) Email: psm@bhel.in

INTERNATIONAL OPERATIONS

Integrated Office Complex, Lodhi Road,
New Delhi-110003, India
Tel: (+91-11-41793282) Email: exports@bhel.in

INDUSTRIAL SYSTEMS & PRODUCTS

Integrated Office Complex, Lodhi Road,
New Delhi-110003, India
Tel: (+91-11-41793243) Email: industry@bhel.in

TECHNOLOGY LICENSING & JOINT VENTURES

BHEL House, Siri Fort,
New Delhi-110049, India
Tel: (+91-11-66337210) Email: tljv@bhel.in



Bharat Heavy Electricals Limited

Registered Office : BHEL House, Siri Fort, New Delhi 110049
Corporate Identity Number : L74899DL1964GOI004281

www.bhel.com

