

**BHARAT HEAVY ELECTRICALS LIMITED: A CORPORATE PROFILE**

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**ABSTRACT**

*BHEL manufactures and supplies major capital equipment and systems like Captive power plants, Centrifugal compressors. Drive Turbines, Industrial boilers and auxiliaries. Waste heat recovery boilers, Gas turbines, Pumps, Heat exchangers, Electrical machines. Valves, Heavy castings and forgings. Electrostatic precipitators, ID/FD fans. Seamless pipes etc. to a number of industries, like metallurgical, mining, cement, paper, fertilizers, refineries & petro-chemicals etc., other than power utilities. BHEL has also emerged as a major supplier of controls and instrumentation systems, especially distributed digital control systems for various power plants and industries. This paper discusses about the corporate profile of BHEL.*

**KEY WORDS:** BHEL, Corporate Profile, Generation, Transmission, Renewable Energy.

**INTRODUCTION**

India in the energy related / infrastructure sector today. BEDEL was established more than 40 years ago when its first plant was set up in Bhopal ushering in the indigenous Heavy electrical Equipment Industry in India, a dream which has been more than realized with a well recognized track record of performance. It has been earning profits continuously since 1971- 72, and achieved a sales turnover of Rs.7286.6 crores with a Pre-Tax profit of Rs. 662.8 crores in 2001 - 2002. BHEL caters to core sectors of the Indian Economy viz., Power Generation & Transmission, Industry, Transportation, Telecommunication, Renewable Energy, Defence etc.,. The wide network of BHEL's 14 Manufacturing Divisions, Four Power Sector Regional Centers over 100 Project sites, Eight service centers and 18 Regional offices, enables the Company to promptly serve its customers and provide them with suitable products, systems and services - efficiently and at competitive prices.

BHEL has already; attained ISO 9000 Certification for Quality Management and ISO 14001 certification for Environment Management. BHEL has attained ISO 9001 certification for quality management and all the manufacturing Units/divisions of BHEL have been upgraded to the latest ISO-9001: 2000 version. All the major units/divisions of BHEL have been awarded ISO-14001 certification for Environmental Management Systems and OHSAS-18001 certification for Occupational Health and Safety Management Systems. BHEL was the first Public Sector Company in the country to win the coveted 'PRIZE' for its Haridwar unit under the CII Exim Award for business excellence, as per the globally recognized model of European Foundation for Quality Management. The company received EEPC's Top Export Award for Project Exports for the seventeenth year in succession. It has also won the SCOPE Meritorious Award for R&D and Innovation 2015-16 for commendable contribution in the area of R&D and Innovation.

The company achieved the perfect MoU score of 1.00 for the year 2016-17 and has also been selected for the MoU award for highest growth rate in market capitalisation among listed PSEs during 2016-

17. 12 out of the 13 power stations awarded with the Ministry of Power's Meritorious Productivity Awards for 2016-17 are equipped with BHEL sets, reaffirming the quality and reliability of BHEL's equipment.

#### **CORPORATE PROFILE:**

Bharat Heavy Electricals Limited is the largest Engineering and Manufacturing Organization in India. It was established to comprehensive range of products and services for Hydro Generators, Thermal Power Stations, Nuclear Power Station and Gas Turbine and Distribution at the initial stage.

To fulfill the objects the following concerns were established.

- 1 . Heavy Electrical Plant - Bhopal (MP ) - Aug 1956
- 2 . High Pressure Boiler Plant - Trichy (TN ) - May 1965
- 3 . Heavy Power Equipment Plant - Hyderabad ( AP ) - Dec. 1967
4. Heavy Electrical Equipment Plant - Haridwar (U P ) - Jan. 1967
- 5 . Boiler Auxiliaries Plant - Ranipet (TN) - Mar 1980

BHEL is in the field of Steam Generator, Serving the needs of various users, who are in need of reliable efficient Steam Generators, Modern Steam Generators are large complex equipment, incorporating the latest advancements in the fields of heat transfer, material science, electronics and other engineering sciences. In the international level BHEL is among the Top 10 organizations in the world production Power Plant Equipment. So far BHEL has secured export orders from more than 40 countries to the tune of 4898 million rupees. BHEL's role in emphasizing on optimum utilization of Indian coal divising methods and equipment's with lower energy consumption and working at a diversities miniature of energy as on date BHEL has a Corporate Office at New Delhi and has 14 Manufacturing Units, 10 Service Centers are located in different places of the country. BHEL has a Corporate Profile and has it Liasion Offices in London, Moscow and Site Offices in Libya, Thailand and Malaysia.

#### **BHEL UNITS & PRODUCT PROFILE:**

High Pressure Boiler Plant - Trichy:

Power Boilers, Industrial Boilers, Nuclear Steam Generators and Reactor Handlers, FBC/ CBFE Boilers, Heat Recovery Steam Generators, Heat Exchangers, Pressure Vessels, Reaction Columns, Piping Systems, Pipe Fittings, Gravimetric Feeders, Soot Blowers, Block Valves, Suspension System and Casting Support System, Thermo Pressed Components and Armored Vehicles for Defence.

#### **Seamless Steel Tube Plant - Trichy :**

Seamless Steel Tube, Spiral Fin Welded Tubes.

#### **Boiler Auxiliaries Plant - Ranipet ;**

Electrostatic Precipitators, Fabric Filters, Air pre-heaters. Fans, Wind Electric Generators, Ash Handling, Coal Handling Equipment, Desalination Plants, Defence Systems, Gates and Dampers and Logo Frames.

#### **Industrial Valves Plant - Govindwal:**

Industrial Valves and Fabrication

#### **Heavy Electrical Plant - Bhopal:**

Steam Turbines, Turbo Generators, Hydrosets, Switch Gear Centroglass, Rectifiers, Capacitors, Transformers, Motors, HVDC Large Electrical Power Supply Machines, Industrial Machines and Large Electrical Traction Machines.

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**Central Foundry Forge Plant - Haridwar:**

Heavy Castings and Forgings

**Heavy Power Equipment Plant - Hyderabad ;**

Power Generator sets, Industrial Turbo sets. Compressors Pumps and Heaters, Bowl Mills, Heat Exchangers, Oil Rigs, Gas Turbines, Switch Gear.

**Electronics Division - Bangalore ;**

Energy Meters, Water Meters, Control Equipment's, Capacitors, Photo Voltaic Panels, Electronic Private Automatic Branch Exchange.

**Electronic Systems Division - Bangalore ;**

Simulators, Telecommunication Systems and other advanced Microprocessor Based Control Systems.

**Electro Porcelan Division - Bangalore :**

Insulators and Bushings, Ceramic Liners

**Insulators Plant - Jagadishpur :**

Insulators and Bushings.

**Component Fabrication plant - Rudrapur :**

Solar cells, Solar Lanterns, Chargers and Solar Clocks.

**Heavy Electrical Equipment Plant - Haridwar ;**

Turbosets, Hydrossets, Electrical Machines, Industrial Control Panels, Winches, Gas Turbines and Light Aircraft's.

**Transformers Plant - Jhansi :**

Transformers, AC Logos, AC EMU, Diesel Shunters.

**Major Functions of BHEL Power Generation**

Power Generation Sector comprises Thermal, Gas, Hydro and Nuclear power plant business. As of 31.3.2008, BHEL-supplied sets account for 85,786 MW or around 64% of the total installed capacity of 1,34,697 MW in the country. Significantly, these sets generated an all-time high 454.59 Billion Units of electricity contributing 73% of the total power generated in the country. The cumulative capacity of projects installed worldwide have crossed 1,00,000 MW.

BHEL has proven turnkey capabilities for executing power projects from Concept to Commissioning. The company has introduced new rating thermal sets of 270 MW, 525 MW & 600 MW in sub-critical range and possesses the technology & capability to produce large capacity thermal sets with super critical parameters and gas turbine-generator sets. Co-generation and Combined cycle plants have been introduced to achieve higher plant efficiencies. To make efficient use of the high ash content coal available in India, BHEL also supplies Circulating Fluidized Bed Combustion (CFBC) boilers for thermal plants.

The Company manufactures 220/235/500/540 MWe, nuclear turbine- generator sets. Custom-made hydro sets of Francis, Pelton and Kaplan types for different head-discharge combinations are also engineered and manufactured by BHEL.

The Company has proven expertise in Plant Performance Improvement through Renovation, Modernization and Uprating of a variety of power plant equipment, besides specialized know-how of

residual life assessment, health diagnostics and life extension of plants. BHEL built thermal sets consistently exceed the national average efficiency parameters and have achieved the highest-ever Plant Load Factor (PLF) of 80.4% during 2007-08, which is 2.5% higher than the national average. Operating Availability (OA) was also the highest-ever at 86.7%.

BHEL is one of the few companies worldwide, involved in the development of Integrated Gasification Combined Cycle (IGCC) technology which would usher in clean coal technology. BHEL has set up Asia's first 6.2 MW IGCC power plants with an indigenously designed pressurised fluidised bed gasifier. The company has also signed a MoU with APGENCO for setting up a 125 MW IGCC plant at Vijayawada.

### Transportation

Most of the trains in Indian Railways, whether electric or diesel powered, are equipped with BHEL's traction propulsion system and controls. The systems supplied are both with conventional DC drives and state-of-the art AC drives. India's first underground metro at Kolkata runs on drives and controls supplied by BHEL. The company also manufactures complete Rolling stock i.e. Electric locomotives up to 5000 HP and EMU coaches and Diesel Electric locomotives from 350 HP to 3100 HP for both mainline and shunting duty applications.

BHEL also undertakes retrofitting and overhauling of rolling stock. In the area of urban transportation, BHEL is geared up for turnkey execution of electric trolley bus systems, light rail systems and metro systems.

BHEL is contributing to the supply of electrics for EMUs for 1500V DC & 25 kV AC to Indian Railways. Almost all the EMUs in service in India are with the electrics manufactured and supplied by BHEL. BHEL has also diversified into the area of track maintenance machines and coach building for Indian Railways.

### Renewable Energy

BHEL has been manufacturing and supplying a range of Renewable Energy systems and products. It includes Solar Energy systems viz. PV modules, PV power plants, Street lighting, solar pumps and solar water heating systems. A large number of small hydro power stations have also been completed. In line with the efforts being made at national level for development of remote areas, BHEL has commissioned six stand alone Solar Photovoltaic (SPV) power plants of 3x110 KWp and 3x55 KWp capacities in Sunderbans (West Bengal). 57 Sets of Solar PV operated petrol pumps are being supplied to M/s HPCL to illuminate and run the company- owned petrol pumps smoothly irrespective of Grid power outage.

### Oil and Gas

BHEL is supplying onshore drilling rig equipment viz. Draw works, Rotary-table, Travelling block, Swivel, Mast and Sub structure, Mud systems and Rig electrics to ONGC and Oil India Ltd. Well heads & X-Mas tree valves up to 10,000 psi rating for onshore as well as offshore application are being supplied to ONGC, Oil India Ltd. and Private Drilling Companies. BHEL has also supplied Casing Support System, Mudline Suspension System and Block Valves to ONGC for offshore application.

It also has the capability to supply complete onshore Drilling rigs, Super-deep drilling rigs, Desert rigs, Mobile rigs. Work over rigs and sub- sea well heads. Currently, BHEL is executing orders for refurbishment and upgradation of onshore Oil Rigs from ONGC & Oil India Ltd.

BHEL has supplied GT driven centrifugal compressor packages to GAIL India Ltd. for their gas compressor stations for the Dahej - Vijaipur gas pipeline project.

### Transmission

BHEL supplies a wide range of products and systems for transmission and distribution applications. The products manufactured by BHEL include Power transformers, Instrument transformers. Dry type

transformers, Shunt reactors, Capacitors, Vacuum and SF6 switchgear, Gas insulated switchgears, Ceramic insulators, etc.

BHEL has developed and commercialised the country's first indigenous 36 kV Gas Insulated Substation (GIS) and has also developed 145 kV GIS which has undergone successful field trials at Hyderabad. HVDC Disc insulators of rating 320kN/420kN have been developed for the first time in the country for use in +/- 800kV HVDC application. For enhancing the power transfer capability and reducing transmission losses in 400 kV lines, BHEL has indigenously developed and executed fixed series compensation schemes and has developed thyristor controlled series compensation scheme, involving thyristor controlled reactors, popularly known as Flexible AC Transmission System (FACTS). BHEL has indigenously developed and commercialized state-of-the-art controlled shunt reactor for reactive power management of long transmission lines. With a strong engineering base, the company undertakes turnkey execution of substations up to 400 kV and has the capability to execute 765 kV substations. High Voltage Direct Current (HVDC) systems have been supplied for economic transmission of bulk power over long distances.

### International Business

BHEL has, over the years, established its references in 70 countries across all inhabited continents of the world. These references encompass almost the entire range of BHEL products and services, covering Thermal, Hydro and Gas-based turnkey power projects. Substation projects. Rehabilitation projects, besides a wide variety of products like Transformers, Compressors, Valves, Oil field equipment. Electrostatic Precipitators, Photovoltaic equipment. Insulators, Heat Exchangers, Switchgears, Castings and Forgings etc. Some of the major successes achieved by BHEL have been in Gas-based power projects in Oman, Libya, Malaysia, Saudi Arabia, Iraq, Bangladesh, Sri Lanka, China, Kazakhstan; Thermal power projects in Cyprus, Malta, Libya, Egypt, Indonesia, Thailand, Malaysia, Sudan; Hydro power plants in New Zealand, Malaysia, Azerbaijan, Bhutan, Nepal, Taiwan, Tajikistan, Thailand, Afghanistan; and Substation projects & equipment in various countries. Execution of these overseas projects has also provided BHEL the experience of working with world renowned consulting organizations and inspection agencies.

The company has been successful in meeting the demanding requirements of international markets in terms of complexity of work as well as technology, quality and other requirements viz. HSE requirements, financing packages and associated O&M services, to name a few. BHEL has proved its capability to undertake projects on fast-track basis. The company has also established its versatility to successfully meet the varying needs of different sectors, be it captive power, utility power generation or the oil sector. Besides undertaking turnkey projects on its own, BHEL also possesses the requisite flexibility to interface and complement other international companies for large projects, and has also exhibited adaptability by manufacturing and supplying intermediate products.

The company is taking a number of strategic business initiatives to fuel further growth in overseas business. This includes firmly establishing itself in target export markets, positioning of BHEL as a regular EPC contractor in the global market both in utility and IPP segments and exploring various opportunities for setting up overseas joint ventures etc.

### Technology Up-Gradation, Research & Development

To remain competitive and meet customers' expectations, BHEL lays great emphasis on the continuous up-gradation of products & related technologies, and development of new products. The Company has upgraded its products to contemporary levels through continuous in-house efforts as well as through acquisition of new technologies from leading engineering organisations of the world.

The Corporate R&D Division at Hyderabad leads BHEL's research efforts in a number of areas of importance to BHEL's product range. Research and product development centres at each of the manufacturing divisions play a complementary role. Centres of excellence have been set up for Simulators, Computational Fluid Dynamics, Permanent Magnet Machines and Surface Engineering. As the fifth in the

series, BHEL is establishing a Centre of Excellence for Intelligent Machines and Robotics (COE-IMAR). In addition to the Corporate R&D Division, BHEL has four specialized institutes, viz., Welding Research Institute at Trichy, Ceramic Research Institute at Bangalore, Centre for Electric Traction and Hydro lab at Bhopal and Pollution Control Research Institute at Haridwar. BHEL has introduced, in the recent past, several state-of-the-art products viz. 60 MW Bubbling Fluidised Bed Combustion Boiler for power generation, 260 MW steam turbine designed to suit combined cycle power plants. Bypass Over Fire Air (BOFA) system for reduction of NOx from coal based thermal power plants, high efficiency Francis and Pelton hydro turbines, new LP turbine variant which can be retrofitted in old Russian (LMW) 210 MW thermal sets, Automatic Storage & Retrieval System (ASRS) for storage and inventory management system of the Indian Army, Solar Panels with 5500 watts output consisting of high- efficiency multi-junction solar cells, Satellite Batteries for INSAT 4A, Controlled Shunt Reactor (CSR) for 400 kV Transmission lines, Flexible AC Transmission Systems (FACTS), STATCOM, Phase Shifting Transformer (PST), 145 kV Gas Insulated Switchgear (GIS), Micro controller based flame scanner, a more energy efficient single cylinder non-reheat steam turbine for 100-140 MW application, IGBT based 3-phase drive system for 700 HP diesel electric locomotives, technology for manufacture of 400 kV long-rod composite insulators with improved properties by adding nano materials. Performance Analysis, Diagnostics and Optimization (PADO) package for power plants, 91 ton BHEL 280 Bowl Mill, etc.

The company is also engaged in research in futuristic areas like fuel cells for distributed environment-friendly power generation, clean coal technology applications, super conductivity applications in transformers, generators/ motors etc. and nano technology for various applications.

### Human Resource Development Institute

The Human Resource Development Institute (HRDI) situated in Noida, is the corner stone of BHEL's learning Infrastructure, along with the Advanced Technical Education Centre (ATEC) at Hyderabad and the Human Resource Development Centres (HRDCs) at different units. Through various organizational developmental efforts, these centres ensure that the prime resource of the organization - the Human Capital - is always in a state of readiness to meet the dynamic challenges posed by the fast changing environment. It is their constant endeavour to take the HRD activities to the Strategic level of becoming an active partner in achieving the organizational goals.

Guided by the HRD Polestar statement "To create an environment supportive of blossoming of full potential of employees", the HRDI along with the HRDCs and the ATEC, through a systematic strategic long term training process and several short-term need based programmes based on comprehensive organizational research, enable the human resources to unearth and polish their potential. The HRDI is spearheading the HRD initiatives in the company and focusing on competency, commitment and culture building.

Some of the core programmes are Advanced Management Programmes, General Management Programmes, Strategic Management Programmes, Senior Management Programmes, Middle Management Programmes, and Young Managers Programmes. In addition, the HRDI provides professional support to Corporate HR and HRDCs at Units/Divisions.

### Health, Safety and Environment Management

BHEL is committed to be an environment friendly company in all its areas of activities, products and services, providing safe and healthy working environment to all stakeholders. In fact this aspect has become an integral part of the company's business performances. Significantly, BHEL has also taken initiatives on Clean Development Mechanism (CDM) projects to reduce greenhouse gas emissions in a more focused way and vigorous efforts are being made to achieve milestones in this area.

In line with the company's strategy, BHEL undertakes a host of Environment Improvement Projects and Community Development Programmes. Some of the major EIPs executed in the past at BHEL plants &

townships included tree plantation drives, installation of rain water harvesting plants, efficient water & energy management, reduction in noise level, improvement in chemical storage & handling systems etc. In conformity with BHEL's concern for society and environment, a more energy efficient single cylinder non-reheat steam turbine for 100-140MW application has been developed, suitable for plants where large amounts of waste heat is available and reheat option is not feasible. This is the largest single cylinder steam turbine engineered so far by BHEL.

### Corporate Social Responsibility

As part of its Corporate Social Responsibility, BHEL adopted 56 villages having nearly 80,000 inhabitants. Other examples of CSR activities are Blood Donation and Health Check-up camps, besides providing infrastructure support at these villages. In addition, BHEL provides financial assistance to various NGOs/Trusts/Social Welfare Societies that are engaged in social activities throughout the country.

Environment Improvement Projects (EIPs) undertaken by the Company included mass afforestation (over 31 lakhs), host of rain water harvesting plants, water, energy & precious resource conservation plants besides projects which helped in reduction of noise level, improvement in fume extraction, utilisation of NCES products etc. As a result of these projects BHEL has been able to maintain healthy environment at its work places & townships besides savings accrued through various resource conservation projects. All manufacturing units/regions of the company are accredited to latest international standards viz. ISO-14001 certification for Environmental Management and OHSAS-18001 certification for Occupational Health and Safety Management Systems.

The company is well recognised as a social conscious organisation and continues to play an active role through a host of community development & other measures in and around its plants and surrounding areas. As part of this, number of welfare projects was undertaken at the Company's 56 adopted villages having nearly 80,000 inhabitants. These included Blood Donation Camps and Health Check-up camps besides providing infrastructure support at these villages.

### Vigilance

The vigilance organisation of BHEL is headed by the CVO. Each Unit/ Region of BHEL has a vigilance set up headed by a senior vigilance executive reporting to the CVO. Preventive vigilance was one of the thrust areas of BHEL Vigilance during 2007-08. Greater awareness of the Company's policies, rules and procedures amongst employees through training programmes was undertaken as a measure of preventive vigilance. 42 such programmes were organized during the year 2007-08 in various Units, Regions and offices of BHEL. During the year 2007-08, System Studies on 'Vendor Registration', 'Procurement of Capital Equipment', 'Scrap Disposal', 'Recruitment of Artisans' etc. were carried out with a view to make systems more effective and transparent. Interactive sessions were held with line executives representing different functional areas, in order to create vigilance awareness and to enhance their knowledge of the Company's policies, rules and procedures.

CVC has decreed that Vigilance objectives can be better achieved through implementation of Transparency Measures in various areas of Company operations, especially those requiring interface with customers and suppliers. Some of these successfully implemented measures include hosting of tender details on the Company's web site, personal and vendor payments through Electronic mode and vendor applications tracking system.

### Clean Development Mechanism

BHEL has taken initiatives on Clean Development Mechanism (CDM) projects to reduce green house gas emissions in a more focused way and vigorous efforts are being made to achieve milestones in this area. During the year, CDM Awareness Programs for the Nodal Officers of the units were conducted and in each unit a CDM projects Committee has been formed to identify projects, oversee the registration,

implementation and generate carbon credit. A broad reference list of CDM activity projects both of in house implementation and joint claim projects with customers has been generated. CDM is now a planned activity for each unit.

**People Orientation:**

To enable each employee to achieve his potential, improve his capabilities perceive his role and responsibilities and success of the company to invest in human resources continuously and be alive to their needs.

**Technology:**

To achieve Technology excellence in operations by development of indigenous technologies and efficient absorption and adoption of imported Technologies to suit business needs and priorities and provide a competitive advantage of the company.

**Image**

To fulfill the expectations which stakeholders like Government as Owner, Employee, Customs and Country at large have from BHEL.

**Company Objectives:****Business Mission:**

To maintain a leading position as suppliers of quality equipment systems and services in the field of conversion, Transmission, Utilization and conservation of energy for application in the area of Electric Power Transportation Oil and Gas exploration and Industries. To utilize company's capabilities and resources to expand business into allied areas and other priority sectors of the economy like Defence, Communication and Electronics.

**Growth:**

To ensure a steady growth by enhancing the competitive edge of BHEL in existing business, new areas and international operations.

**Profitability:**

To provide a reasonable and adequate return on capital employed primarily through improvements in operation, efficiency, capacity, utilization and productivity and general adequate internal resources to Finance the Company's Growth.

**Customer Focus:**

To build a high degree of customer confidence by providing increased value of his money through international standards of produce quality, performance and superior customer service.

**CONCLUSION**

Being one of the top profit making companies BHEL has attained such position undoubtedly because of the sustained cooperation and dedicated service by the 51,000 employees. Further it represents a high energy potential forces which alone can transform BHEL into Global Player that is expected. Further the strength of BHEL has always lies in its highly trained and motivated people.

BHEL as an organization is putting its continuous efforts to keep it in a leading position in contributing the equipment required for Power and Industrial Sector in India and abroad. Also BHEL is making more contribution of Power to our Nation indirectly. Hope this will continue and BHEL will be a global leader in the years to come.



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