



RAIL TRANSPORTATION

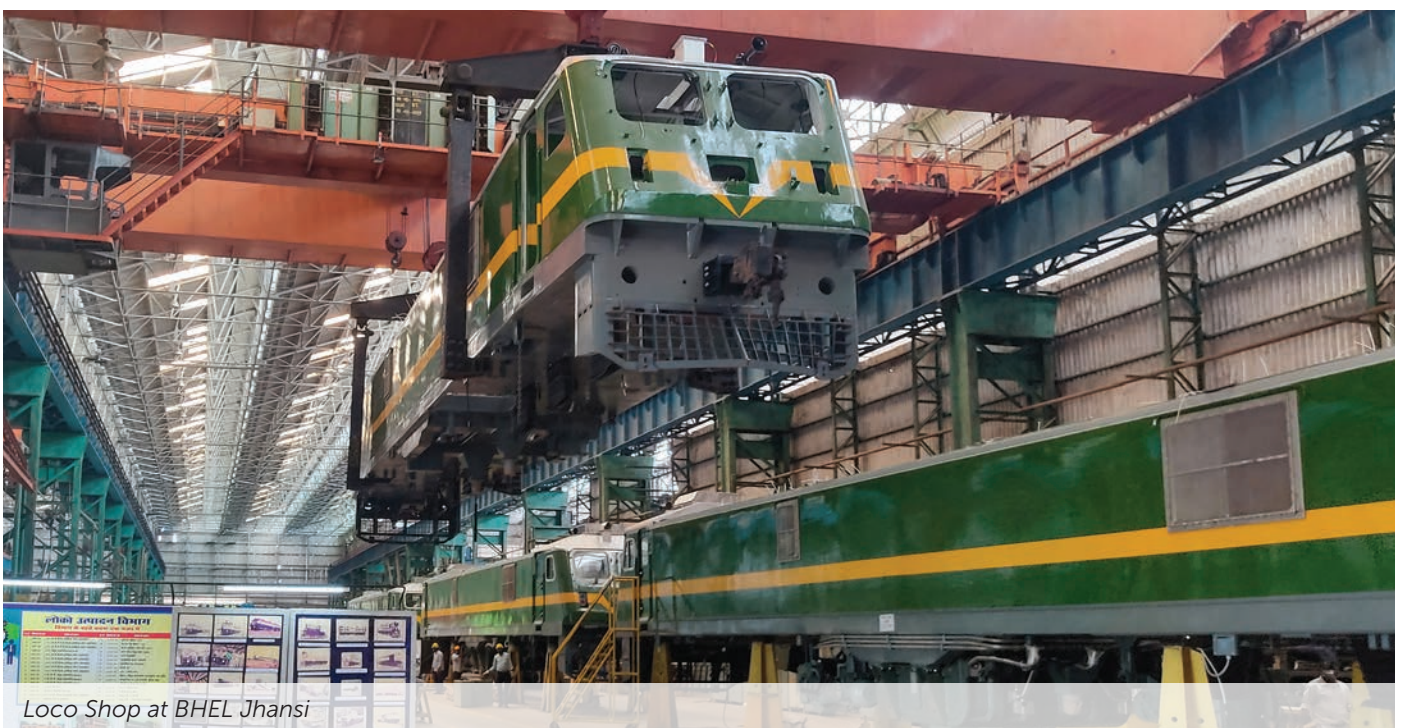
Propelling Progress
on the Developmental Track

About BHEL

Since 1964, BHEL has been 'Making in India' as a leading Capital Goods sector company. Today, the company's businesses are in the areas of power and industry, offering comprehensive solutions, including products, systems and services to power generation (thermal, hydro, gas, nuclear and solar PV), transmission, transportation, defence, aerospace, oil & gas and other core sectors of the country, and also abroad. BHEL, incorporated as a Public Sector Undertaking of the Government of India with a shareholding of 63.17%, has established

16 manufacturing plants spread across India, producing capital goods for the customers in domestic as well as international markets. The Company has steadily expanded its product portfolio through both partnerships with global OEMs as well as in-house product development. The in-house product development is backed by consistent investment of more than 2.5% of revenue on R&D and innovation. At BHEL, we firmly believe that serving our customers, protecting the environment, and contributing to society are intrinsically linked, and form the core of our corporate ethos. The Company has been supporting communities through programs like skill development; promoting health, hygiene & education; and running several programs on environmental protection & improvement..

BHEL'S WIDESPREAD NETWORK



Our Journey so far ...



Since 1962

Engineering & manufacturing Traction Machines

One of the few suppliers approved for all 3 Major items - Transformers, Motors & Propulsion equipment



Traction Equipment

Majority of locomotives & EMUs of Indian Railways (IR) are equipped with BHEL Traction equipment



Electric Locomotives

Only manufacturer in India other than Indian Railways' Production Units/ JVs

800+

Locomotives supplied to IR & Industries



International Presence

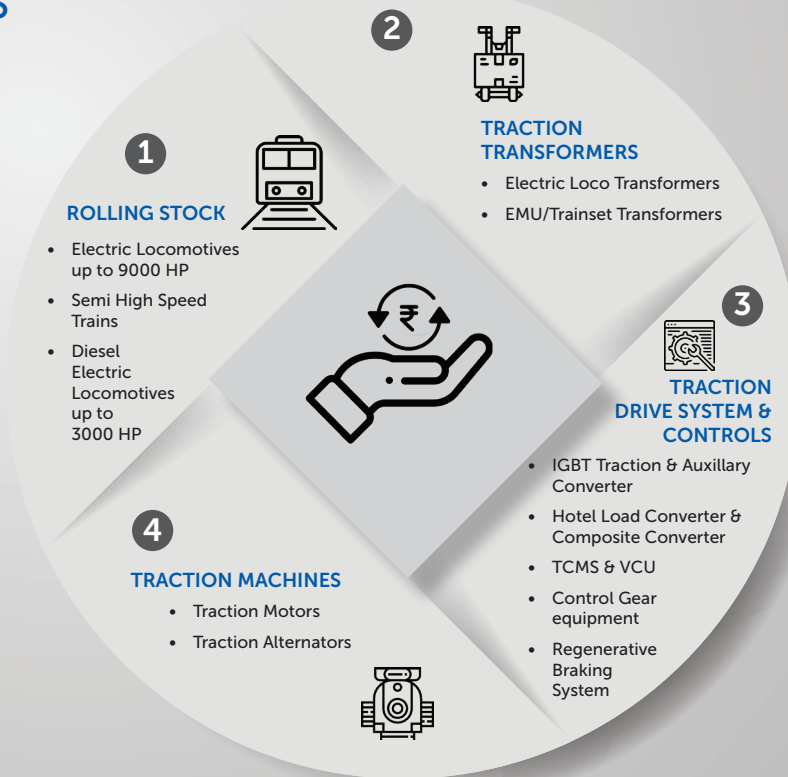
Supplied Traction equipment to Mozambique, Bangladesh, Sri Lanka, Angola, Senegal, Myanmar, Malaysia



USD 260+ Mn

worth annual supplies for Transportation equipment

OFFERINGS



Engineering Capabilities

BHEL has established strong design & engineering capabilities for complete rolling stock and traction equipment to provide world class sustainable solutions to its customers. Over the years, the company has been instrumental in introducing 3-Ø technology for locomotives and EMUs in India. Through its dedicated research and development centres and collaborations with top research institutes and global technology providers, the company has proven its expertise in the field of traction product design as well as complete system engineering solutions.



Semi High Speed Vande Bharat Express

KEY HIGHLIGHTS

- India's first IGBT based Air-conditioned EMU train is equipped with BHEL-supplied Electrics and Controls. 13 such trains are in service on India's Mumbai Suburban Rail Systems.
- BHEL has developed and supplied MEMU with 3-phase electrics with Ethernet-based communication to Indian Railways
- Indigenously developed On-Board IGBT Propulsion System for EMUs/MEMUs & Locos
- Developed WAG-7 (5000 HP) Locomotive with Regenerative Braking System for DC Motors, first time in India, resulting in reduction of ~20% of total energy consumed
- Indigenously developed Propulsion System for uprated 9000 HP (WAG9HH) locomotive
- Developed Composite Converter for Locomotives
- Manufactured & supplied IGBT-based 6000 HP (WAG9H) Freight Locomotives
- Diesel Electric Shunting Locomotives with Air-conditioned cab: BHEL manufactures Diesel Electric Shunting Locomotives in power range of 350-3250 HP, for industrial applications such as Power, Steel, Cement, Fertilizer, etc.

Manufacturing Capabilities

In the last six decades, BHEL has been a reliable partner of Indian Railways (IR), offering a wide range of products and propulsion systems for various rolling stock. BHEL has dedicated facilities to manufacture rolling stock and traction equipment at its Bhopal, Jhansi and Bengaluru plants.

LOCOMOTIVES

- Electric Locomotives (upto 9000 HP)
- WAG-7 Locomotives with Regenerative Braking System
- Diesel-Electric Shunting Locomotives (up to 3250 HP)

TRACK MACHINES

- Diesel Electric Tower Car
- Rail-cum-road vehicle



Air-conditioned AC-EMU manufactured for suburban railways



Electric Locomotive WAG-9H

- OHE recording-cum-test car
- Utility Vehicle

ELECTRONICS

- Complete IGBT-based Propulsion Systems comprising Traction, Auxiliary Converters & VCU for 6000 HP WAG 9/WAP 7 & WAP 5 Locomotives
- 9000 HP propulsion equipment
- Hotel Load Converters for Head on Generation
- Traction, Auxiliary Converters & TCMS for EMUs/Air conditioned EMUs/ MEMUs/ Metro/ Semi high speed train sets (Vande Bharat)
- Composite Converters
- Rectifiers & Controls:
 1. Power Rectifiers for entire range of Diesel Rolling Stock
 2. Conventional Controls for DEMUs/DETCs/ EMUs/MEMUs
- Dedicated servicing facility with Pan India presence across Maintenance Sheds

TRACTION ELECTRICS

- Traction Transformers
- Traction Motors
- Alternators
- Loco Auxiliaries
- Electrics for Diesel Electric Tower Car
- Auxiliary/ Exciter Generator: AG3101AX & AG2702AX in Diesel Electric Locomotives

OTHER EQUIPMENT

- Wheel & Axle Machining & Assembly
- Bogie: Motorised Bogies for Mainline Locomotives
- Specialised Wagon: (Up to 28 Axle, 296 Tonne)
- Gears & Pinions: Varieties of Gears & Pinions to Indian Railways
- Eddy Current Clutch: For operating Radiator Cooling Fan in Diesel Electric Locomotives



RCF MEMU rake



BHEL-make electrical & driver consoles inside AC EMU train



RESEARCH & TESTING CENTRES

CENTRE FOR ELECTRIC TESTING

Centre for Electric Testing (CET) at BHEL Bhopal has been set up with UNDP assistance for testing of complete Rolling Stock.

CENTRES OF EXCELLENCE

- For Simulators, Surface Engineering, Computational Fluid Dynamics, Permanent Magnet Machines, Intelligent Machines & Robotics and Machine Dynamics at Hyderabad
- Caters to the development needs for transportation electronics including type testing of Traction Converter & Inverter, at Bengaluru

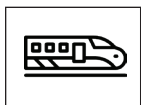


Centre for Electric Testing at BHEL Bhopal



PREPARING FOR GROWTH

BHEL has been adept at transforming itself in line with the market requirements throughout its illustrious journey & the company is currently focusing on:



- **Trainsets for Semi High Speed Trains:**

Supply of complete Trainsets including underslung propulsion and Stainless steel/Aluminium coaches



- **High Power (9000 HP & above) Electric locomotives:**

High efficiency & high power locomotives including all electrics & mechanicals



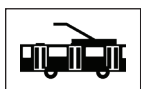
- **Signalling:**

Development of Train Collision & Avoidance System (TCAS), 'Kavach' to ensure highest safety standards



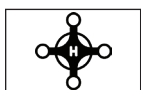
- **Urban Transportation:**

Gearing up for catering to the demand for High Speed Trains, coaches for urban transportation, EMU train sets, Metro, Metro-neo, Metro-lite



- **Dual Mode Shunting Locomotives (DMSL):**

Working both on battery and electric power



- **Hydrogen fuel cell:**

For providing environment friendly solution to Indian Railways through Hydrogen fuel cell technology



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