

Engineering Dreams Inspiring Innovation



BHARAT HEAVY ELECTRICALS LIMITED
AN INDUSTRIAL GIANT



About the Company

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.





Making in India since **1964** and supplying products and services globally



One of India's largest employers in the engineering space
 ~**28,000** highly skilled employees
9,200+ engineers



16 manufacturing facilities spread across the country producing equipment conforming to international standards



4 regional offices
8 service centres
15 regional marketing centres
2 repair units



References in **91** countries in all six inhabited continents.



POWER



RENEWABLES



TRANSMISSION



TRANSPORTATION



DEFENCE & AEROSPACE



E-MOBILITY



BATTERY ENERGY STORAGE SOLUTIONS



INDUSTRIAL SYSTEMS & PRODUCTS



OIL & GAS



RESEARCH & DEVELOPMENT

POWER

The power generation segment comprises nuclear, hydro, thermal, gas and renewable power plant businesses. BHEL has been in this segment for over five decades, having commissioned its first thermal set in 1969. The company has proven turnkey capabilities for executing power projects from concept to commissioning.

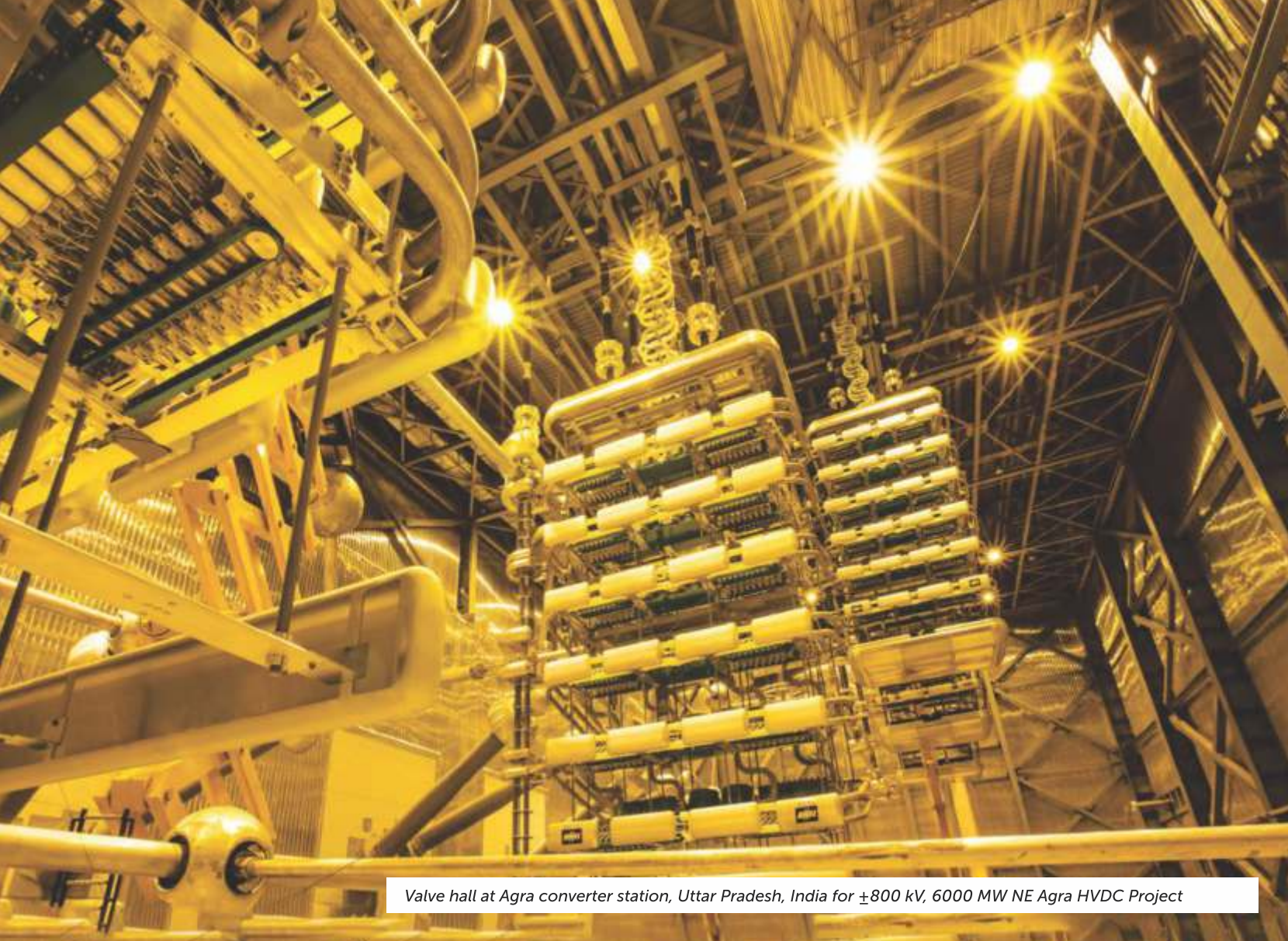
- BHEL offers a wide variety of efficient supercritical sets up to 1,000 MW rating, including 660/ 700/ 800 MW. We also offer lower rating thermal sets for utility and industrial applications
- The company also offers state-of-the-art emission control equipment for thermal plants for lower carbon footprint and compliance with the global emission norms
- The company manufactures a wide range of products for nuclear power plants viz. steam generators, reactor headers and end shields, besides nuclear turbine-generator sets ranging from 220 MWe to 700 MWe ratings
- BHEL offers design, engineering, manufacturing, testing & commissioning of a wide range of customized hydro sets of Francis & Pelton type up to 400 MW rating & Kaplan type up to 100 MW rating along with matching Generators. We are also capable of executing Electro-Mechanical works for Pumped Storage Projects (PSP) i.e. Reversible Pump-Turbine & Motor-Generator sets up to 300 MW rating.
- The company manufactures advanced-class large size gas turbines and matching generators. Additionally, the company supplies co-generation and combined cycle plants with higher plant efficiencies
- BHEL has proven expertise in plant performance improvement for BHEL and non-BHEL sets through renovation, modernisation and uprating of a variety of power plant equipment including solutions towards flexible operations

2x660 MW supercritical power plant commissioned by BHEL at Suratgarh, Rajasthan



RENEWABLES

- BHEL is one of the few EPC players which manufactures almost all the major equipment of solar power plants viz. Solar Cells, Solar Modules, PCUs, HT Panels, SCADA, Power Transformers, etc., with complete grid storage solutions
- BHEL has a dedicated industrial R&D Centre for developing high-efficiency silicon solar cells and process optimization
- BHEL has emerged as the market leader in floating solar EPC segment in India by commissioning some of the country's largest floating solar power plants viz. NTPC Ramagundam 100 MW (Telangana), NTPC Simhadri 25 MW (Andhra Pradesh), NTPC Kayamkulam 22 MW (Kerala), etc.
- BHEL has a solar portfolio of more than 1200 MW, out of which more than 1100 MW capacity comprising large scale utility Ground mounted, Floating solar, Rooftop, Canal Top solar plants have already been commissioned



Valve hall at Agra converter station, Uttar Pradesh, India for ± 800 kV, 6000 MW NE Agra HVDC Project

TRANSMISSION

BHEL is a leader in the field of power transmission in India with a wide range of transmission systems and products and having a proven track record across the globe.

- BHEL undertakes turnkey transmission projects from concept to commissioning on EPC basis which includes execution of EHV & UHV substations/ switchyards, both AIS and GIS types ranging from 33 kV to 765 kV, HVDC converter stations (up to ± 800 kV), and reactive power compensation schemes.
 - BHEL has executed a number of high voltage direct current (HVDC) projects in India, notably the world's first multi-terminal ± 800 kV, 6000 MW UHVDC Transmission link between North-Eastern part of India to Agra (Uttar Pradesh).
 - BHEL is the first transformer manufacturer in India having successfully Short Circuit tested up to 500 MVA, 400 kV Auto Transformer & 333 MVA, 765 kV Generator Transformer.
 - BHEL has indigenously developed and commissioned India's first 400 kV phase shifting transformer (PST).
- Major products manufactured and supplied by BHEL include:
- Power transformers up to 1200 kV
 - Converter transformers up to 800 kV, Thyristor valves and controls for HVDC application
 - Instrument transformers up to 1200 kV
 - Dry type transformers
 - Vacuum and Gas Insulated Switchgears
 - Control and relay panels, SCADA
 - Composite Insulators for upto 765 AC & 800 kV DC Application
 - FACTS-FSC, Phase shifting Transformer (PST), Thyristor Controlled Shunt Reactor (CSR) & Synchronous Condenser for Dynamic reactive Power Management
 - Fibre Optic Current Transformer (FOCT)
 - Bay Control Unit (BCU), Merging Unit (MU), Switchgear Control Unit (SCU) for Digital Substation Solution up to 400 kV



TRANSPORTATION

BHEL is a leading designer and manufacturer of Rail Transportation systems like semi high-speed trains, Electric Locomotives, Diesel Electric Shunting Locomotives and Electrical Multiple Units. BHEL also manufactures critical equipment like Traction Converters/ Inverters, Motors, Transformers, Bogies, Train Control Management System (TCMS).

- Supplied 800+ Locomotives for Railways and Industrial operation.
- Manufacturing capability of Electric Locomotives upto 9000 HP and Diesel Electric Shunting Locomotives upto 3250 HP
- India's first fleet of fully air-conditioned AC EMU trains for the Mumbai suburban region equipped with BHEL - Electrics and control system
- Manufacturing 3-phase underslung equipment for a wide range of rolling stock including India's flagship project - Vande Bharat (semi high-speed) & Kolkata metro
- Exported state-of-the-art Traction equipment to South Asian, South-East Asian and African nations



DEFENCE AND AEROSPACE

- BHEL is a reliable supplier of equipment and services to Indian defence forces for almost four decades with dedicated engineering and manufacturing facilities
- Major products include Super Rapid Gun Mount (Upgraded), Strategic Naval Equipment, Integrated Platform Management System (IPMS) for naval warships, Thermo-pressed Components for tanks, Electrical Machines, Turret Castings for T-72 tanks, Simulators, Castings and Forgings, etc.
- BHEL is one of the few firms worldwide with capability to design and manufacture Compact Heat Exchangers and Liquid Cooling Systems for military aircrafts viz. LCA Tejas
- BHEL is targeting new products and systems in the defence sector including Air Defence Gun System, Electrical Propulsion System, Marine Gas Turbine, Active Protection System, Armoured vehicles, etc.
- Indian Space Research Organisation (ISRO) has partnered with BHEL for manufacture of space-grade solar panels, Li-ion cells for space applications and satellite batteries. BHEL is rapidly expanding its offering in the aerospace segment

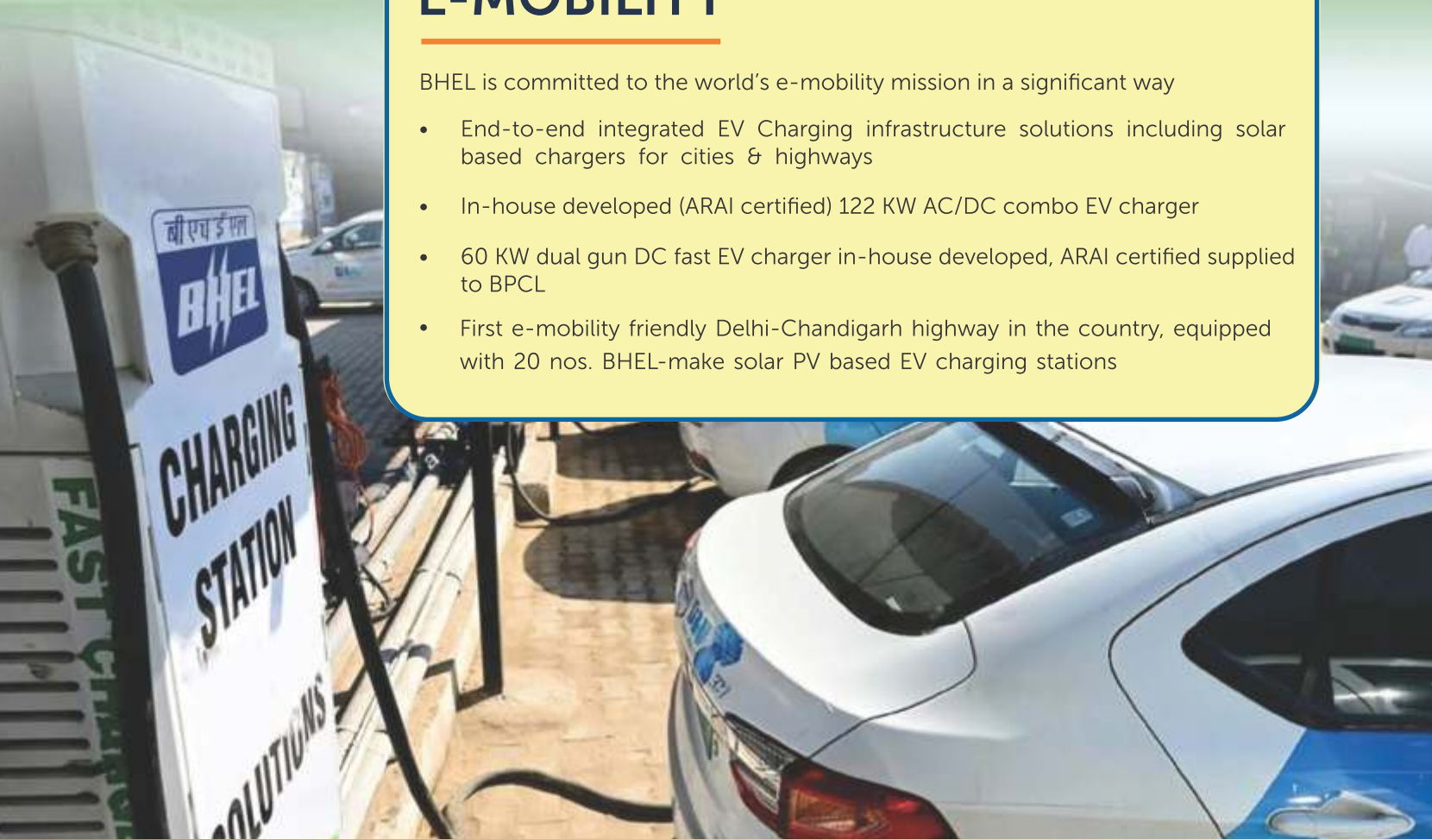


Heat Exchanger and pre-cooler for LCA Tejas - supersonic combat aircraft, indigenously designed and manufactured by BHEL in collaboration with ADA

E-MOBILITY

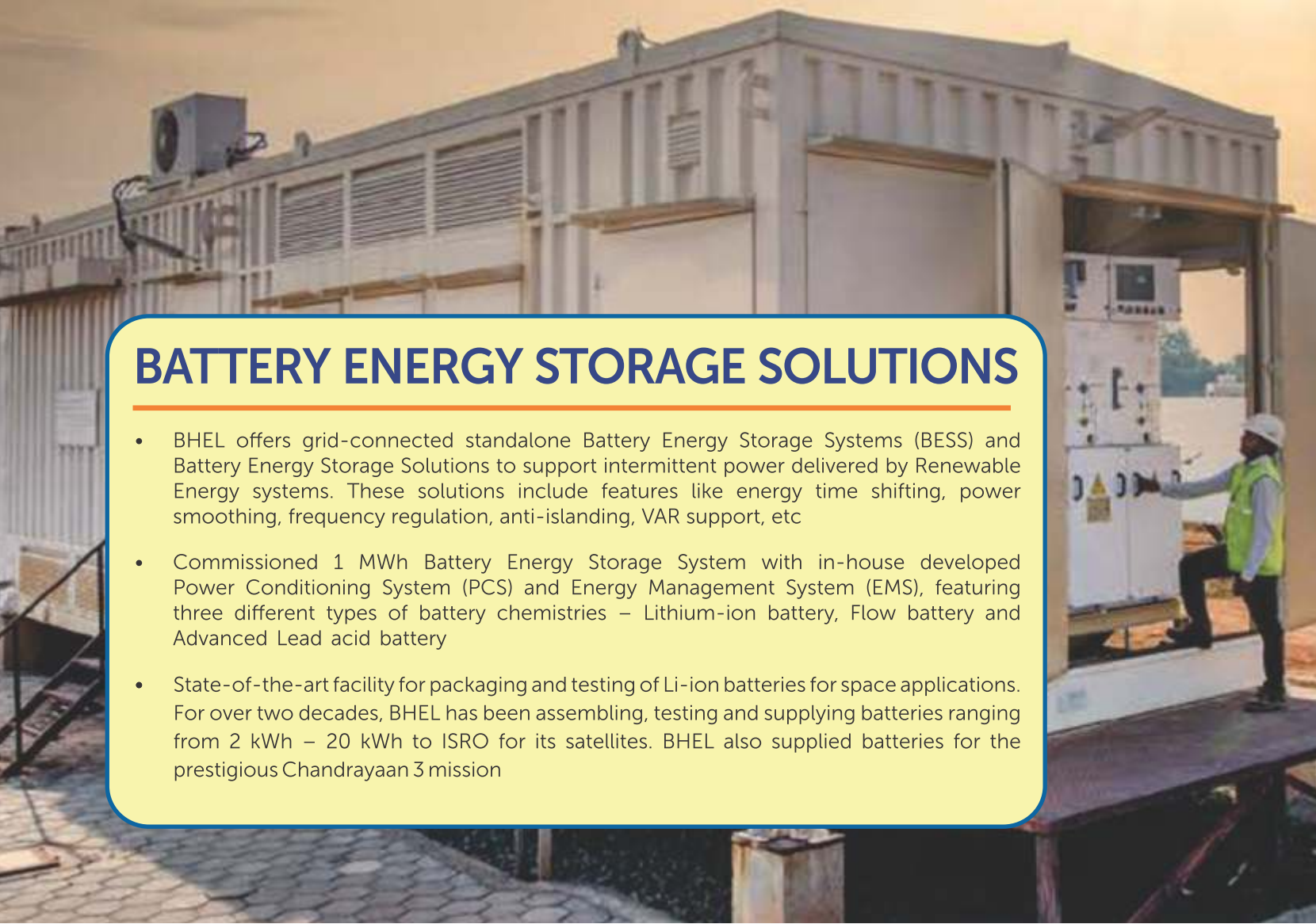
BHEL is committed to the world's e-mobility mission in a significant way

- End-to-end integrated EV Charging infrastructure solutions including solar based chargers for cities & highways
- In-house developed (ARAI certified) 122 KW AC/DC combo EV charger
- 60 KW dual gun DC fast EV charger in-house developed, ARAI certified supplied to BPCL
- First e-mobility friendly Delhi-Chandigarh highway in the country, equipped with 20 nos. BHEL-make solar PV based EV charging stations



BATTERY ENERGY STORAGE SOLUTIONS

- BHEL offers grid-connected standalone Battery Energy Storage Systems (BESS) and Battery Energy Storage Solutions to support intermittent power delivered by Renewable Energy systems. These solutions include features like energy time shifting, power smoothing, frequency regulation, anti-islanding, VAR support, etc
- Commissioned 1 MWh Battery Energy Storage System with in-house developed Power Conditioning System (PCS) and Energy Management System (EMS), featuring three different types of battery chemistries – Lithium-ion battery, Flow battery and Advanced Lead acid battery
- State-of-the-art facility for packaging and testing of Li-ion batteries for space applications. For over two decades, BHEL has been assembling, testing and supplying batteries ranging from 2 kWh – 20 kWh to ISRO for its satellites. BHEL also supplied batteries for the prestigious Chandrayaan 3 mission




INDUSTRIAL SYSTEMS & PRODUCTS

BHEL supplies major equipment for a number of industries including Oil and Gas, Metallurgy and Mining, Petrochemicals, Chemicals, Automobiles, Steel, Aluminium, Cement, Fertiliser, Sugar, Paper, Textiles, etc.

BHEL's vast range of products for industrial applications includes AC machines, alternators, centrifugal compressors, oil rigs, x-mas tree valves, transformers, substations, switchgear, heat exchangers, pressure vessels, columns, fired heaters, locomotives, downstream oil and gas packages (sulphur recovery unit), gas turbine

based co-generation and combined cycle power plants, steam turbine based captive power plants to suit the requirement of different industries, turbo-generators, complete range of steam generators (Circulating Fluidized Bed combustion, Pulverised Fuel, Utility Boiler & Heat Recovery Steam Generator) for process industries capable of burning a wide variety of fuels, electrostatic precipitators and fabric filters.




Centrifugal compressor under assembly at BHEL works in Hyderabad, Andhra Pradesh

OIL & GAS

- BHEL supplies complete onshore drilling rigs capable of drilling up to 9,000 metres, with AC-SCR system or AC drives incorporating the latest state-of-the-art technology, and also mobile rigs, work-over rigs.
- BHEL also supplies onshore drilling rig equipment like draw works, rotary-table, travelling block, swivel, mast and substructure, mud systems, artificial lift system (surface units of sucker rod pumps) and rig electrics to leading oil and natural gas exploration companies of India.
- Wellheads and X-Mas tree valves up to 15,000 Psi rating and Choke & Kill Manifold upto 10,000 Psi rating for onshore as well as offshore applications are also provided by BHEL to drilling companies.
- The company has also supplied casing support systems, mudline suspension systems and block valves for offshore application.



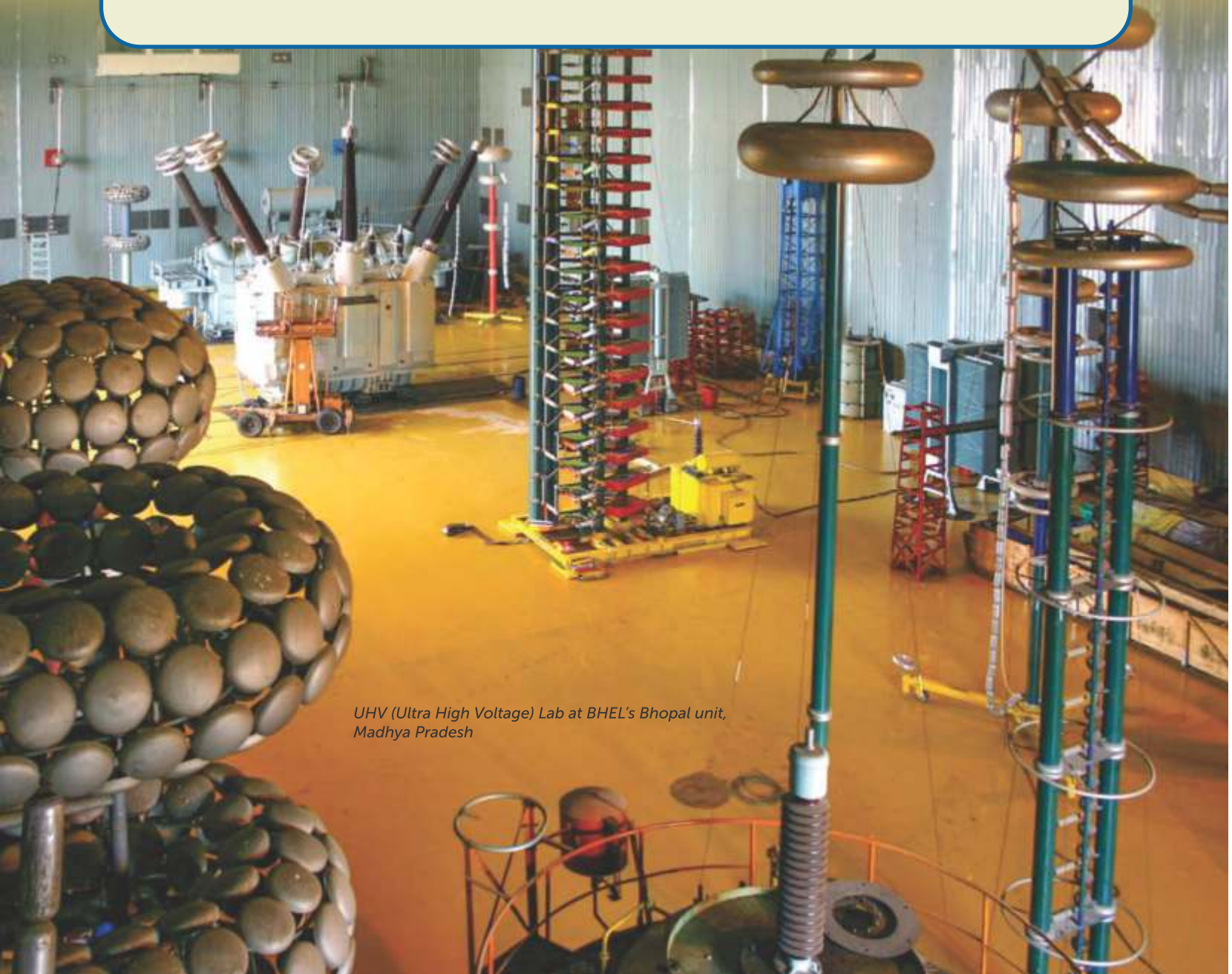
X-Mas Tree Valve manufactured at BHEL's Tiruchirapalli unit in Tamil Nadu



BHEL-make EV-2000 Land Oil Rig at ONGC Ankleshwar, Gujarat

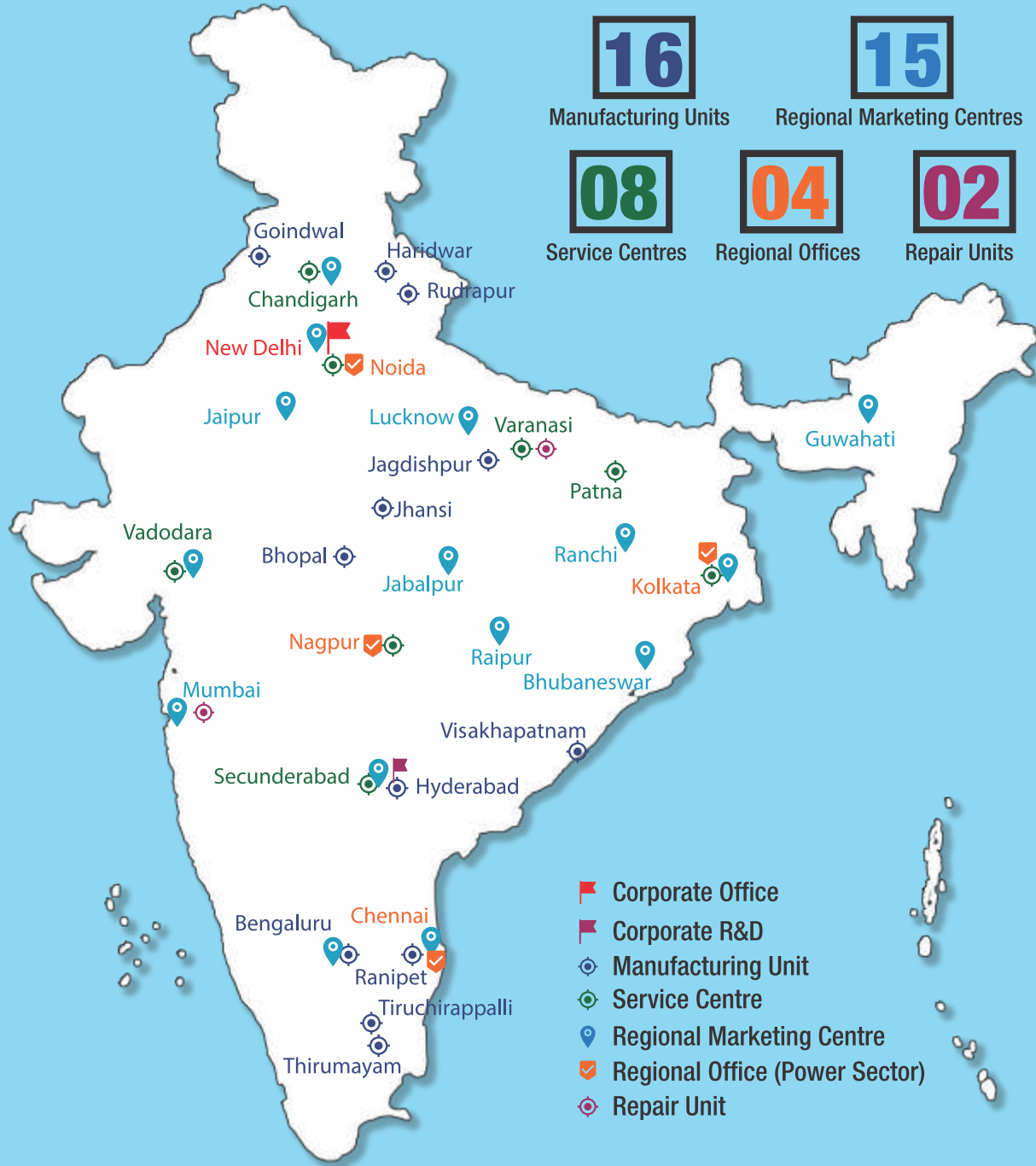
RESEARCH & DEVELOPMENT

- R&D expenditure (>2.5% of Turnover) – one of the highest in Indian engineering field
- Centres of Excellence for Intelligent Machines & Robotics, Machine Dynamics, Compressors & Pumps, Nanotechnology, UHV Engineering, Simulators, Computational Fluid Dynamics, Surface Engineering, Permanent Magnet Machines, Advanced Transmission Systems, Power Electronics and IGBT and Controller Technology, Control & Instrumentation, Coal Research Centre, Advanced Fabrication Technology, and Defence
- Five specialised institutes viz. Ceramic Technological Institute, Amorphous Silicon Solar Cell Plant, Pollution Control Research Institute, Welding Research Institute and Centre for Electric Transportation for carrying out advanced R&D in various engineering disciplines and identified technological areas
- Filing patents/copyrights applications regularly – more than 5,650 filings
- Strong engineering and R&D base for in-house development of indigenous technologies
- Technology collaboration agreements with leading global manufacturing and engineering companies
- Focus on clean thermal technologies



UHV (Ultra High Voltage) Lab at BHEL's Bhopal unit, Madhya Pradesh

PAN-INDIA PRESENCE



The graphical representation does not purport to be the political map of India

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