



Session-06 : Overcoming Challenges & Strengthening the Supply Chain for Semiconductor Devices

25th Nov 2024

Bharat Mandapam, New Delhi

Panel for Discussion

Name	Designation	Organization
Ms. Bani Varma	Director (Industrial Systems & Products)	BHEL
Sh. B Shyam Babu	Executive Director (Electronics Division)	BHEL
Sh.Kamalesh Hatua	Associate Professor	IITM
Sh. Sunny Malhotra	Chairman of IESA (NCR Chapter) & Advisor Kaynes Semicon	IESA & Kaynes Semicon
Sh. Naresh Rana	Director Sales	Analog Devices
Sh. Rahul Gupta	Vice President, Business Development	Sahasra Electronic Solutions limited

Evolution of Public Procurement Policy – Make in India

PPP-MII Order
2017

2017

Public Procurement (Preference to Make in India), Order 2017 Dtd 15.06.2017 - to promote manufacturing and production of goods & services in India

Works
included

2018

PPP-MII Order partially modified on 28.05.2018 to include works (including turnkey works)

Partial
modification

2019

PPP-MII Order partially modified on 29.05.2019 (only local suppliers eligible if sufficient local capacity is available)

Restriction
on GTE

2020

PPP-MII Order partially modified on 04.06.2020 (Class I/ Class II local suppliers, no global tender above Rs. 5 Lakh and below Rs. 200 Cr. etc., unless approved by CA)

Type	Local content	Price preference
Class I	≥ 50%	✓
Class II	More than 20% but less than 50%	X
Non Local	≤ 20%	X

Notification
on Countries
sharing land
border

2020

DoE Order dated 23.07.2020 (Bidders from countries sharing land borders to be registered with DPIIT)

Notification
on Countries
sharing land
border

2023

DoE Order dated 23.02.2023 (Includes even TOT from Bidders from countries sharing land borders to be registered with DPIIT)

PPP-MII
Order (Rev)

2024

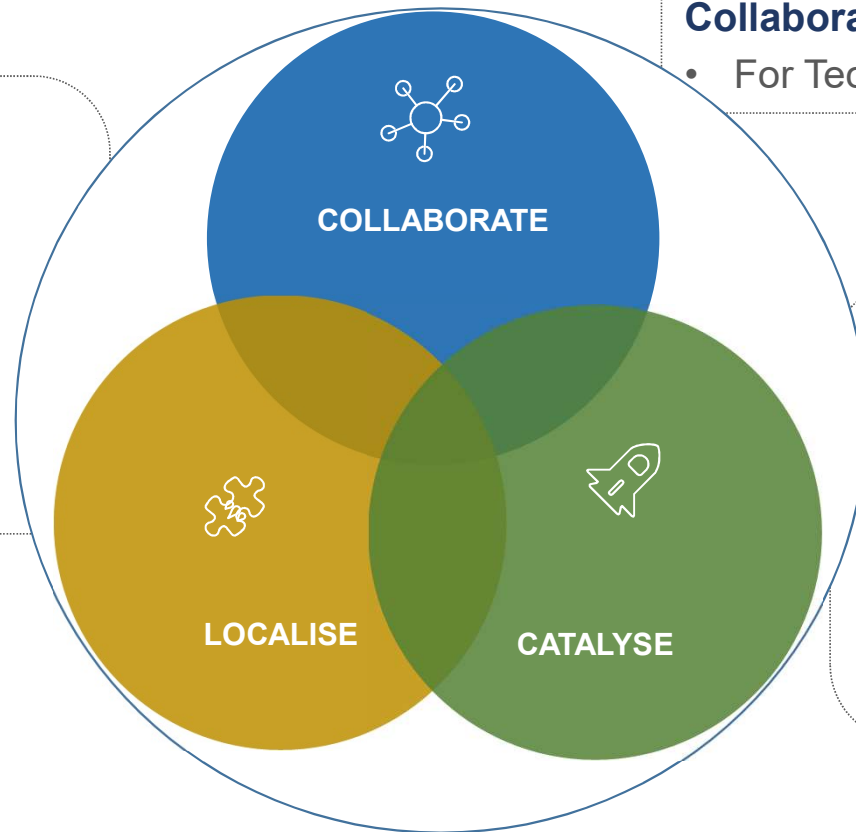
DoE Order dated 19.07.2024 (Rebranding, repackaging, refurbishing not considered as value addition ; 10% of contract value would be deducted in case false MII declaration)

BHEL's Framework for AtmaNirbhar Bharat

Localise

Import substitution through

- in house engineering or manufacturing
- supporting domestic manufacturers for indigenization



Collaborate

- For Technology and Manufacturing

Catalyse

- Enable solutions for challenges faced in engineering and manufacturing
- Support domestic ecosystem with R&D and Testing infrastructure

Indigenized offerings with Indigenized supply chain

BHEL's Outreach Initiatives

COLLABORATE

April '20

Expression of Interest (29.04.20)

Manufacturing in India with BHEL

July '20

SANYOJAN (03.07.20)

Domestic Collaborations for Manufacturing

CATALYSE

Aug '20

SANRACHNA (24.08.20)

Technology Innovation Platform

LOCALISE

Nov'20

Expression of Interest (13.11.20)

for import substitution

Interaction (18.11.20)

with IEEMA

Dec '20 – Oct'23

Interaction (03.12.20)

with Local industry (coordinated by DPIIT)

SAMVAAD 1.0 (21.12.20 – 11.02.22)

Workshops with Local industry

SAMVAAD 2.0 (28.10.22 – 29.11.22)

Workshops with Local industry

SAMVAAD 3.0 (09.11.23 – 06.08.24)

Workshops with Local industry

SAMVAAD 4.0 (25.11.24 – ..)

Workshops with Local industry

Items imported hitherto where local suppliers have been developed

Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
1	2 mm sheets & 6 mm Plates of C276 grade	BHEL-SAMVAAD	MIDHANI, Hyderabad
2	C276 Cladded Plate through Hot rolling (1250 mm width)		Jindal Stainless Limited
3	Tubes of grade: SA312TP304 H/347 H, SUP 304 SS		Tubacex Tubes & Pipes
4	Tubes of grade: SA213TP347H SS, SA213TP340H SS		Welspun Specialty Solutions Ltd
5	SA312TP304 SS Tubes		Ratnamani, Gujarat
6	SA335P22 Alloy steel Pipes (upto OD 355.6 mm and thickness upto 14.27 mm)		Maharashtra Seamless Ltd.
7	Spray pipes		Sunrise Industries, Vadodara
8	Spray nozzles		Lechler, Thane
9	Synthetic Ester Oil		Savita Oil, Silvassa
10	Hydrogenerator shaft forgings (36.3 MT)		LTSSHF, Mumbai
11	Hemispherical Dished ends SA234WP91		CHW Forge, Ghaziabad
12	RIP Bushings (245 kV)		Yash High Voltage, Vadodara Massa Izolyator Mehru, Gurugram
13	RIP Bushing (420 kV)		Siemens India Ltd. Hitachi Energy India Ltd

Items imported hitherto where local suppliers have been developed

Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
14	OIP Bushing (800 kV)	BHEL-SAMVAAD	CG Power and Industrial Solutions Ltd., Nashik
15	Insulated Rivetless Roller Bearings for Inverter side of Traction Motors		SKF India, Schaeffler India
16	Auxiliary Additive 3A 333 of VPI varnish		3A Associates, Mumbai
17	GT Blade Flats C450		Star Wire India Ltd,
18	GT Blade Flats SS403Cb		Laxcon, Ahmedabad
19	Compressor Journal/Thrust Bearings		MICHELL Bearings (INDIA) LLP
20	Maintenance Free Breather		EASUN-MR TAP Changers (P) Ltd. Precimeasure Control Pvt. Ltd.
21	Size -2 and Size-3 BUSHINGS for 36kV GIS		Radiant Enterprises
22	Absorber Re-circulation Pumps		KSB Ltd., Thane
23	Beech Wood Tangential Top Ring	Open Tender	Agya Enterprises, Bhopal Roechling Industrial India Pvt Ltd
24	Helical Wire Shock Mounting	GeM	Ridham Industries, Ahmedabad SEISMOSYS, Bangalore

Items imported hitherto where local suppliers have been developed

Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
25	Isothermal Tiles	BHEL-SAMVAAD	Thermoflyde Industries Private Limited, Gujrat Carborundum Universal LTD, Chennai Ganeshas Lime And Minerals, Ahmedabad
26	Chromite Sand		Khemka Refractories, Odisha
27	Welding Electrode (Tungsten based)		D & H Secheron Electrodes, Mumbai
28	16Mo3 Forgings & SA350LF2 Forgings		Bharat Forge, Pune
29	DIN EN 10028-7-1.4550 SS Plates		Jindal Stainless Limited, Hissar
30	FIN FLAT 89.7 x 6 - SA387GR12CL2		Evonith Value Steel Ltd, Hyderabad
31	Forged Elbow- D42.4X8.8/D38.1X7.11 F12CL2		Suhani Alloys Pvt Ltd, Faridabad
32	AS Round Bar Dia 200MM - SA213GrT91		Laxcon Steels Limited, Ahmedabad
33	CRNGO 270 Grade		JSW, Bellary
34	Field lead Core Bar	Open tender	IMA, Kolkata
35	Exciter Half ring Forging		IMA, Kolkata
36	Epoxy Glass Fabric tape used as Rotor Inter Turn Insulation		Sahney Insulation Group, Nasik
37	Nomex Interturn Tape		Sahney Insulation Group, Nasik

Items imported hitherto where local suppliers have been developed

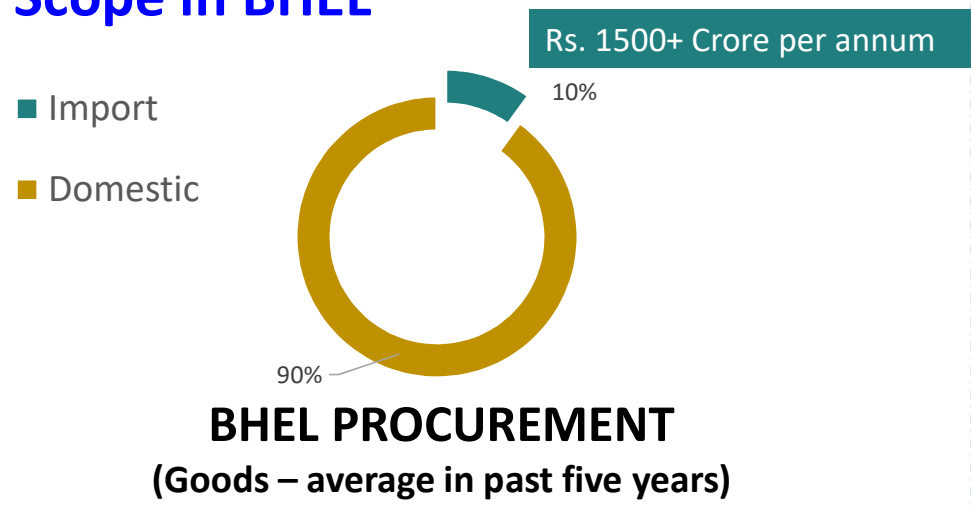
Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
38	Magnetic Shunt Paper	BHEL-SAMVAAD	Isovolta (I), Nasik Senapathy Symons, Bengaluru
39	Mica Paper Glass tape with accelerator		Isovolta (I), Nasik Lakshmanan Isola, Bengaluru
40	Angulating Spring Support with Weld on Bracket		Lisega, India
41	Electro hydraulic actuators of Turbine valves		Bosch Rexroth India
42	Oil Module		Hydac, Coimbatore
43	Oil Throttle Valve		Hawa Valves, India
44	Gun Barrel Assembly		M/s Advance Weapons Equipment India Ltd.(AWEIL), Kanpur
45	Heat Sink, Water Cooled		Thermovac Aerospace, Bengaluru Perfect Machining centre Vinayaka CNC
46	FEMALE QUICK COUPLINGS		Ritra Technologies, Bhopal
47	Wire silicone 0.5sqmm 20kV RED		Thermo Cables Ltd
48	CURRENT TRANSDUCER 1000A/250MA		Electrohms Pvt Ltd
49	CAP POLYPROP MTL 1MF 10% 1400V		Advance Components & Instruments
50	Centrifugal Fan		Superior Electric Machines Pvt. Ltd.

Items imported hitherto where local suppliers have been developed

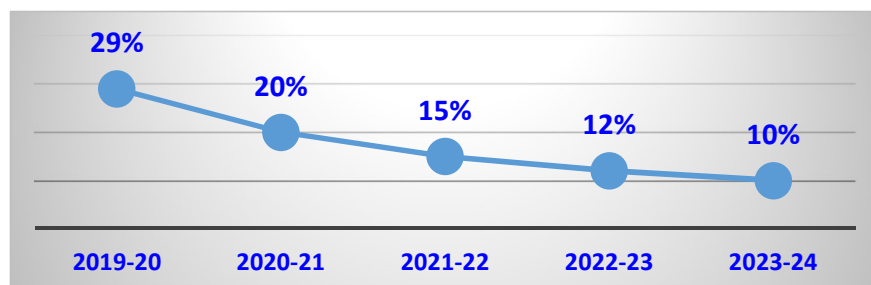
Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
51	Resistors(3T)	BHEL-SAMVAAD	Precision Electronics Ltd., Noida
52	DC Earthing switch		Patra & Chanda, Howrah
53	Silicone Oil		Elkay Chemicals, Pune
54	FG Mat		Pliogrip Resins and Chemicals, Thane Fibreglass Insulation, Bhopal
55	HPH Tube sheet Forgings		CHW Forge Pvt ltd., Ghaziabad L&T Special Steels &Engg, Hazira
56	Compressor casing Forging		L&T Special Steels &Engg, Hazira
57	Fr-5 stg#1 Bucket casting		Indo MIM, Andhra Pradesh
58	Fr-6B Turbine Casting		Vimal Alloys, Ludhiana
59	Fr-6B CDC Casting		Vimal Alloys, Ludhiana

Opportunity for Indigenization

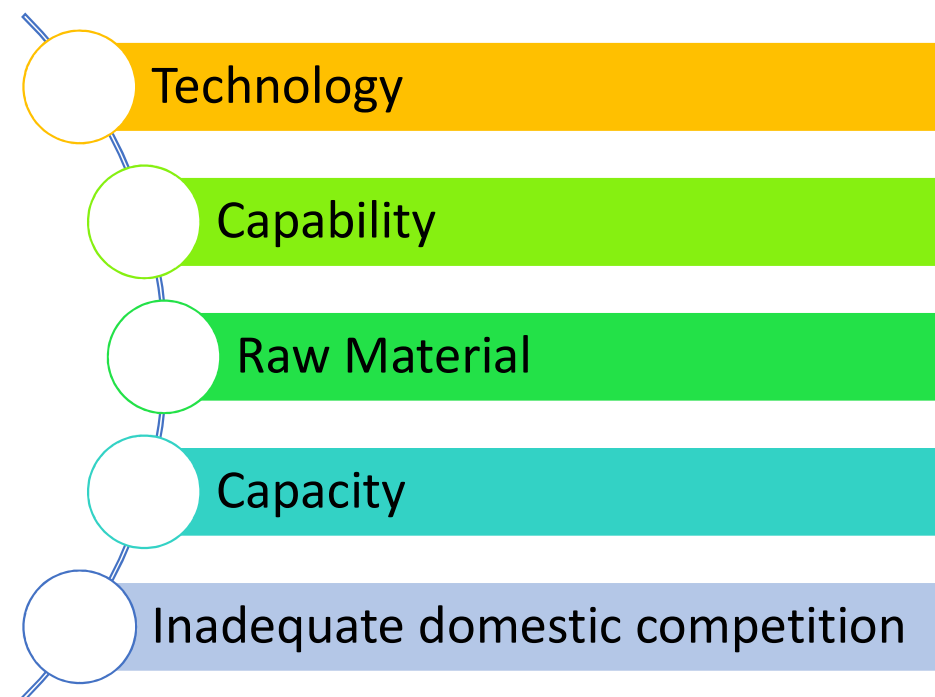
Scope in BHEL



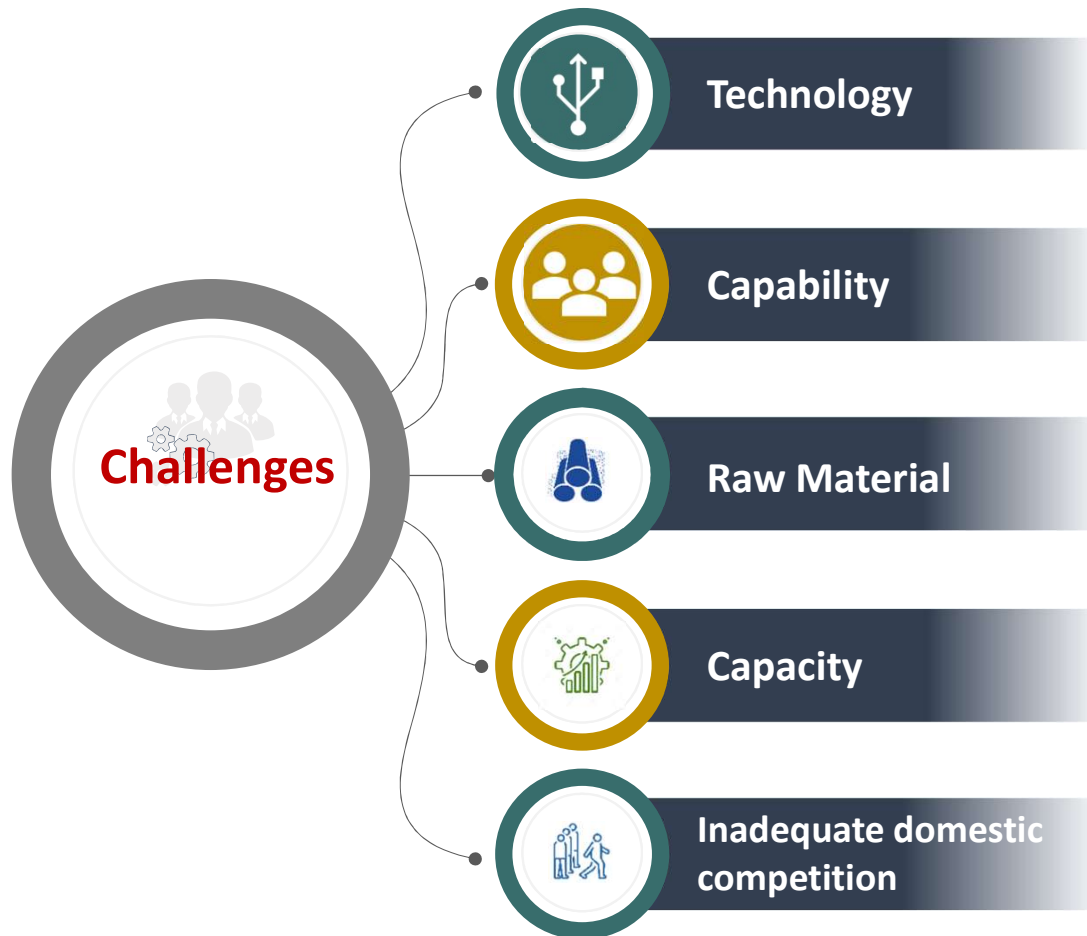
Trend of Imports in BHEL during the last few years



Overcoming the challenges...



Demand-supply gap – Few examples



Examples

Generator Circuit Breakers, Boiler Water Circulating Pumps, **Integrated Electronic devices**, Current Insulated Bearings, **Solar Ingots and Wafers**

LP & TG Forgings > 50 MT, HP & IP Forgings <50 MT, Retaining ring forgings, C276 sheets, Titanium Sheets, A516 Gr.70 Plates (T> 115 mm), A515Gr.70Plates (T>150 mm)

Nickel

Cladded sheets, Alloy Steel pipes & tubes (P91/ 92, T91/ 92)

Pressurization system for Motors, Armature Reversing Contactor, Mono PERC solar cells, Gypsum Dewatering System, Steel Plates (T> 120 mm)

BHEL SAMVAAD

An opportunity for local vendors to meet the Demand – Supply gap

8

Categories

- Special Alloy Steels, Pipes and Tubes (P91/ 92 Pipes, T91/92 Tubes, etc)
- Special / Alloy / Electrical Steel
- Items for FGD
- Castings & Forgings
- Insulated rivetless and antifriction bearings
- Electrical Insulating Materials
- Electrical , Electronic & Solar items, Advance propulsion systems
- Systems/ Packages

200+

Items

16

Manufacturing Units

2000+

Crores per annum

What's new in SAMVAAD 4.0



1.

Focus

*on the core where
gaps in technology
/ facilities are
prominent*



2.

Collaborate

*Invite ideas from the
domestic industry and
academic / research
institutions on how, as
part of a joint effort with
BHEL, one can not only
minimize the imports in
the Country but also
enhance capacities*



3.

Deliberate

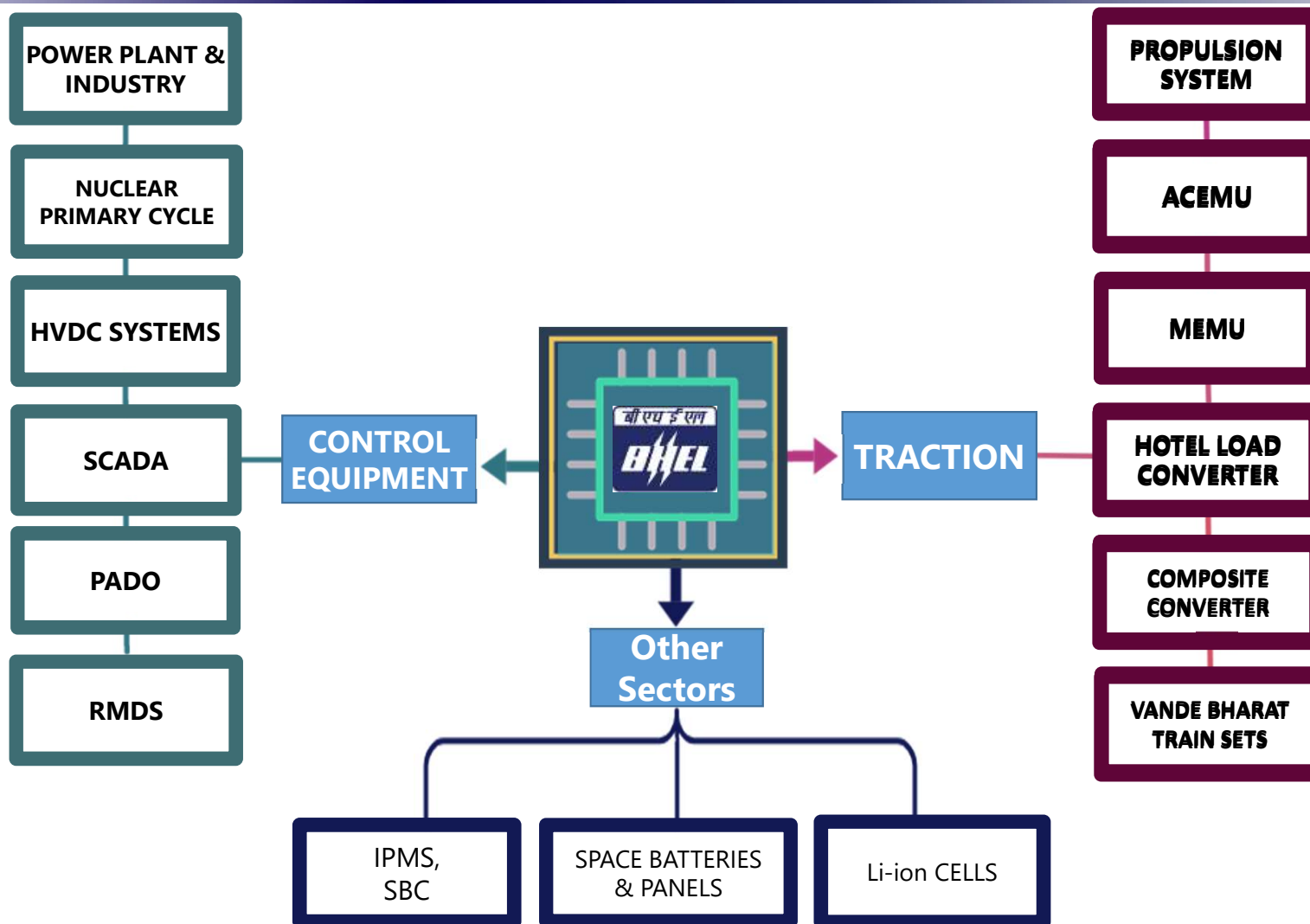
*on inputs w.r.t.
technical
alternatives*



SAMVAAD INTERACTION FOR ELECTRONIC COMPONENTS!

SAMVAAD 4.0

ELECTRONICS DIVISION : PRODUCT PROFILE





Control Systems- Thermal, Hydro, Nuclear, solar and Gas based power plants. HVDC Controls

Power

Industry

Control systems for captive power plants and Process Industries

Software System Solutions

PADO, RMDS, Simulators, Flexibilization



C & I PRODUCTS IN A GLANCE



- **Control Systems- Thermal, Hydro, Nuclear, solar and Gas based power plants. HVDC Controls**
- **Control systems for captive power plants and Process Industries**
- **PADO, RMDS, Simulators, Flexibilization**



**POWER PLANT &
INDUSTRY**

**NUCLEAR
PRIMARY CYCLE**

HVDC SYSTEMS

SCADA

PADO

RMDS

TRACTION PRODUCTS IN A GLANCE

Comprises of :

- Traction Converter (TC) & Hotel Load Converter (HLC)

New In house design of Complete Water Cooled Hotel Load Converter

Scope includes: Traction Converter, Auxiliary Converter, Train Control & Management System (TCMS) and Bought-out items

Comprises of :

- Traction Converter
- Auxiliary Converters I & II
- Vehicle Control Unit (VCU)

1490+ Locos across 42 Loco Sheds under operation

Composite & Hotel Load converter

EMU /MEMU

Vande Bharat

6000 /9000 HP Propulsion system

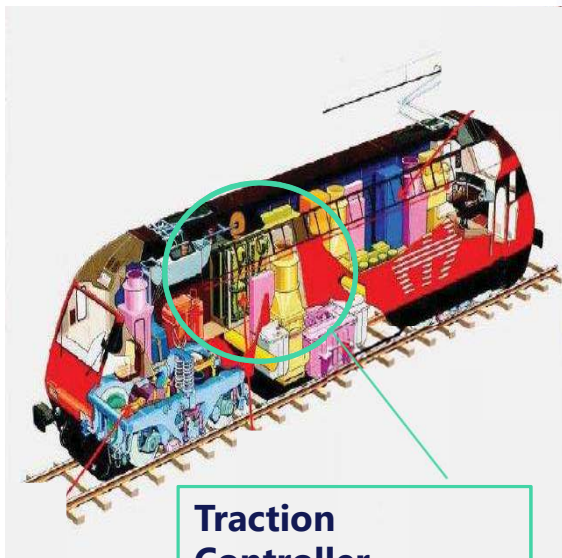
Development of Semi high speed Train sets

Order received for 80 No.s of complete train sets

completely in-house developed product, under operation

Comprises of: Traction Converter, Auxiliary Converter, Airco converter & Train Control & Management System (TCMS).

India's 1st ACEMU Loco in local train under operations at Mumbai-Made by BHEL



Traction Controller

TRACTION PRODUCTS IN A GLANCE



- Propulsion System (6000 / 9000 HP): 1490+ Locos across 42 Loco Sheds under operation
- ACEMU: India's 1st ACEMU Loco in local train under operations at Mumbai-Made by BHEL
- MEMU: Scope includes: Traction Converter, Auxiliary Converter, Train Control & Management System (TCMS) and Bought-out items
- HLC/ Composite: New In house design of Complete Water Cooled Hotel Load Converter
- Vande Bharat: Development of Semi high speed Train sets. Order received for 80 No.s of complete train sets

PROPULSION
SYSTEM

ACEMU

MEMU

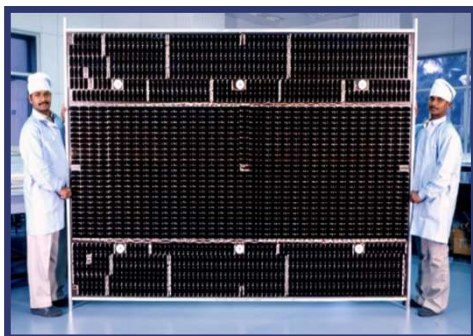
HOTEL LOAD
CONVERTER

COMPOSITE
CONVERTER

VANDE BHARAT
TRAIN SETS

OTHER SECTORS PRODUCTS IN A GLANCE

- **ESD Supplies customized Space grade solar panels and Batteries to ISRO for its satellite missions and Li-Ion Cells for Space applications**
- **More than 600 Sq Mtrs of Space grade Solar Panels supplied and more than 100 space grade batteries supplied to ISRO .**
- **Static Bi-Directional Converter (SBC)- Indigenously designed & developed by BHEL. More than 80% indigenous components.**



Material Budget for EDN

Year	2024-25	2025-26	2026-27	2027-28	2028-29
Material Budget (Rs. Cr)	1150	1500	2000	2000	2000



Electronic Components

Components for Power Devices

Advanced Propulsion Systems



Electronic Components

Electronic component requirement for Electronic Module Manufacturing

Sl No	Item description	Types	Value in Rs. Cr.
1	High power IGBTs	10+ types	80
2	Integrated circuits SMD/through hole	1400+ types	60
3	Fibre Optic components	10+ types	16
4	Passive SMD components	2600+ types	18
5	Discrete semiconductors	600+ types	17
6	Misc semiconductor components, varistors, relays, SD cards etc	1100+ types	35
Total		5700+ types	226+

Electronic Components

Approximately 18 types of Components required for Electronic Module Manufacturing have been Indigenised in the last 3 Years.

Import substitution has been done by in-house engineering and supporting domestic manufacturers for indigenization

Items imported hitherto where local suppliers have been developed

Local Supplies developed in past 2-3 Years


S1.	Item description	Supplier, M/s
1	Water Cooled Cold Plates for Traction Locomotives	M/s Thermovac , Bangalore
2	Female Quick Couplings for Traction Locomotives	M/s Ritra , Bhopal, M/s ADL Hydraulics, Chennai
3	EMI/EMC Shield	VA CORP, Bangalore
4	84 Pin connector	Protectron, Bangalore
5	CAP MATL POLY PROP 8uF, 440Vac, 4PIN PAC	Vishay India
6	CAPACITOR 1300MF 10% 2200V	Vishay India
7	CAPACITOR 1200MF 10% 800V	Vishay India
8	CAP POLYPROP MTL 0.22MF 10% 850V	Advance Capacitors, Mysore

Items imported hitherto where local suppliers have been developed

Local Supplies developed in past 2-3 Years

Sl.	Item description	Supplier, M/s
9	HEATSINK 13C/W CLIP MOUNTED SW25-2G	Perfect Machining Centre, Mysore
10	HEAT SINK M/C (Induction Heating)	Perfect machining Centre, Mysore
11	DPUMR HEAT SINK	Pooja Associates. Bangalore
12	Heat spreaders for Processors	Vinayaka CNC, Bangalore
13	Laminated Busbar	Incresol, Bangalore
14	Fiber optic cable assembly used in EMU/LOCO power modules	M/s Huber+suhner India
15	Fiber optic cable assembly used in EMU/LOCO power modules	M/s Amphenol India
16	Current transducer 1000A/250mA	Electrohms, Bangalore
17	Voltage Transducer 750V/50mA	Electrohms, Bangalore
18	Silicone wire 20AWG 20kV	M/s Thermo cables, Hyderabad

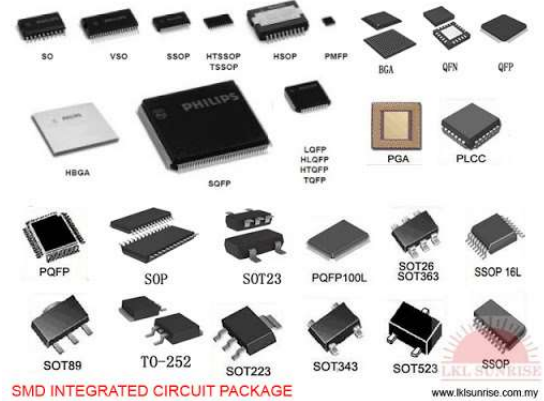
Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
IGBTs (10 + Types)	For Railways	IGBTs: Up to 1500 A and Up to 4500 V	80	EDN	8541 3010	Power electronic module manufacturers	

As on today , there are no manufacturers within the country

Major OEMs : M/s Mitsubishi, Japan ; M/s ABB, Switzerland ; M/s Hitachi, Japan ; M/s Dynex, UK ; M/s Semikron, Germany

Components - Electronic


Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
Integrated Circuits (ICs) (1400 + Types)	For Railways and C&I products	PFGA,DSP, Microcontrollers Comparators Multiplexers Timers Memory chips Regulators ADC, DAC, opto couplers PCB mountable DC DC converters	60	EDN	85235100 85437099 85415000 85044010	Electronic module manufacturers	

As on today, there are no manufacturers within the country except Semiconductor Laboratory (SCL) India, who manufacture some of the ICs.

Major OEMs:

M/s Texas Instruments, USA ; M/s Analog Devices, USA ; M/s Intel, USA:M/s Onsemi, USA ; M/s Microchip, USA ; M/s NXP, USA


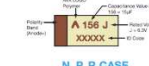

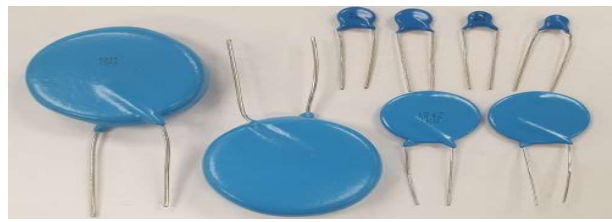
Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
Fibre optic components (10 + Types)	For Railways and C&I products	Fibre optic Transmitters and receivers	16	EDN	9001 1000	Power electronic module manufacturers	

As on today , there are no manufacturers within the country

Major OEMs : M/s Optek, USA ; M/s OMC, UK ; M/s Broadcom, USA

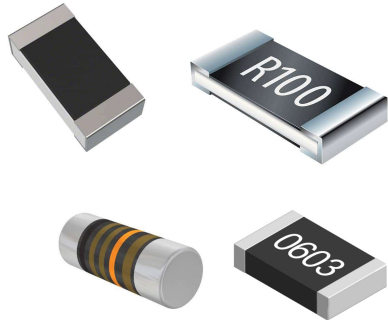
Components - Electronic

Category	Application	Description	Require ment per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph																																																																																																																																																																		
Passive components: Capacitor SMD and Through hole (800 + Types)	For Railways and C&I products	Capacitors: MLCC, Al electrolytic, ceramic, tantalum etc	12.0	EDN	8532 1000	Electronic module manufacturers	<div><div><p>MARKING A, B, C, D, E, G, H, K, S, T, V, W, X, Y CASE</p><p>N, P, R CASE</p></div><div><p>CASE DIMENSIONS: millimeters (inches)</p><table><tr><th>Code</th><th>EIA Code</th><th>EIA Metric</th><th>L±0.20 (0.008)</th><th>W±0.20 (0.008)</th><th>H±0.20 (0.008)</th><th>W±0.20 (0.008)</th><th>A±0.30 (0.012)</th><th>S Min.</th></tr><tr><td>A</td><td>1208</td><td>3216-18</td><td>3.20 (0.126)</td><td>1.60 (0.063)</td><td>1.60 (0.063)</td><td>1.20 (0.047)</td><td>0.80 (0.031)</td><td>1.10 (0.043)</td></tr><tr><td>B</td><td>1210</td><td>3628-21</td><td>3.50 (0.138)</td><td>2.80 (0.110)</td><td>1.90 (0.075)</td><td>2.20 (0.087)</td><td>0.80 (0.031)</td><td>1.40 (0.055)</td></tr><tr><td>C</td><td>2312</td><td>6032-28</td><td>6.00 (0.236)</td><td>3.20 (0.126)</td><td>2.80 (0.110)</td><td>2.20 (0.087)</td><td>1.30 (0.051)</td><td>2.90 (0.114)</td></tr><tr><td>D</td><td>2917</td><td>7343-31</td><td>7.30 (0.287)</td><td>4.30 (0.169)</td><td>2.90 (0.114)</td><td>2.40 (0.094)</td><td>1.30 (0.051)</td><td>4.40 (0.173)</td></tr><tr><td>E</td><td>2917</td><td>7343-43</td><td>7.30 (0.287)</td><td>4.30 (0.169)</td><td>4.10 (0.162)</td><td>2.40 (0.094)</td><td>1.30 (0.051)</td><td>4.40 (0.173)</td></tr><tr><td>G</td><td>1208</td><td>3216-15</td><td>3.20 (0.126)</td><td>1.60 (0.063)</td><td>1.50 (0.059) max</td><td>1.20 (0.047)</td><td>0.80 (0.031)</td><td>1.10 (0.043)</td></tr><tr><td>H</td><td>1210</td><td>3628-15</td><td>3.50 (0.138)</td><td>2.80 (0.110)</td><td>1.50 (0.059) max</td><td>2.20 (0.087)</td><td>0.80 (0.031)</td><td>1.40 (0.055)</td></tr><tr><td>K</td><td>1208</td><td>3216-10</td><td>3.20 (0.126)</td><td>1.60 (0.063)</td><td>1.00 (0.039) max</td><td>1.20 (0.047)</td><td>0.80 (0.031)</td><td>1.10 (0.043)</td></tr><tr><td>N</td><td>0805</td><td>2012-10</td><td>2.05 (0.081)</td><td>1.30 (0.051)</td><td>1.00 (0.039) max</td><td>1.00 (0.039)</td><td>0.50 (0.020)</td><td>0.85 (0.033)</td></tr><tr><td>P</td><td>0805</td><td>2012-15</td><td>2.05 (0.081)</td><td>1.30 (0.051)</td><td>1.50 (0.059) max</td><td>1.00±0.10 (0.039±0.004)</td><td>0.50 (0.020)</td><td>0.85 (0.033)</td></tr><tr><td>R</td><td>0805</td><td>2012-12</td><td>2.05 (0.081)</td><td>1.30 (0.051)</td><td>1.20 (0.047) max</td><td>1.00±0.10 (0.039±0.004)</td><td>0.50 (0.020)</td><td>0.85 (0.033)</td></tr><tr><td>S</td><td>1208</td><td>3216-12</td><td>3.20 (0.126)</td><td>1.60 (0.063)</td><td>1.20 (0.047) max</td><td>1.20 (0.047)</td><td>0.80 (0.031)</td><td>1.10 (0.043)</td></tr><tr><td>T</td><td>1210</td><td>3628-12</td><td>3.50 (0.138)</td><td>2.80 (0.110)</td><td>1.20 (0.047) max</td><td>2.20 (0.087)</td><td>0.80 (0.031)</td><td>1.40 (0.055)</td></tr><tr><td>V</td><td>2924</td><td>7361-38</td><td>7.30 (0.287)</td><td>6.10 (0.240)</td><td>3.55 (0.140)</td><td>3.10 (0.120)</td><td>1.30 (0.051)</td><td>4.40 (0.173)</td></tr><tr><td>W</td><td>2312</td><td>6032-15</td><td>6.00 (0.236)</td><td>3.20 (0.126)</td><td>1.50 (0.059) max</td><td>2.20 (0.087)</td><td>1.30 (0.051)</td><td>2.90 (0.114)</td></tr><tr><td>X</td><td>2917</td><td>7343-15</td><td>7.30 (0.287)</td><td>4.30 (0.169)</td><td>1.50 (0.059) max</td><td>2.40 (0.094)</td><td>1.30 (0.051)</td><td>4.40 (0.173)</td></tr><tr><td>Y</td><td>2917</td><td>7343-20</td><td>7.30 (0.287)</td><td>4.30 (0.169)</td><td>2.00 (0.079) max</td><td>2.40 (0.094)</td><td>1.30 (0.051)</td><td>4.40 (0.173)</td></tr></table><p>W1 dimension applies to the termination width for A dimensional area only.</p></div></div>	Code	EIA Code	EIA Metric	L±0.20 (0.008)	W±0.20 (0.008)	H±0.20 (0.008)	W±0.20 (0.008)	A±0.30 (0.012)	S Min.	A	1208	3216-18	3.20 (0.126)	1.60 (0.063)	1.60 (0.063)	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)	B	1210	3628-21	3.50 (0.138)	2.80 (0.110)	1.90 (0.075)	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)	C	2312	6032-28	6.00 (0.236)	3.20 (0.126)	2.80 (0.110)	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)	D	2917	7343-31	7.30 (0.287)	4.30 (0.169)	2.90 (0.114)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)	E	2917	7343-43	7.30 (0.287)	4.30 (0.169)	4.10 (0.162)	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)	G	1208	3216-15	3.20 (0.126)	1.60 (0.063)	1.50 (0.059) max	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)	H	1210	3628-15	3.50 (0.138)	2.80 (0.110)	1.50 (0.059) max	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)	K	1208	3216-10	3.20 (0.126)	1.60 (0.063)	1.00 (0.039) max	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)	N	0805	2012-10	2.05 (0.081)	1.30 (0.051)	1.00 (0.039) max	1.00 (0.039)	0.50 (0.020)	0.85 (0.033)	P	0805	2012-15	2.05 (0.081)	1.30 (0.051)	1.50 (0.059) max	1.00±0.10 (0.039±0.004)	0.50 (0.020)	0.85 (0.033)	R	0805	2012-12	2.05 (0.081)	1.30 (0.051)	1.20 (0.047) max	1.00±0.10 (0.039±0.004)	0.50 (0.020)	0.85 (0.033)	S	1208	3216-12	3.20 (0.126)	1.60 (0.063)	1.20 (0.047) max	1.20 (0.047)	0.80 (0.031)	1.10 (0.043)	T	1210	3628-12	3.50 (0.138)	2.80 (0.110)	1.20 (0.047) max	2.20 (0.087)	0.80 (0.031)	1.40 (0.055)	V	2924	7361-38	7.30 (0.287)	6.10 (0.240)	3.55 (0.140)	3.10 (0.120)	1.30 (0.051)	4.40 (0.173)	W	2312	6032-15	6.00 (0.236)	3.20 (0.126)	1.50 (0.059) max	2.20 (0.087)	1.30 (0.051)	2.90 (0.114)	X	2917	7343-15	7.30 (0.287)	4.30 (0.169)	1.50 (0.059) max	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)	Y	2917	7343-20	7.30 (0.287)	4.30 (0.169)	2.00 (0.079) max	2.40 (0.094)	1.30 (0.051)	4.40 (0.173)
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Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s TDK, Japan ; M/s Vishay, USA ; M/s Samsung, Korea ; M/s Murata, Japan ; M/s AVX, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
RESISTOR SMD (1600 + types)	For Railways and C&I products	SMD resistors: Metal film, wirewound, precision resistors, power resistors etc	4	EDN	8533 1000	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s Vishay, USA ; M/s Tyco, USA ; M/s Yageo ; M/s Koaspear, USA ; M/s TT Electronics, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
INDUCTIVE COMPONENTS (130 + types)	For Railways and C&I products	HF CHOKE, TRANSFORMER PCB MOUNTABLE : SMT and Through hole	3	EDN	8504 5090 8504 9010	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s TDK, Japan ; M/s Wuerth, Germany ; M/s Coilcraft, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
PCB mountable trimpots (90 + Types)	For Railways and C&I products	Trimpot, PCB mountable: SMT and through hole.	0.3	EDN	8533 4010	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s Vishay, Germany ; M/s Bourns, USA

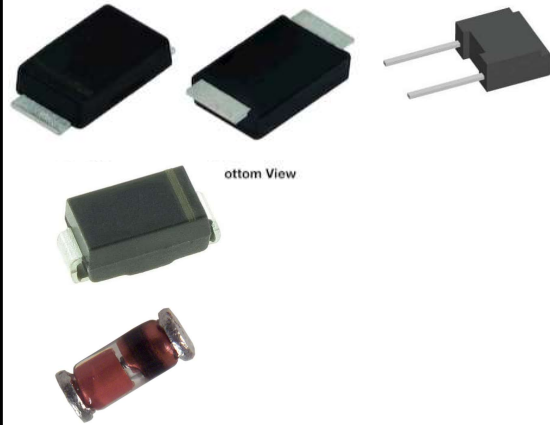
Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
TRANSISTOR (140 + Types)	For Railways and C&I products	TRANSISTOR, Mosfet, FET, FOR POWER CONTROL APPLICATIONS	2	EDN	8541 2900	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s Onsemi, USA ; M/s NXP, Netherlands ; Ms/ Vishay, USA ; M/s Infineon, Germany


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
Diode (250 + types)	For Railways and C&I products	Rectifiers : SMT and Through hole	1	EDN	8541 1000	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs ; M/s Onsemi, USA ; M/s NXP, Netherlands ; Ms/ Vishay, USA ; M/s STM, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
LED components (80 + Types)	For Railways and C&I products	LED: SMT and through hole of industrial grade Light pipes	1	EDN	8539 5000	Power electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s Broadcom, USA ; M/s Kingbright, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
OSCILLATOR (50 + Types)	For Railways and C&I products	Crystal and Oscillators	0.3	EDN	8533 3100	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s Jauch, Germany ; Abracon, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
THYRISTOR (6 Types)	For Railways and C&I products	HV thyristors and Fast recovery diodes up to 1000 A and 4500 V	0.4	EDN	8541 3010	Power electronic module manufacturers	

BHEL Edn manufactures some of these parts.

Major OEMs : M/s Infineon, Germany ; M/s Semikon, Germany ; M/s Littelfuse, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
VARISTOR (30 + Types)	For Railways and C&I products	Varistors for power application	0.4	EDN	8533 4090	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types are not manufactured within the Country.

Major OEMs : M/s Bourns, USA ; Ms/ Dean Technology, USA ; M/s Littelfuse, USA ; M/s TDK, Japan


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
Battery and accesories	For Railways and C&I products	Batteries: Lithium cells and its accessories	0.85	EDN	8507 1000	Electronic module manufacturers	

Majority of the types are not manufactured within the Country.

Major OEMs : M/s Panasonic, Japan ; M/s Maxell, Japan ; M/s Renata


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
SD Memory CARD (4 Types)	For Railways and C&I products	SD MEMORY CARD : INDUSTRIAL GRADE	0.3	EDN	8523 5220	Electronic module manufacturers	

None of these are manufactured within the Country.

Major OEMs : M/s Transcend, USA ; FMJ storage, USA ; M/s Swissbit,

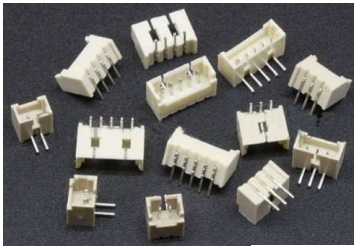
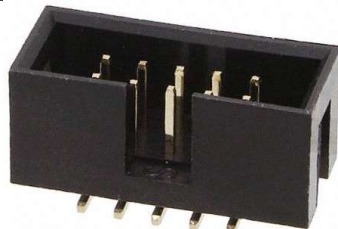
Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
SURGE SUPPRESSOR (50 + Types)	For Railways and C&I products	Surge Suppressors	0.3	EDN	8535 4030	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types are not manufactured within the Country.

Major OEMs : M/s Vishay, USA ; M/s Diode Inc, USA ; M/s PANJIT International, USA

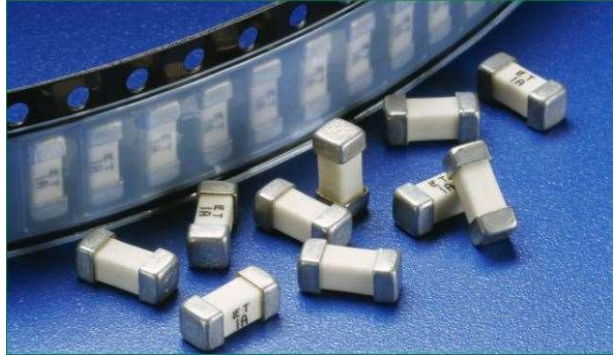
Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
Connectors (600 + types)	For Railways and C&I products	PCB mountable SMT and through hole connectors	13.0	EDN	8536 9090	Electronic module manufacturers	 

Few parts required by BHEL are offered by some Vendors. Majority of the types are not manufactured within the Country.

Major OEMs : M/s Tyco, USA ; M/s Harting, Germany ; M/s Phoenix, USA ; M/s Erni, Germany ; M/s Molex, USA

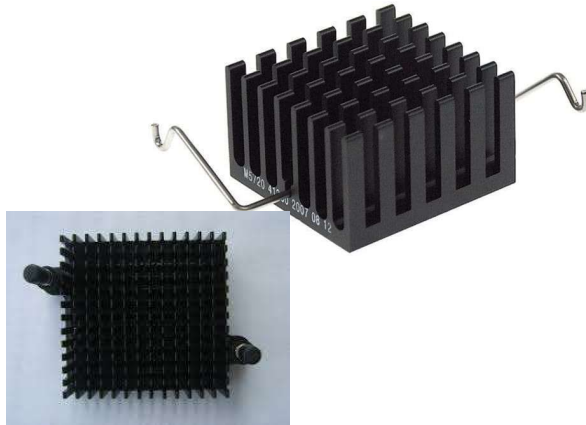
Components - Electronic

Classification	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
PCB mountable, SMD FUSE (50 + types)	For Railways and C&I products	PCB mountable SMT and through hole FUSE	0.6	EDN	8536 1030	Electronic module manufacturers	

Majority of the types, especially Surface Mount Devices are not manufactured within the Country.

Major OEMs : M/s Little fuse, USA ; M/s Mersen, France


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
HEATSINK (7 Types)	For Railways and C&I products	Heatsink for cooling electronic components such as FPGA, DSP, Microcontrollers etc Heatsink for very high power applications.	0.2	EDN	7318 2990	Electronic module manufacturers	

Majority of the types, have been indigenised. Only Processor cooling heatsinks are not manufactured within the Country.

Major OEMs : M/s Fischer, USA, M/s AAVID, USA


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
RELAY (50 + Types)	For Railways and C&I products	PHOTOMOS RELAY	3.5	EDN	8536 4900	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types which are PCB mountable are not manufactured within the Country.

Major OEMs : M/s Tyco, USA ; M/s Siemens, Germany ; M/s Panasonic, Japan


Components - Electronic

Category	Application	Description	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
SWITCH (50 + Types)	For Railways and C&I products	Switches: SMT and through hole	0.5	EDN	8536 5005	Electronic module manufacturers	

Few parts required by BHEL are offered by some Vendors. Majority of the types which are PCB mountable are not manufactured within the Country.

Major OEMs : M/s Grayhill, USA ; M/s Bourns, USA ; M/s Tyco, USA

Components - Electronic

Catyeogy	Application	Description	Require ment per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photograph
TRANSDUCER (10 + Types)	For Railways and C&I products	Voltage sensors up to 3 kV and current sensors up to 5000 A	7	EDN	8504 9090	Electronic module manufacturers	

Some of the types, have been indigenised. Others are in the process of indigenisation.

Major OEMs : M/s LEM, Switzerland ; M/s Knick , Germany

Components for Power Devices

Items/ Material with NO manufacturer/ facility available in India					HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	Requirement p.a. (Rs Cr)		
Ceramic metal brazed Housing & Cover flange	For manufacturing Diodes & Thyristors		BHEL EDN	0.50	85419000	Hind rectifier, Ruttonshaw, Vishay India
Special Features of the job		Chemical Composition (Major Elements): OFHC copper brazed with FeNi42 flange and Al ₂ O ₃ Ceramic brazed with FeNi42 flange Dimension: range OD: 57-120 mm, ID: 40-78 mm; Depth Range: 14 – 40 mm; Wt: 150 – 250 Gm				

Sl .	Requirements of the job	Facility /Technology	Whether available in India (Yes / No)
1.	Brazing of FeNi42 sheet with Cu contact disc, Brazing of Al ₂ O ₃ ceramic with FeNi42 sheet	Bimetal Cu-NiFe42 high temp reduced atmosphere leakproof brazing, 10-8 torr/cc Ceramic to Metal brazing	Indigenised through M/s. Aseem Technologies, Indore,MP Indigenised through M/s Cumi, Hosur, Tamilnadu



Items/ Material with NO manufacturer/ facility available in India					HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	Requirement p.a. (Rs Cr)		
Molybdenum Disc	For manufacturing Diodes & Thyristors	Moly disc for high temp eutectic alloying of wafer with Al: Si alloy	BHEL EDN	0.50	85419000	Hind rectifier, Ruttonshaw, Vishay India
Special Features of the job		Moly disc for high temp alloying of wafer Dimension: range : 19-78 mm;; Thickness1.5-3.5 mm; Wt: 15 – 250 Gm				

As on today , there are no manufacturers within the country.

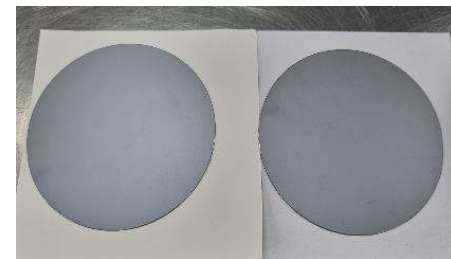
Major OEMs : Plansee, Austria ; H C Starck, UK ;



Items/ Material with NO manufacturer/ facility available in India					HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	Requirement p.a. (Rs Cr)		
Silicon Wafer	For manufacturing Diodes & Thyristors	n-type raw silicon wafer manufactured using FZ technology and NTD Doped	BHEL EDN	0.15	38180010	Hind rectifier, Ruttonshaw, Vishay India
Special Features of the job		n-type silicon wafer (FZ), manufactured using FZ technology and NTD Doped (Ph), 38 mm- 125mm dia, Thickness- 400- 980 microns, resistivity 40-280 ohm cm				

As on today, there are no manufacturers within the country.

Major OEMs : Siltronic , Germany ; Topsil Global wafer, Denmark



Items/ Material with NO manufacturer/ facility available in India					HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	Requirement p.a. (Rs Cr)		
Silicon Diffused wafer metallised	For manufacturing HVDC Thyristors	Silicon diffused wafer / chip -using float wafer technology	BHEL EDN	1.50	38180010	Hind rectifier, Ruttonshaw, Vishay India
Special Features of the job		Silicon diffused wafer / chip made using float wafer technology for HVDC application Dia- 70-86 mm, thickness 800-1000 microns				

As on today , there are no manufacturers within the country

Major OEMs : ABB, Switzerland ; Dynex, UK



Items/ Material with NO manufacturer/ facility available in India					HSN Code	Details of other clients in India who require the job
Classification	Application	Specification	Unit	Requirement p.a. (Rs Cr)		
Silicon Diffused chip	For manufacturing Diodes & Thyristors	Silicon diffused high voltage thyristor chip using alloying technology	BHEL EDN	1.5	38180010	Hind rectifier, Ruttonshaw, Vishay India
Special Features of the job		Silicon diffused high voltage thyristor chip using alloying technology for Converter/ inverter /traction application, Dia-38 -55 mm, rating-2000-5000 V/ 500-1550 A				



BHEL Edn manufactures Silicon Diffused chips for diodes. For high power thyristors, there are no manufacturers within the country

Major OEMs : Dynex, UK ; Proton, Russia ; ABB, Switzerland ; IXYS, UK

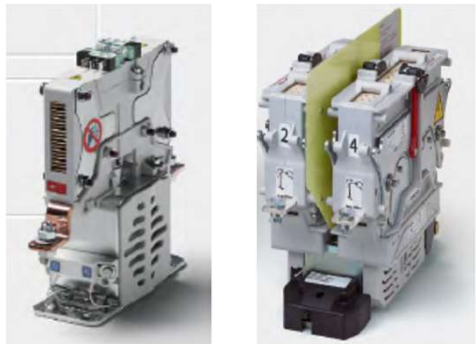



Advanced Propulsion Systems


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction grade APC Receiver for MEMU/EMU and Vande Bharat Project	Railways	1) APC Receiver as per Spec PS4452891 - part A	0.10	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction grade Event Recorder for Vande Bharat Project	Railways	1) Event Recorder as per Spec PES4452868 - part A	1.07	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	




Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Special Contactors for Vande Bharat Project	Railways	1) Single pole 1500V, 200/250A 2) Double pole 1500V, 800A 3) Single pole 1000V, 150 A 4) Single pole 1500V, 800A	0.64	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade MCB, Contactors and MPCB for Vande Bharat Project	Railways	1) 3 pole 440V, 400A Contactor 2) MPCB 3 pole 4-6.3A, 415Vac 3) 3 pole 690V, 150A 4) 3 pole 440Vac, 40A	0.64	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	

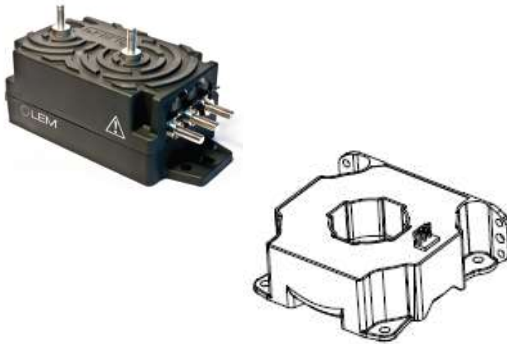
Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Power Resistors for Vande Bharat Project	Railways	1) Precharge Resistor 6.8 Ohms/300W 2) Precharge Resistor 22 Ohms/150W 3) 3.9 Ohms/ 500W 4) 3-5 Ohms/400-500W 5) Discharge Resistor 27K Ohms	0.64	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Power Capacitors for Vande Bharat Project	Railways	1) Film Capacitor 6uF, 4600Vdc 2) Film Capacitor 580uF, 1100V 3) Film Capacitor 390uF, 2kV	0.8	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Power Supplies for Vande Bharat Project	Railways	1) Power Supply 75W 110Vdc to ± 24 Vdc 2) Power Supply 300W 110Vdc to ± 24 Vdc 3) Power Supply 150W 110Vdc to ± 24 Vdc	0.08	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Power Module and Gate Driver for Vande Bharat Project	Railways	1) 3.3kV, 450A phase leg IGBT module 2) 3.3kV, 600A High Voltage Insulated Gate Bipolar Transistor 3) 1.7kV, 1000A phase leg IGBT module	2.02	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	 



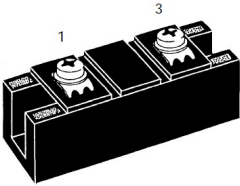
Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Voltage & Current transducer and Temperature Sensor for Vande Bharat Project	Railways	1) Voltage Transducer 1500V-2000V input, output 50mA 2) Voltage Transducer 500V input, output 50mA 3) Current Transducer 1000A:200mA & 500A:100mA 4) NTC based Temperature Sensor 10kOhm, 1800mm	0.52	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Gate Driver and Controller and battery charger unit board for Vande Bharat Project	Railways	Development of Gate Driver, Controller, Battery Charger Unit for Underslung Traction and Auxiliary Converter	1.12	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction grade Blower of various rating (Flow, Pressure)	For Railways	Centrifugal Fan Assy. for Traction/Aux Converter	0.80	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	



Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction grade Relays for Vande Bharat Project	Railways	1. 110Vdc/24Vdc Instantaneous Relays 2/3/4CO	0.09	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction grade Safety devices for Vande Bharat Project	Railways	1) High Voltage indicators upto 4kV 2) Fast Recovery diode for Battery charger module 3) Power Schottky diode for Power Supplies	0.06	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	  


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction grade connectors for Vande Bharat Project	Railways	1) 4 pole 415Vac power supply Circular Connector 2) M12 D/X coded male and female connectors 3) Heavy Duty Connectors	0.01	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	

Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction grade LVT for MEMU/EMU and Vande Bharat Project	Railways	1) Line Voltage Transformer as per Spec PS4452889 - part A 2) Line Voltage Transformer as per Spec PES/ACMEMU/02/LVT	37.7	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction grade Surge Arrestor for MEMU/EMU and Vande Bharat Project	Railways	1) As per Spec PS4452949- part A 2) Spec TBSG/ACMEMU/02/AC LIGHTNING SURGE ARRESTOR	0.69	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction grade FDS for Vande Bharat Project	Railways	1) Fire Detection System as per Spec PES4452868 – part A	13.12	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction grade Wiper Assemblies for Vande Bharat Project	Railways	As per BHEL spec PS4452874		EDN		-ABB -MEDHA -ALSTOM TRANSPORT	67



Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction grade TM air filter/ Cyclonic filters for EMU/MEMU/ Vande Bharat Project	Railways	As per BHEL spec TBSG/ICF/ACME MU/02/ TM Air Filter & TBSG/ICF/ACME MU/02/CYC FILTER		EDN		-ABB -MEDHA -ALSTOM TRANSPORT	



Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
DC Earthing Switch	Railways	As per BHEL specs PS4452947		EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Ethernet Routers and Switches	Railways	1. Viper-208-T4G-TBN 2. Viper-008-100FD 3. Viper-112A	10	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


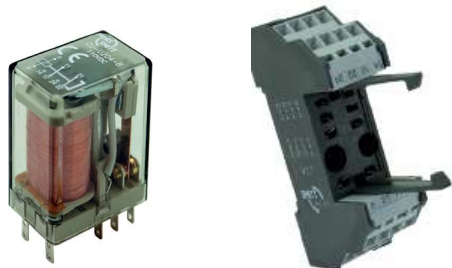
Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Special Contactors	Railways	1) Contactor double pole 120A/220Vac 2) Contactor single pole 250A/220Vac 3) Contactor single pole 40A/110Vdc	14.07	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Contactors	Railways	1) 440Vac: a. 3Pole, 16A/38A/50A/93A/150A/225A/265A, b. 4Pole, 20A	6.30	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	



Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Power Supplies	Railways	1. POWER SUPPLY 110Vdc to ± 24 Vdc, 500W 2. Power Supply 110Vdc to 24Vdc 300W	13.61 Cr	EDN	85044010	-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Compact MCBs with special tripping Characteristics	For Railways	1P and 3P MINIATURE CIRCUIT BREAKER K-Series	4.20	EDN	39219099	-ABB -MEDHA -ALSTOM TRANSPORT	



Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Temp Management System	For Railways	AXIAL FAN 1) 250M3/H 9,5W 48VDC 2) 115 VAC, Air flow: 270 m3/h, 3) 24V DC, Air Flow: 205 m3/hr	1.42	EDN	39219099	-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Compact Relays	Railways	1. 110Vdc/24Vdc Instantaneous Relays PS4452665 2. 230Vac Relays	7	EDN	76161000	-ABB -MEDHA -ALSTOM TRANSPORT	


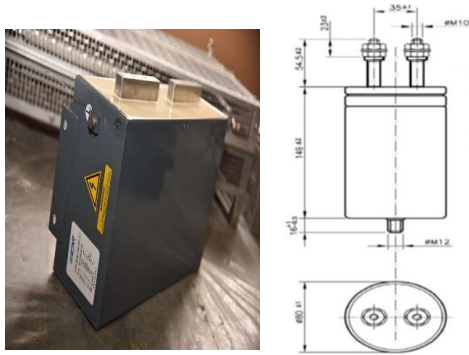
Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Compact Relays	For Railways	Timer Relays, Overcurrent Relays	1	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Compact Relays	For Railways	Differential and Non-Differential Thermal Overload Relays,	1	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	



Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Compact Relays	For Railways	Solid State Relay	0.10	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Special Contactors	Railways	Power Contactor 1) 2P 250A/1500 Vdc/ac 2) 2P NO 1700A 1800Vdc/ ac 3) 2P NO 1000A 1500Vdc/ ac	21 Cr	EDN	39219099	-ABB -MEDHA -ALSTOM TRANSPORT	

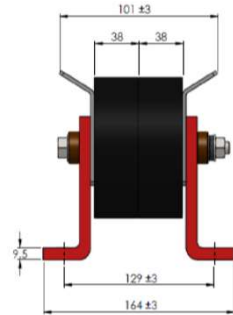

Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Capacitors for Traction application	Railways	1) 1.085mF, 2.8KV dc/300A 2) 0.1uF 1400V 3) 2.0 uF 1000V 28A 4) 2uF, 500Vac	13.19	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Power Capacitor for Traction application	Railways	1) SINE WAVE FILTER CAPACITOR Type Rating : 68UF +/-10% 440V 40A. 2) CAPACITOR 6500uF, 1800Vdc, 312A	2.78	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Special Relays	Railways	1. 110Vdc/24Vdc Instantaneous Relays PS4452665 2. 230Vac Relays	0.84	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Driver Display Unit	Railways	1. DDU as per Spec: PS4452711 2. Driver Display Unit with Ethernet Interface	24.41	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Power Resistors for Traction application	Railways	1) RESISTOR 30 Ohm 2) Precharge resistor, 38ohms	0.24	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Fast acting Semiconductor Fuse for Traction application	Railways	1) 200A, 500Vac/ 250Vdc fuse with fuse base. 2) 315A, 440Vac fuse with fuse base.	0.75	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	


Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Electrical Connectors	Railways	1) M12 D/A/X-coded crimp connector with pins 2) Molex 8/10/12/18/14/16 pole Connectors with pins 3) D-Sub 9/15 pole connector with pins and housing 4) D-sub quick lock Backshell and M3 long hood for 9 pin connector 5) Quintax M12 D coded M/F connector with casing and pins	0.65	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	

Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Magnetic Components for Traction application	Railways	1) Ringcore Ferrite 2) Ferrite Clamp filter with case 3) Snap Ferrite	0.5	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Magnetic Components for Traction application	Railways	1) 100V/5V 5VA Transformer 2) 415/140Vac Transformer as per spec PS4452499	7.77	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	

Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Special Contactors	Railways	Load Disconnect Switch 250Amps, 220Vdc	0.09	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	
Traction Grade Special Cable Ties & Cable Binders	Railways	Cable ties & Cable binders with steel barb	0.50	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	

Components - Electrical & Electronics

Classification	Application	BHEL Specification	Requirement per annum (Rs. Cr.)	BHEL Unit	HSN Code	Required by any other clients	Photographs
Traction Grade Quick Disconnect fittings /couplings	Railways	Quick Disconnect fittings for cooling circuit	2	EDN		-ABB -MEDHA -ALSTOM TRANSPORT	



Thank You

THANK YOU

Write to samvaad@bhel.in to convey your interest