



संवाद
Sanwaad

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Interaction



09th Jan'21

#VocalforLocal

Transformers

An Overview

TRANSFORMER: A JOURNEY & ITS MILESTONES

MOVING FROM

1 MVA, 33 kV (1961) : BHEL'S
FIRST TRANSFORMER



THROUGH

220 kV, 50 MVA AUTO TRANSFORMER (1967)
400 kV, 50 MVA GT (1976)
400 kV, 50 MVAR SHUNT REACTOR (1977)
500 kV, 315 MVA HVDC CONVERTOR
TRANSFORMER (1988)



TO LEADERSHIP

1200 kV, 333 MVA
AUTO TRANSFORMER (2011)

MOVING AHEAD WITH CONFIDENCE

765 kV, 500 MVA AUTO TRANSFORMER
765 kV, 80 MVAR SHUNT REACTOR
1200 kV, 333 MVA AUTO TRANSFORMER
1200 kV, 180 MVA TESTING TRANSFORMER
500 kV, 498 MVA HVDC TRANSFORMER

BHEL - A GIANT TRANSFORMER MANUFACTURER

	Bhopal	Jhansi
Installed Capacity	30000 MVA/ANNUM	15000 MVA/ANNUM
Turnover Per Year	1000 Crores	650 Crores

Product Profile

- **Power Transformer**
- **Shunt Reactor & associated NGRs**
- **Controlled Shunt Reactor**
- **HVDC Transformer & Smoothing Reactor**
- **Instrument Transformers: CT, CVT, CVD**
- **Transformer Bushings**
- **Capacitors**

Product Profile (Jhansi)

- **Power Transformer**
 - up to 220 kV, 315 MVA
 - up to 400 kV, 135 MVA
- **Rectifier Transformer (up to 132 kV, 120 kA)**
- **Furnace Transformer (up to 33 kV, 60 MVA)**
- **Electrostatic Precipitator Transformer (up to 95 kVp / 1400mA)**

Product Profile (Jhansi)

- **Traction Transformer**
 - **Locomotive Transformer up to 7775 KVA**
 - **EMU Transformer up to 1578 KVA**
- **Cast Resin Dry type Transformer (up to 36kV, 15 MVA)**
- **Instrument Transformer**
 - **(Current Transformer up to 220 kV class)**
 - **(Voltage transformer (EMVT) up to 220 kV class)**

BHEL Product Capabilities - Power Transformers

- **420KV Class, 50/60 Hz**
 - 1000 MVA, 3-phase
 - 600 MVA, 1-phase
- **765KV Class, 50/60 Hz**
 - 1000 MVA, 1-phase
- **1200KV Class, 50/60 Hz**
 - 1000 MVA, 1-phase



BHEL Product Capabilities - Gapped Core Reactor

with associated neutral grounding reactor

- 420KV Class, 150 MVAR, 3-phase
- 765KV Class, 110 MVAR, 1-phase



BHEL Product Capabilities - Controlled Shunt Reactors

- **420 KV CLASS, 50/60 Hz**
 - 200 MVA, 3-phase
 - 150 MVA, 1-phase
- **765 KV CLASS, 50/60 Hz**
 - 110 MVA ,1-phase



BHEL Product Capabilities - HVDC Transformers And Reactors

- $\pm 500\text{kV}$ / $\pm 800\text{kV}$
HVDC CONVERTER
TRANSFORMERS 600 MVA,
3 WINDING, 1 PHASE
- $\pm 500\text{kV}$ HVDC
SMOOTHING REACTORS
(OIL FILLED) 254 MVA_r,
360 mH, 1568 Amp



BHEL Product Capabilities (Jhansi) - Power Transformers

- **Power Transformer**
 - (Upto 400 kV, 135 MVA)
 - (Upto 220 kV, 315 MVA)
- **Rectifier Transformer**
 - (Upto 132 kV, 120 kA)
- **Furnace Transformer**
 - (Upto 33 kV, 60 MVA)



BHEL Product Capabilities (Jhansi) - ESP Transformers

- **Electrostatic Precipitator (ESP) Transformer**
- **Rating: Upto 95 kVp 1400 mA**
- ***Used in Electro Static Precipitator to separate & collect fly ash***



BHEL Product Capabilities (Jhansi) - Instrument Transformers

- **Current Transformer**
 - (Up to 220 kV Class)
- **Voltage Transformer**
 - (Up to 220 kV Class)
- *Used in measurement of power in high voltage systems & protection of power systems*



BHEL Product Capabilities (Jhansi) - Traction Transformers

- **Freight Loco Trfr (1 Ph & 3 Ph Loco)**
 - (25KV up to 7775 kVA)
- **ACEMU Trfr. (1 Ph & 3 Ph EMU)**
 - (25kV up to 1578 kVA)



BHEL Product Capabilities (Jhansi)

Cast Resin Dry type Transformers

- (Up to 33 kV 15 MVA)
- *Used in*
 - *Fire sensitive areas*
 - *Limited space areas*
 - *Multi-story buildings*



Product Range – Bushing, Capacitor & Instrument Transformer

Product	Rating
H.T. Capacitors for Power Factor Correction (Motor Capacitors)	3.3 kV to 11 kV, delta connected capacitor banks.
H.T. Capacitors for Shunt, Series & SVC (Static Var compensation), Harmonic filter and HVDC Application.	3.3 kV to 500 kV, Single phase / three phase Capacitor Banks of Rating 0.5 to 330 MVAR. (Unit rating : Max. 550 kVAR, 12 kV).
CVT for metering, protection and Power Line Carrier communication (PLCC).	33 kV to 1200 kV, 4400 pF to 13200 pF.
Surge Capacitor for protection of Generator and Transformers	11 kV to 40 kV 0.125 to 0.25 μ F
Coupling Capacitor for Power Line Carrier Communication (PLCC)	33 kV to 400 kV 4400 pF to 13200 pF
Current Transformer (Dead Tank & Live Tank)	Up to 400 kV & 3600Amp
OIP Condenser Bushing	52 kV to 400 kV

400 kV Fixed Series Capacitor



500 kV AC Filter Capacitors for HVDC



1200kV, 2000 pF Capacitor Voltage Transformer (Commissioned at NHPTL BINA in 2011-12)



Major Materials

- Cold Rolled Grain Oriented Silicon Steel
- Electrolytic Grade Copper Conductor
- Insulation
- Oil
- Tap changer
- Bushings
- Coolers / Radiators
- Various Other Fittings

Agenda for Discussion

- **ITEMS FOR IMPORT SUBSTITUTION**
- **ITEMS WITH LIMITED VENDOR BASE**

Items for Import Substitution

Insulation Items

Description (Annual Procurement value)	Indian Vendors	Foreign Vendors	Remarks
Crepe Paper (Rs. 40 Lakhs)		ABB AB Cartiera Di Nebbiuno SRL Munksjo Paper AB Weidmann Elec. Technoogy	No manufacturer in India for this electrical grade special paper.
Semi-Conducting Tape	Three A Associates Incorporated	Krempel GMBH	No manufacturer in India for this special tape.
Cellulosic Paper for Electricals purpose (Kraft Paper) (Rs. 83 lakhs)	ABB Power Products & Systems India Ltd	Tervakoski OY Munksjo Paper AB Weidmann Elec. Technoogy	Sufficient manufacturers are not available in India.
Special Paper (Rs. 15 lakhs)	Agya Enterprises	ABB AB Cartiera Di Nebbiuno SRL Munksjo Paper AB Weidmann Elect. Technology	No manufacturer in India for this special paper. M/s Agya Enterprises is also a trader
Mastic Compound Epoxy M Putty (2 Lakhs)		ABB AB Von Roll Switzerland	No manufacturer in India

Insulation Items

Description	Indian Vendors	Foreign Vendors	Remarks
Press Board Sheet (Rs. 13 Crores indigenous, Rs. 13 Crores Imported)	Senapathy ABB India	ABB AB Enpay Endustriyel Pazarlama Kokusai Pulp & Paper Krempel GMBH OJI F-Tex Co Ltd Weidmann Elec Technology	Specially required for 765 kV HVDC and other higher rating jobs requiring superior properties. For 400 kV and above jobs, customer has identified only foreign suppliers.
Press Board Ring	ABB India Ltd Enpay Transformer Components (I) Pvt Ltd	Weidmann Elec. Technology	Indian vendors are also importing from abroad. Imported material required for 765 kV transformers, HVDC convertors and reactors
Beechwood Top Ring (Rs. 3.5 Cr)	-	Deutsche Holzveredelung Schmeing GMBH KG Roechling Engineering	No manufacturer in India.

Bushings

Description	Indian Vendors	Foreign Vendors	Remarks
Condensor Type RIP Bushing (Rs. 15 Cr)	Yash High voltage	ABB Switzerland ABB AB HSP MASSA LLC Shenyang Hexin Bushing Trench High Voltage Xian XD High Voltage	No manufacturer in India for RIP Bushings in higher KV class.
Bushings (Oil to SF6, 800 KV, 1200 KV, HVDC)	-	Grid Solutions ABB Switzerland ABB AB Trench High Voltage Shenyang Hexin	No manufacturer in India

Capacitor items

Description	Indian Vendors	Foreign Vendors	Remarks
Description	Indian Vendors	Foreign Vendors	Remarks
Aluminium Foil (Rs. 4.5 Cr)	Ess-Dee Aluminium	Alcan Packaging Kreuzlingen AG Daihan-Eunpakgy Ind. Co. Ltd Sam-A-Aluminium Danyang Jingyi Aluminium Industry	Sufficient manufacturers not available in India.
Cellulosic Paper for capacitor (Tissue Paper) (Rs. 50 lakhs in 4 years)	-	Inner Mangolia Chen Fir Glatfelter Ober-Schmitt	No manufacturer in India
BOPP Film (Rs 9 lakhs)	-	Anhui Tongfeng Bollere Shin-Etsu Film Sichun Dongfang Insulating Tervakoski Dielectrics	No manufacturer in India
Capacitor Oil (Rs. 4.5 Cr)	-	Changzhou Winschem JX Nippon Mitsubhishi Xiamen Sanchao	No manufacturer in India
Tinned Copper Foil	KMG Wires	Manfred JC Neimann	Sufficient manufacturers not available in India.

Test and measurement items

Description	Indian Vendors	Foreign Vendors	Remarks
Online DGA (Rs. 15 Cr)	Chromatography & Instruments Inch Automation Pvt Ltd MTE India Pvt Ltd Om Technical Solutions	A Eberle GMBH Qualitrol LLC MTE Meter Test Equipment Doble Engineering	All Indian vendors are also importing from abroad. Customer approved vendors are all foreign suppliers
Capacitance & Tan Delta Measurement Kit (Rs. 50 lakhs)	Sivananda Electronics Om Technical Solutions	Haefely Test AG Megger Ltd Doble Engineering	Om Technical is importing from abroad. So only one Indian vendor available.
Oil BDV Test Kit (Rs. 20 lakhs)	Sivananda Electronics	Megger Ltd	Sufficient Indian manufacturer not available

Test and measurement items

Description	Indian Vendors	Foreign Vendors	Remarks
Turns Ratio Measurement Kit (Rs. 30 lakhs)	Sivananda Electronics	Megger Ltd Haefely Test AG H Tinsley & Co	Sufficient Indian manufacturer not available
FRA Kit (Rs. 50 lakhs)	-	Haefely Test AG Megger Ltd Omicron Electronics Asia Doble Engineering	No Indian manufacturer available. Doble Engineering also imports from abroad.

Test and measurement items

Description	Indian Vendors	Foreign Vendors	Remarks
Fibre Optic Temperature Monitoring system (Rs. 3 Cr)	Machtech Engineering Precimeasure Controls	Luxtron Corporation Qualitrol LLC Rugged Monitoring Quebec	No Indian manufacturer available. Indian vendors are also importing.
Automatic Moisture content Fischer Test set (Rs. 30 Lakhs)	-	Megger Ltd SI Analytics GMBH	No manufacturer in India.
Portable DGA	Chromatography Instruments Co &	Morgan Schaffer Inc	Sufficient manufacturers not available in India. CIC is also importing from abroad

**Materials / Fittings with
Limited Vendor Base**

Major Items/ Raw Materials

ITEM DESCRIPTION	ANNUAL REQUIREMENT
TRANSFORMER OIL	Rs. 5000 lakhs
MOULDED COMPONENT (IMPORTED MATERIAL)	Rs. 200 lakhs
UDEL WOOD BOARD & UDEL WOOD TOP RING WITH JOINT	Rs. 150 Lakhs
WELDABLE BUSHING (12/15/17.5/36 KV)	Rs. 50 lakhs
CETRAL STUD BOLT ASSEMBLY	Rs. 35 lakhs
EPOXY PACKING AS PER BHEL SPECIFICATIONS	Rs. 30 lakhs
INSULATION ADHESIVE FOR TRANSFORMER	Rs. 10 lakhs
VITON RUBBER	Rs. 10 lakhs
ALUMINIUM TAPE ROLL	Rs. 11 lakhs
DISCHARGE RESISTORS	Rs. 7 lakhs
UN-VARNISHED FIBRE GLASS MAT	Rs. 5 lakhs
FLEXIBLE TREATED GLASS SLEEVE	Rs. 1 lakhs
CERAMIC SPACERS	Rs. 5 lakhs
ALUMINIUM CASTINGS	Rs. 5 lakhs
EPOXY BUSHING 1.1 KV	Rs. 1.5 lakhs

Major Items/ Fittings

ITEM DESCRIPTION		ANNUAL REQUIREMENT
DRY TYPE NEUTRAL GROUNDING REACTOR	Rs. 75 lakhs	
OIL STORAGE TANK	Rs. 50 lakhs	
FAN	Rs. 30 lakhs	
R.T.D/WTI/OTI (IND)	Rs. 18 lakhs	
NON RETURN VALVE FOR CONSERVATOR	Rs. 15 lakhs	
TEST TAP ASSEMBLY	Rs. 14 lakhs	
INSULATORS 33 KV AND ABOVE	Rs. 5 lakhs	

Major Items/ Fittings

ITEM DESCRIPTION		ANNUAL REQUIREMENT
WATER FLOW INDICATOR/OIL FLOW INDICATOR	Rs. 25 lakhs	
OIL BDV TEST KIT	Rs. 20 lakhs	
BREATHER	Rs. 16 lakhs	
SHOCK RECORDER	Rs. 10 lakhs	
GAS COLLECTING DEVICE	Rs. 8 lakhs	
LIGHTNING ARRESTOR/SURGE ARRESTOR/SURGE MONITOR	Rs. 5 lakhs	

Jhansi List

MATERIAL CATEGORY	ITEM DESCRIPTION	ANNUAL REQUIREMENT (Rs. Lakhs)
131012	RESIN IMPREGNATED GLASS TAPE	13.18
131021	NON WOVEN F.G. COPPED STRAND MAT	10.23
091006	PTEE WIRE	5.61
131005	ALUMINISED KRAFT PAPER	5.59
081004	PHOSPHOR BRONZE SCREEN	3.50
131020	PIGMENT FOR EPOXY RESIN	2.20
121001	CALENDARED PRESS BOARD	1.83
131008	TERELENE TAPE	1.26
131004	TERELENE SLEEVE & VARNISHED GLASS BRAIDED SLEEVE	1.17
131017	SEMI CONDUTIVITY TAPE	0.31
131006	DOUBLE ADHESIVE TAPE	0.29
131026	DISCONNECTING FILM	0.26

Jhansi List

MATERIAL CATEGORY	ITEM DESCRIPTION	ANNUAL REQUIREMENT (Rs. Lakhs)
241004	FAN (AXIAL) TRANSFORMER	14.65
191025	RIDL WOOD RODS & NUTS	5.84
241008	CENTRIFUGAL FAN FOR DTT	2.91
171005	CERAMIC SPACERS	2.29
251010	EPDM MODULE FOR CABLE	1.84
191034	MILLED STRIPS, MILLED BLOCKS & T-STRIPS	1.61
261004	AL.CLAMP PLATE	1.11
231007	SPEICAL VALVE 80 NB (AL) FOR 3 PHASE LOCO TRFR	0.77
231006	SCHRADER VALVE	0.30
261012	MONO GRAM / NAME PLATE (ALUMINIUM CASTING)	0.30
191022	PBD/UDEL/ SRBP/NBC/FG MIXED COMPONENTS AS PER DRG.	0.23
231015	65 NB BUTTERFLY VALVE FOR IGBT EMU TRFR	0.09
191016	SRBP/PERMA GLASS POWDER	0.09

Jhansi List

MATERIAL CATEGORY	ITEM DESCRIPTION	ANNUAL REQUIREMENT (Rs. Lakhs)
261015	ALUMINIUM SHIELD/STRESS RING	0.02
261019	OIL GAUGE/TOUGHNED GLASS	1.08
261020	THERMOSTAT	0.15
261023	U LINK RING	0.11
261025	ACRYLIC/PERSPEX SHEETCOMPONENT	0.14
261029	HANDLE FOR B/F VALVE	0.19
270005	N-2 GAS REGULATOR	4.25
270008	INTERLOCK	7.99
321005	WINDING OF ESP-HV COILS	1.83
351016	ESP TRANSFORMER TANK ASSY. (NTPC)	4.32
371010	MACHINING (TURNING, MILLING, GRINDING ETC) OF JOBS ON LABOUR BASIS	0.23
421001	NICKLE IRON RING CORE	0.77
421018	FABRICATED SHUNT ASSLY ON FINISHED BASIS	1.05

Jhansi List

MATERIAL CATEGORY	ITEM DESCRIPTION	ANNUAL REQUIREMENT (Rs. Lakhs)
441002	OFI/WFI	0.29
441004	OTI/ WTI/RTD (INDIGENOUS)	19.77
441007	BUCHHOLZ RELAY (INDG.)	0.06
441009	ALCOHOL THERMOMETER	4.85
461005	THERMISTORS	0.31
461010	SINGLE PAIR PROTECTOR	2.97
461012	WIRE WOUND RESISTANCE	0.41
461014	TAP SWITCH	1.09
461016	TEMPERATURE SCANNER	3.65
461025	RESISTANCE THERMOMOTER	0.08
461047	DIRECT HOT SPOT TEMPERATURE MONITORING SYSTEM	0.24
461050	OIL SURGE RELAY	7.87

Expectations

- All vendors/suppliers to get themselves registered in GeM portal.
- Vendors currently not in business with BHEL are requested to come forward for registration and assessment of their products.
- Suppliers are requested to get themselves approved from major Indian Utilities like PGCIL, NTPC, NHPC, NPCIL, SEBs, etc.
- Vendors to ensure that their value addition to material being supplied complies with Public Procurement Order - Make In India, Govt. of India 2020 circular
- IEEMA to persuade manufacturers of various fittings and instruments to standardise their products for interchangeability.

Contact Us for any queries or details

- Sh. Arun Khare, SDGM (Transformer Engineering), Bhopal ; a_khare@bhel.in
- Sh. M Kurre, AGM (Bushing, Capacitor & Instrument Transformer Engineering), Bhopal ; mkurre@bhel.in
- Sh. Tushar Dave, AGM (Material Management – Transformers), Bhopal ; tdave@bhel.in

BHEL support for Development of Suppliers



24x7 Online portal for registration

- Simple registration form
- Timebound evaluation



Product development support

- Drawings, specifications
- Tooling



Hand holding with R&D and type testing



No LD/ penalty for developmental orders

BHEL support for MSMEs

MSMEs

PURCHASE PREFERENCE

As per Public Procurement Policy and MSMED ACT

ITEM PREFERENCE

358 items currently reserved for MSEs. When developed, items being imported can also be added to this list.

BILL DISCOUNTING

Payments through **TReDS** platform extended to all MSMEs

- RXIL Limited
- Invoice Mart
- M1Xchange

INTERACTIONS

Regular supplier meets.

BENEFITS

- EMD waived
- No elimination in RA
- Relaxation in prior experience and prior turnover to MSEs
- Time bound payments

BHEL support for Start-ups



BENEFITS

**Relaxation in prior
experience and turnover**



STARTUP RUNWAY

**BHEL is tendering its
requirements on GeM
wherein Startups can
supply goods as per the
Startup Runway on GeM**

Calendar for BHEL SAMVAAD

[Detailed list](#)

SNO	Category of Material	Date	Day	TIME
1	Raw Materials-Special/ Alloy/ Electrical Steel	29.12.2020	Tuesday	10:00 AM - 12:00 PM
2	Consumables for Foundry Applications	01.01.2021	Friday	10:00 AM - 12:00 PM
3	Welding Consumables of Special Grade	05.01.2021	Tuesday	10:00 AM - 12:00 PM
4	Castings & Forgings	08.01.2021	Friday	10:00 AM - 12:00 PM
5	Components-Mechanical	12.01.2021	Tuesday	10:00 AM - 12:00 PM
6	Insulating Materials	15.01.2021	Friday	10:00 AM - 12:00 PM
7	Components - Electrical & Electronics	19.01.2021	Tuesday	10:00 AM - 12:00 PM
8	Components – Solar	22.01.2021	Friday	10:00 AM - 12:00 PM
9	Systems & Packages	27.01.2021	Wednesday	10:00 AM - 12:00 PM

[Click here for filling up your details regarding your participation](#)

For any queries, please contact us on samvaad@bhel.in

Enrollment for BHEL SAMVAAD – Online Form submission

BHEL SAMVAAD

"An Interaction forum with local industry for strengthening the cause of Aatma Nirbhar Bharat"

***Required**

Supplier Name and address *

Your answer

Contact person Name *

Your answer

Contact person's email address *

Your answer

Contact person's Mobile No. *

Your answer

Category of Material (Kindly select your option, so that VC link is activated with you accordingly for the scheduled date and time) *

- ☐ General development & Engineering - 05.07.2021 - 10:00 AM - 12:00 PM
- ☐ Components for Family Applications - 07.07.2021 - 10:00 AM - 12:00 PM
- ☐ Industrial Conversion of Special Grade - 08.07.2021 - 10:00 AM - 12:00 PM
- ☐ Casting & Forgings - 09.07.2021 - 10:00 AM - 12:00 PM
- ☐ Components for Turbine - 12.07.2021 - 10:00 AM - 12:00 PM
- ☐ Industrial Materials - 15.07.2021 - 10:00 AM - 12:00 PM
- ☐ Components for Health & Medicals - 16.07.2021 - 10:00 AM - 12:00 PM
- ☐ Components for Air - 22.07.2021 - 10:00 AM - 12:00 PM
- ☐ Systems & Logistics - 23.07.2021 - 10:00 AM - 12:00 PM

List of items proposed to be developed for BHEL *

Your answer

Submit



Thank You

THANK YOU

In order to give thrust to 'Make in India' program of GOI, list of items (unit wise) for which local suppliers are needed is given here ->

<http://corpapp.bhel.in/EOIDetails/>

Write to samvaad@bhel.in, to convey your interest