



# संवाद

4.0

## Samvaad

- सहयोग से सफलता

# Local Ecosystems to be developed for Air Cooled Condenser

25<sup>th</sup> Nov 2024

Bharat Mandapam, New Delhi

# Panellists for the session

Name	Designation	Organization
Sh. Tajinder Gupta	Director (Power)	BHEL
Sh. Rajesh Kumar Dwivedi	Director (Finance)	BHEL
Sh. Praveen Kishore	ED (CPC & PEM)	BHEL
Sh. M K Asthana	ED (QA & I)	NTPC
Sh. Ajay Sharma	CGM (Engineering)	NTPC
Sh. Jagat Singh	GM & Head (PSTS)	BHEL

# 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)

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)

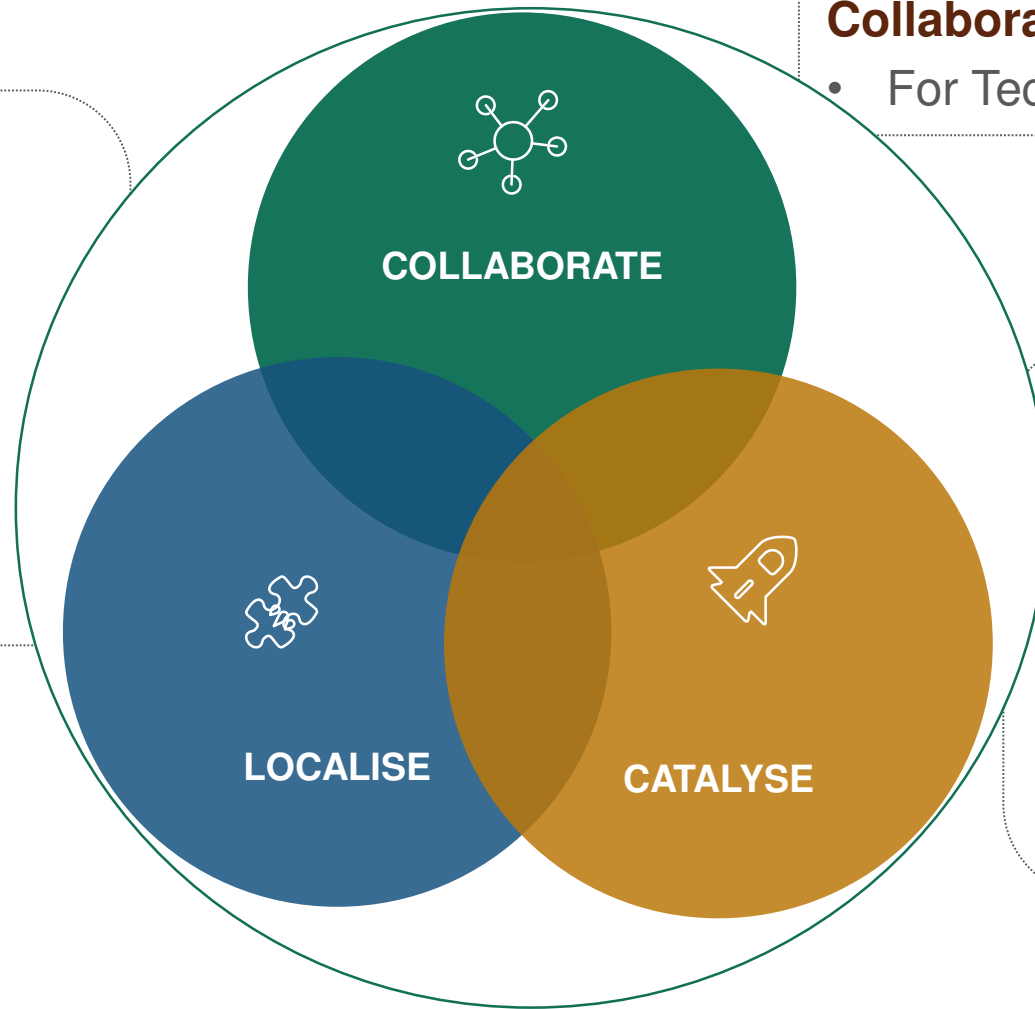
Type	Local content	Price preference
Class I	≥ 50%	✓
Class II	More than 20% but less than 50%	X
Non Local	≤ 20%	X

# 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

Aug '20

**SANRACHNA ( 24.08.20 )**

Technology Innovation Platform

CATALYSE

Nov'20

**Expression of Interest ( 13.11.20 )**

for import substitution

**Interaction ( 18.11.20 )**

with IEEMA

LOCALISE

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

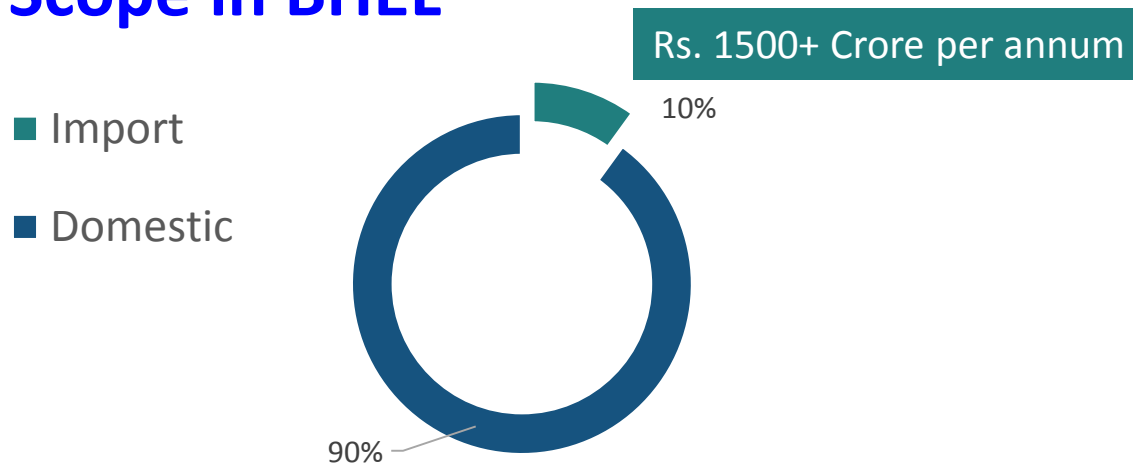
Orders Placed			
Sl.	Item description	Source identification through	Supplier, M/s
38	Magnetic Shunt Paper	BHEL-SAMVAAD	Isovolta (I), Nasik Senapathy Symons, Bengaluru
39	Mica Paper Glass tape with accelerator		Isovolta (I), Nasik Lakshmanan Isola, Bengaluru
40	Angulating Spring Support with Weld on Bracket		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

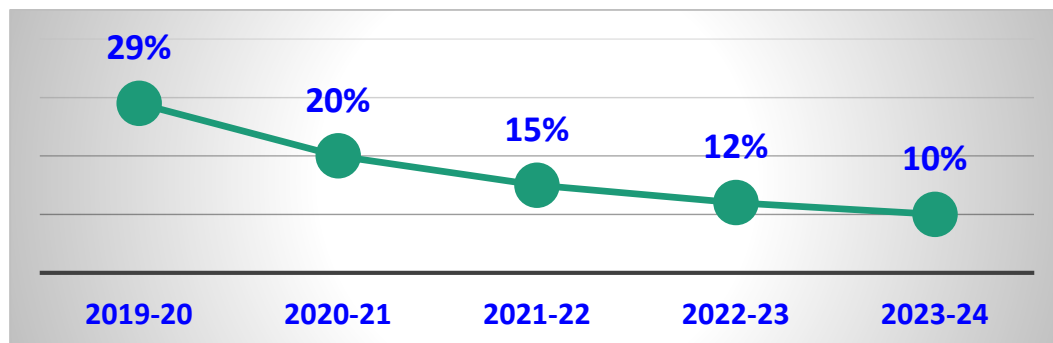
# Opportunity for Indigenization

## Scope in BHEL

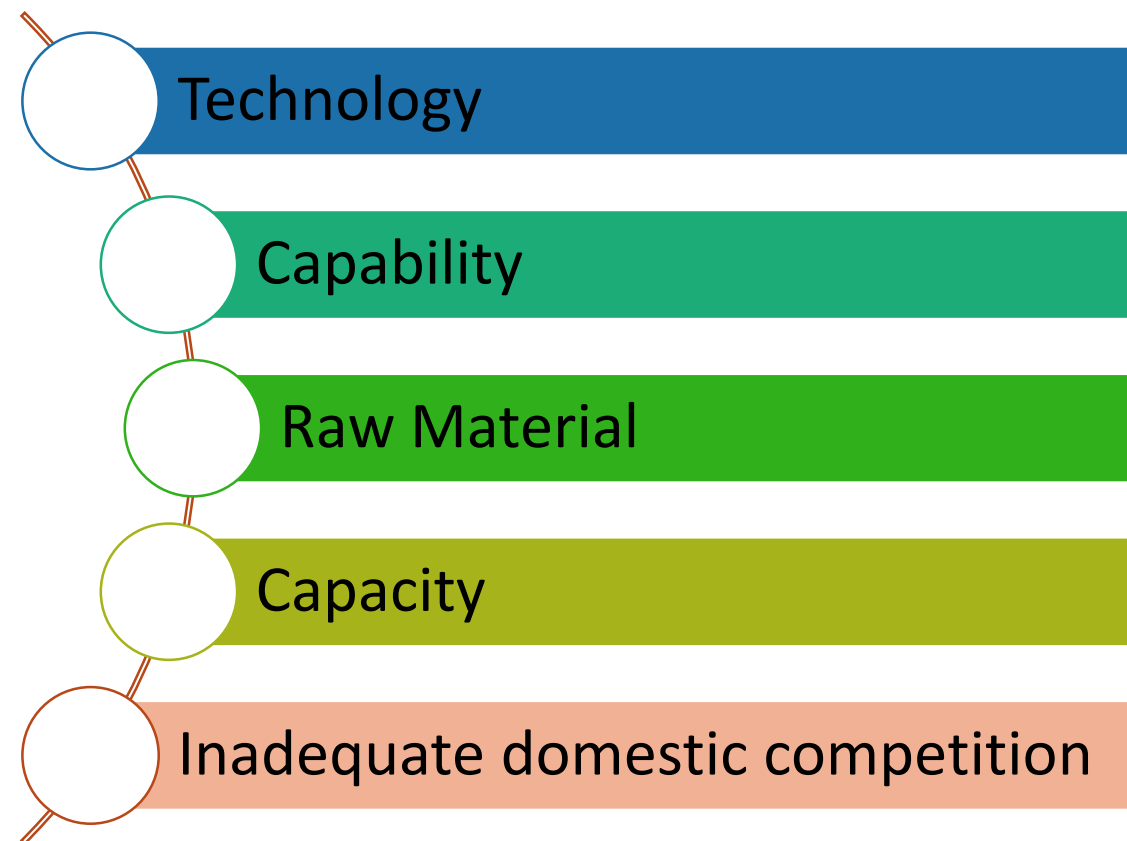


### BHEL PROCUREMENT (Goods – average in past five years)

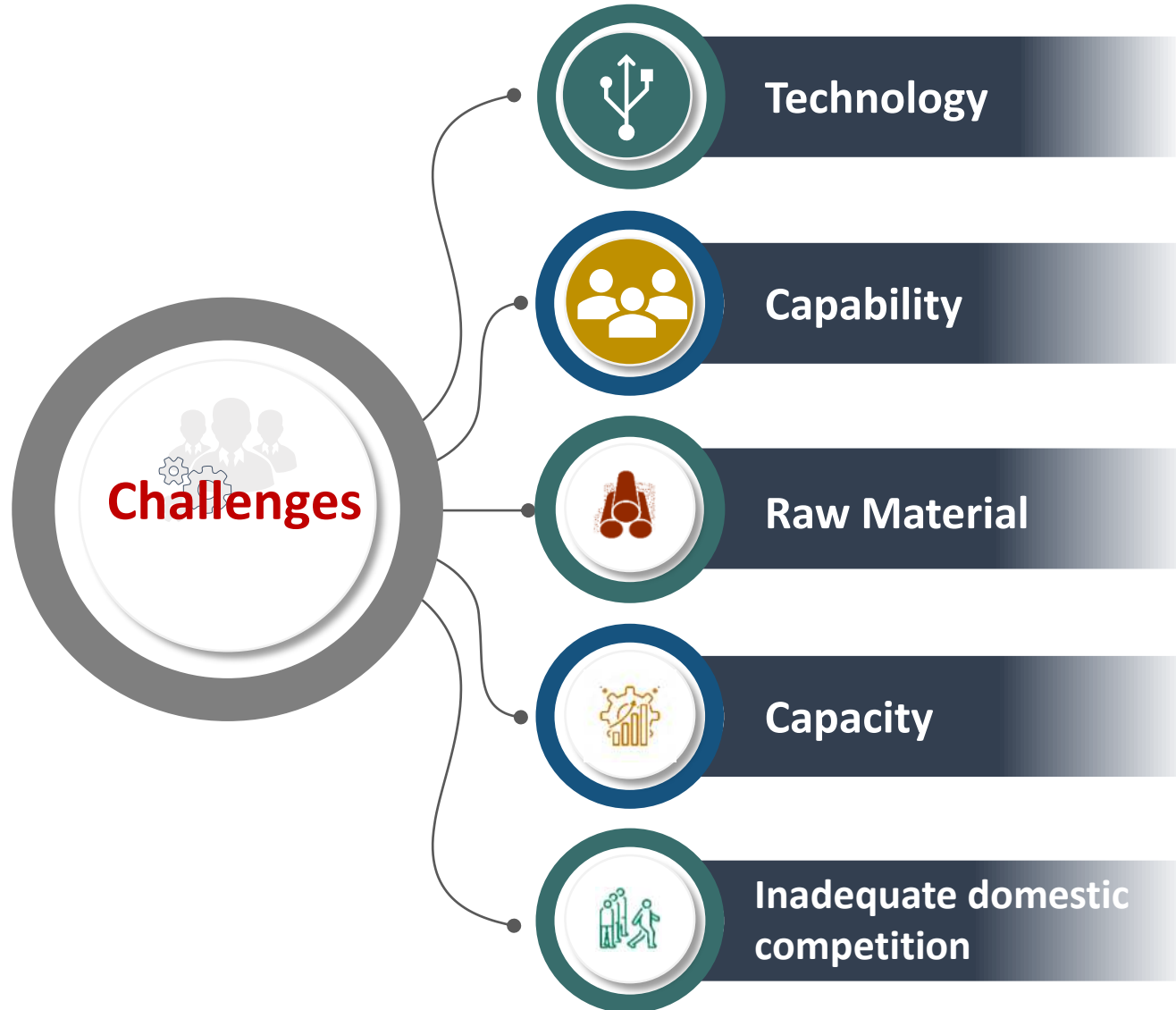
#### Trend of Imports in BHEL during the last few years



## 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

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

# BHEL SAMVAAD

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

10

**Categories**

200+

**Items**

16

**Manufacturing Units**

2000+

**Crores per annum**

- 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
- BOP for strengthening H2 value chain
- Carbon Fibre Reinforced Composites

# What's new in SAMVAAD 4.0

1.

## Focus

on the core few  
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 minimize  
the imports in the  
Country

3.

## Deliberate

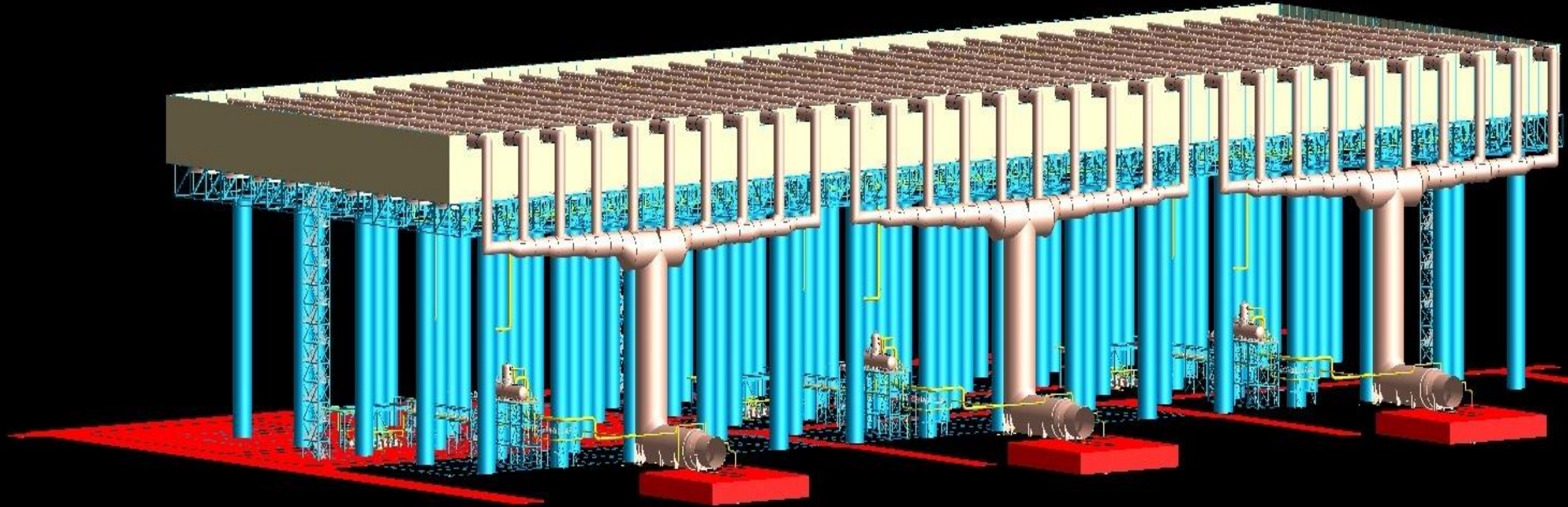
on inputs w.r.t.  
technical  
alternatives



**Let's get down  
to business!**



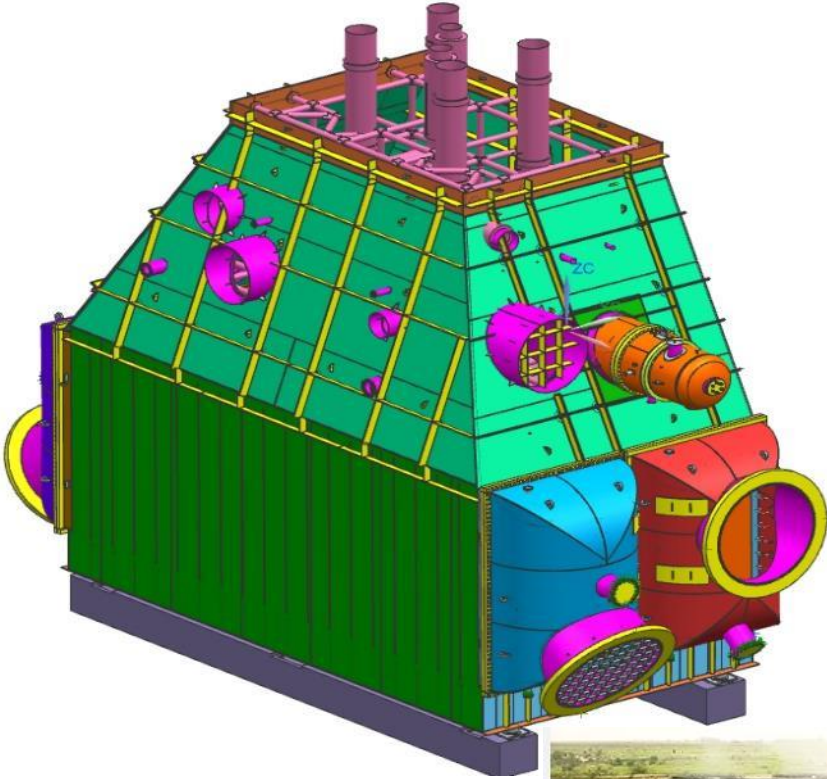
# AIR COOLED CONDENSER





# Type of Cooling System

## Wet Cooling System

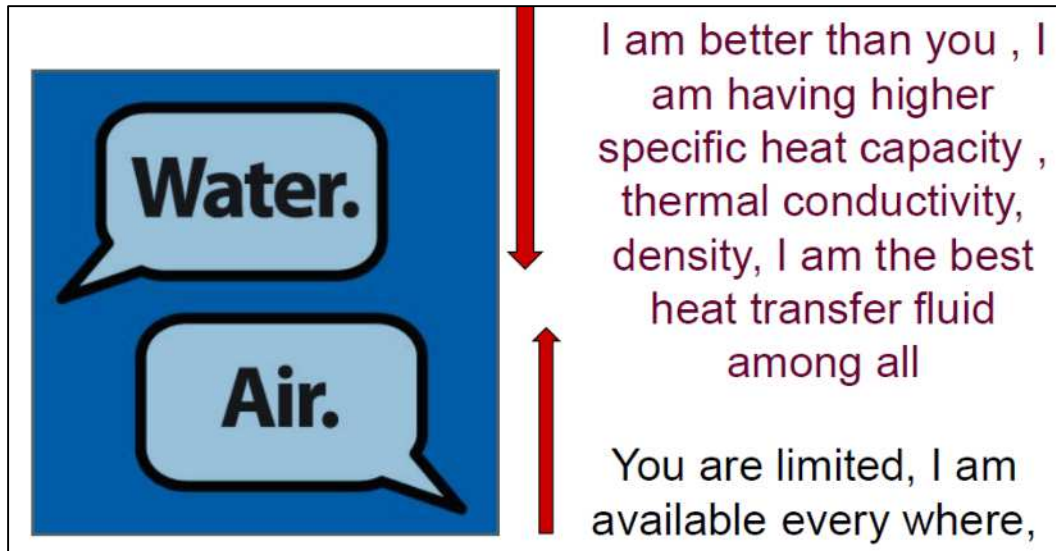


## Dry Cooling System



# Why ACC?

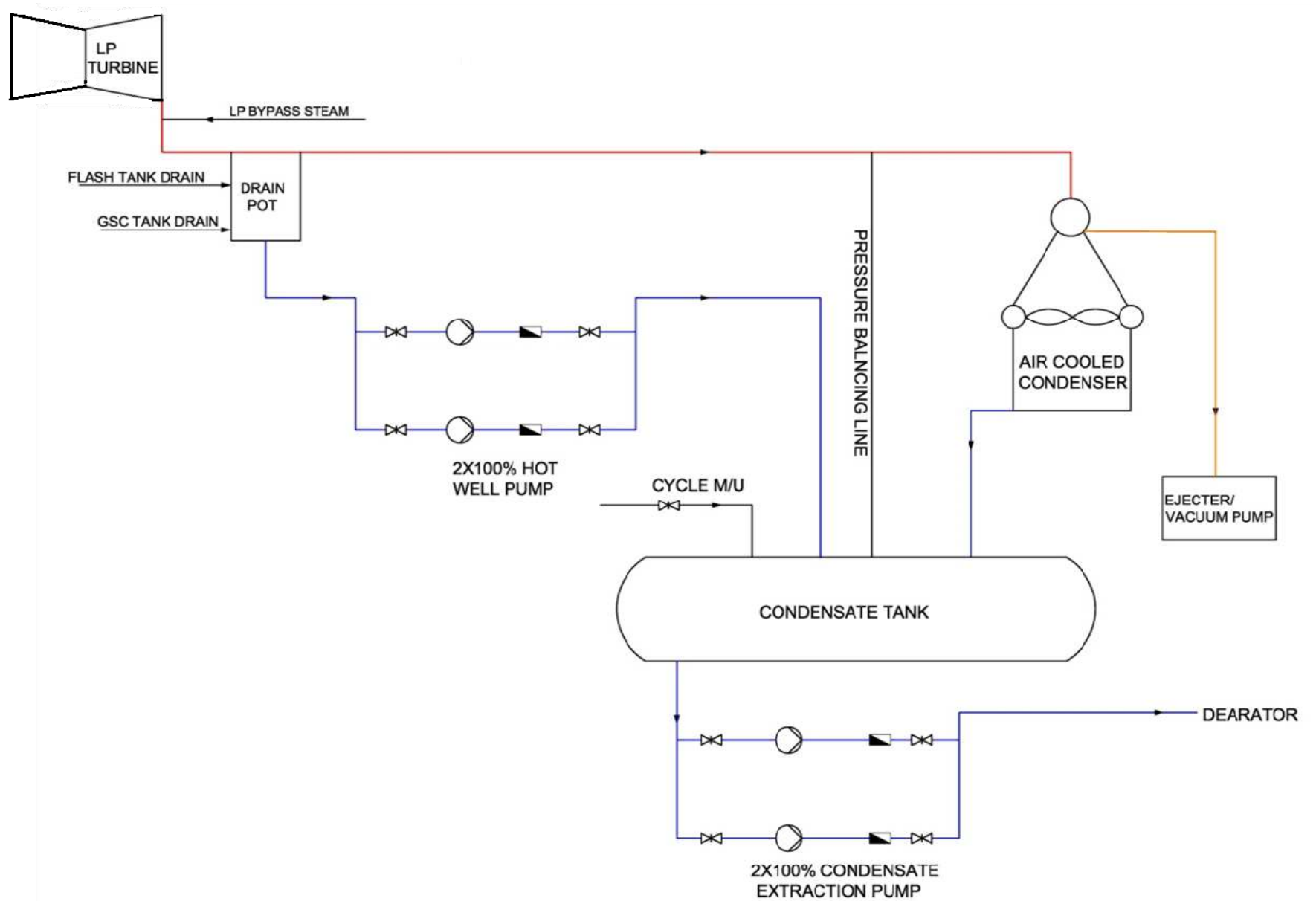
- Scarcity of Water.
- Impact on environment & ecology.
- Cost of water storage, pumping & its treatment.
- Water saving of 1.5 - 2 m<sup>3</sup>/hr per MW (~100 lac m<sup>3</sup> per annum in 800MW TG set) with ACC.



All Earth's water (1,386,000,000 Km<sup>3</sup> sphere with radius of about 693 Km . (Radius of earth is 6378km)

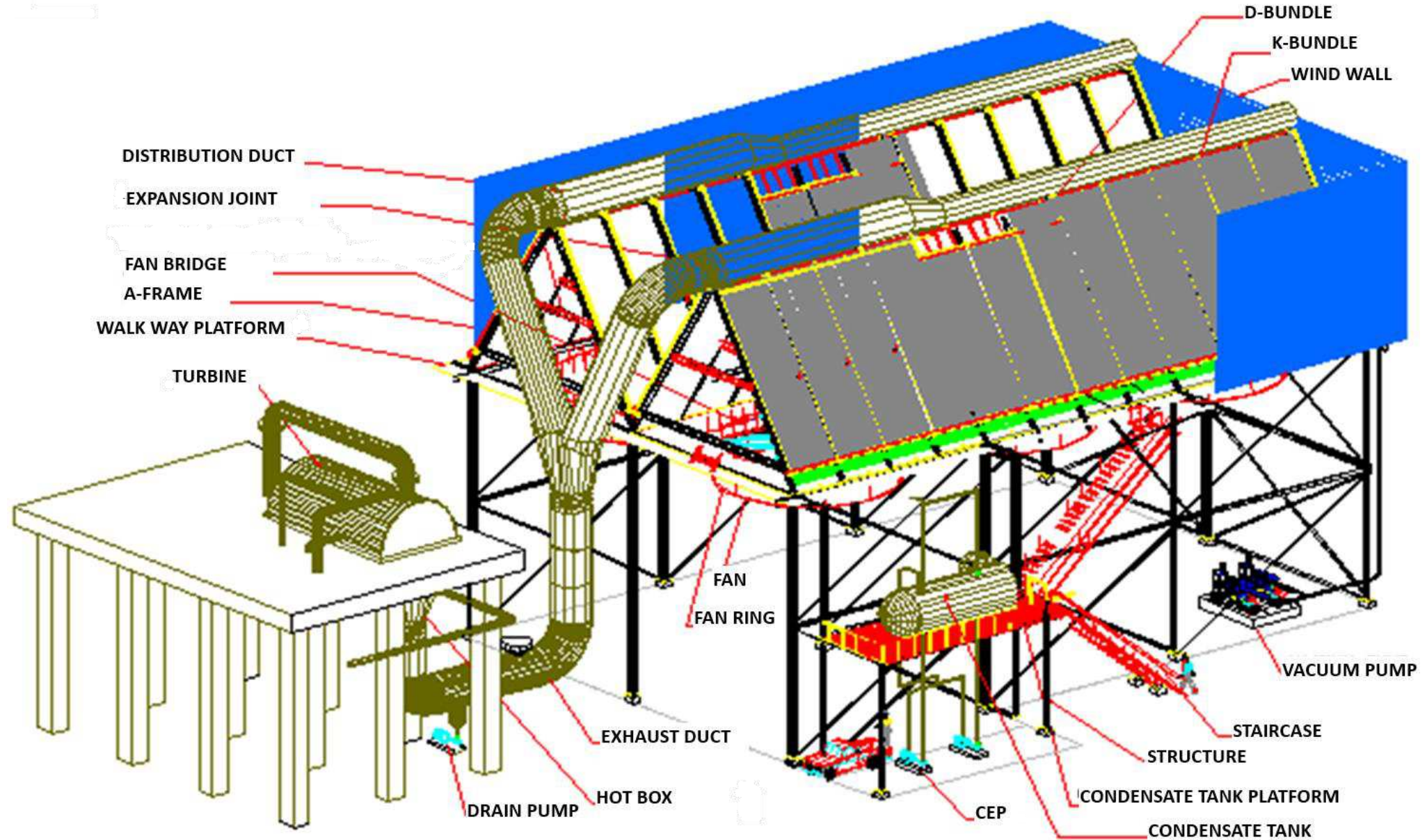
97% of this is sea water. 3% is fresh water out of which 2% is in form of iceberg or underground.

# Line Diagram of ACC





# General Arrangement of ACC



## Major Components of ACC

Sl. No.	Item/Component	Qty / unit (Approx.)	Qty for 12 Units	Remarks
1	<u>Tube Bundle</u>	1260 No.	15,120 No.	Length 11 to 12 m, Width 2.5m
2	<u>Structure</u>	5500MT	66,000MT	Bolted Steel Structure (IS2062 E350 B0 and E250 BR)
3	<u>Exhaust Duct System</u>	1800MT	21,600MT	From 500mm to 9.2m (IS2062 E250 BR)
4	<u>Gear Box</u>	90 No.	1,080 No.	Service Factor 3
5	<u>Cooling Air Fan &amp; Fan Bell</u>	90 No.	1,080No.	Diameter 10.97 m
6	<u>Expansion Joints</u>	32-34 No.	396No.	Size from 2.8 m to 9.2 m
7	<u>Vacuum Pump</u>	4 No.	48 No.	(2 no. Holding & 2 no. Hogging)
8	<u>Isolation Valve</u>	10 No.	120 No.	Size 2.8-3.0 m
9	<u>Fan Motor</u>	90 No.	1,080 No.	LV Type
10	Piping and support	250 MT	3,000MT	Carbon steel piping (SA 106 Gr. B)
11	<u>Tanks and De-aerator</u>	4 No.	48 No.	2 No. Tanks and 2 No. Deaerator



# Ongoing and Completed Projects with ACC

**3X660 MW North Karanpura**



**3X800 MW Patratu**

## Upcoming Projects in ACC

Following NTPC projects with ACC are received/under award to BHEL:

Sl. No	Project	Rating in MW	No. of Units	Total MW	Remarks
1	Darlipali	800	1	800	Received
2	Telangana	800	3	2400	Received
3	Meja	800	3	2400	Under Negotiation
4	Obra	800	2	1600	4.8 GW projects expected in near future
5	Anpara	800	2	1600	
6	Patratu Stage II	800	2	1600	
		Total	13	10400	

## ACC Parameters (Tentative) of Upcoming Projects

Sl. No.	DESIGN PARAMETERS	UNIT	On going tender (Tentative) (800MW)	Remarks
1	Back Pressure	mm Hg (abs.)	150	Total 1080 no. of modules considering 12 units of ACC (7 with BHEL + 5 with L&T)
2	Design Ambient Temperature	Deg. C	40	
3	Worst Ambient Temperature	Deg. C	46	
4	No. of Fans/Modules	Nos.	90	
5	No. of RCC Columns	Nos.	25	
6	Motor Rating	KW	132/160	
7	Plot Area (tentative)	m X m	140X132	
8	No. of Bundles	Nos.	1260	
9	Fan Deck Height	m	63-65	
10	Weight of ACC	MT	~15000	~ 180000 MT (12 units)



## Indian and Global Practices in ACC w.r.t Scope

Activity	Global (Higher Rating)		India (Captive Plants)	
	ACC OEM	Client / Contractor	ACC OEM	Client / Contractor
Design	√		√	
Engineering	√		√	
Supply (Mech, C&I)	√		√	
Erection & Commissioning		√	√	
PG Testing	√		√	
Civil Execution		√		√
Electrical		√		√

# Certain issues faced in Sourcing Locally for NKP and Patrattu

- Steel Structure Raw Material:
  - IS 2062 E350 B0 material is not readily available.
  - British universal sections are considered in design. Not readily available/limited supplier in India. Built-up sections are created.
  - Limited Suppliers for Circular Hollow Sections for Dia 350mm and above.
- Procurement has to be made from outside India due to non-availability of local supplier for the following:
  - Base Tube Raw Material
  - Isolation Valve
  - Hogger

## Development Area in ACC (From Supply Point)

Most of the items/components are indigenous. Following items need to be developed in India to increase the local value addition.

- Aluminum Cladded Carbon Steel Strip for base tube
- Steam Isolation Valves
- Vacuum Pump, mainly Hogging Pump
- Cooling Air Fan

## Issues which can expedite execution of ACC

- Timely and sequentially supply of ACC items like structure, duct etc. due to large volume.
- Supplier base for Erection & Commissioning to be enhanced
- We need to examine assembling of ACC duct at site owing to its large size.



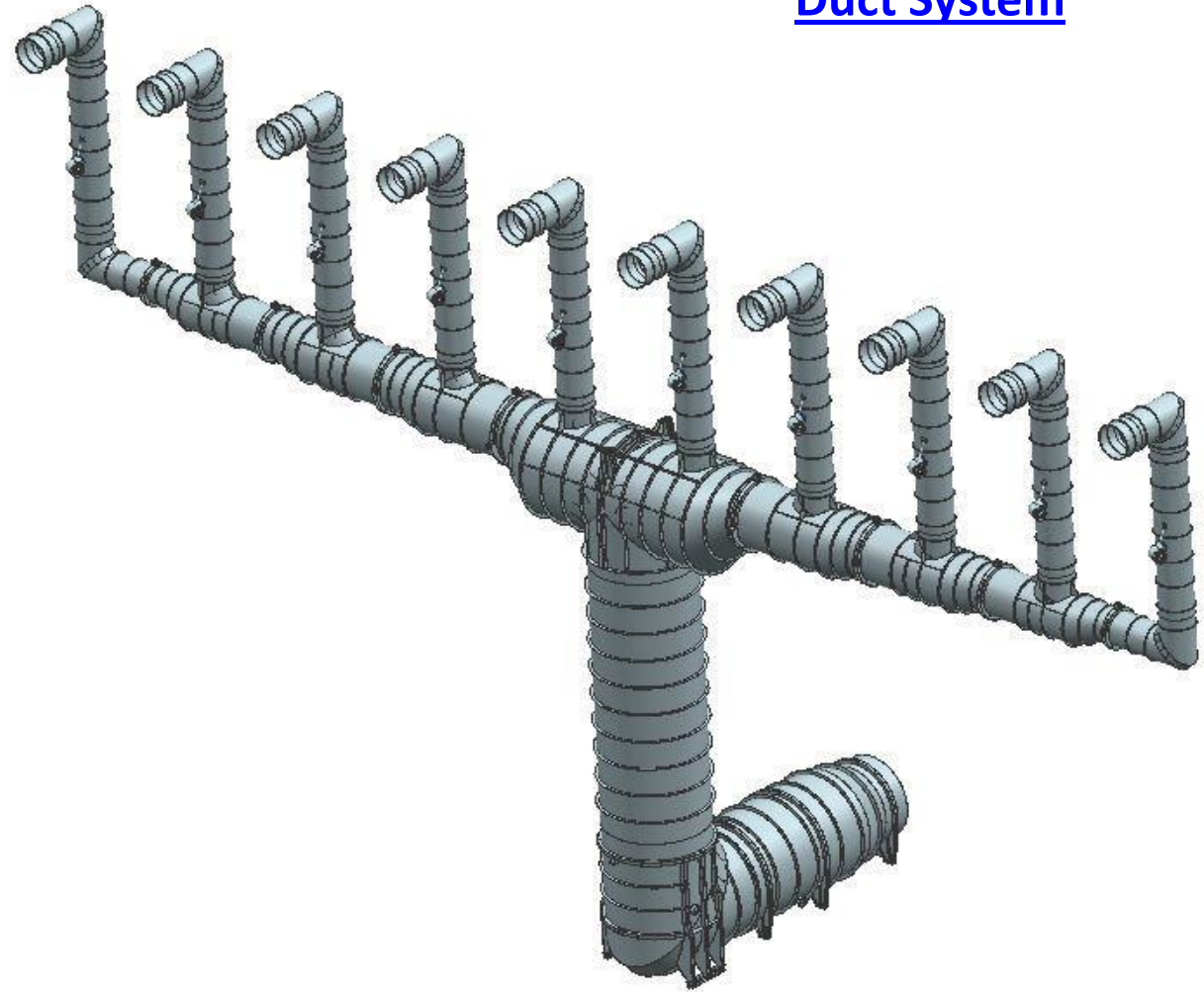
**THANKS**

# Major Components of ACC

Duct Riser



Duct System





# Major Components of ACC



Gimbal and Hinge Expansion Joints



Lateral Expansion joints



Isolation Valves





# Major Components of ACC



Tube Bundle System (A-Frame)





## Cooling Air Fan and Fan Bell



## Gear Box



## Motor with Fan Bridge





# Major Components of ACC



## Structure





# Major Components of ACC



## Air Evacuation System





# Major Components of ACC



Drain Tank



Condensate Tank with Deaerator

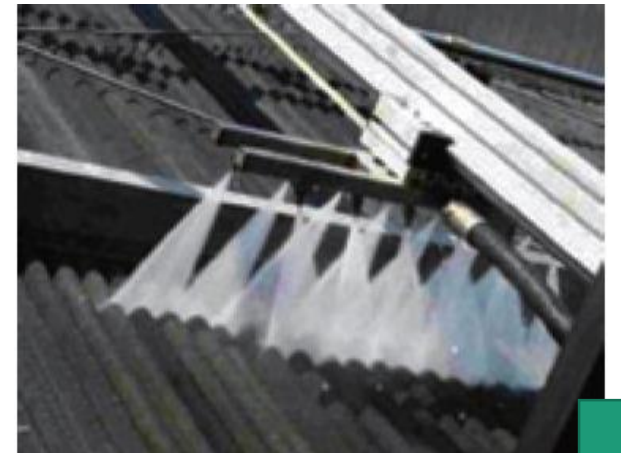


Drain Pump





# Major Components of ACC



Fin Cleaning System

samvaad@bhel.in





# Development Area in ACC (From Supply Point)

## Aluminum Cladded Carbon Steel Strip for base tube

**Material :** Low Carbon Steel (1.5 mm thk.)  
DC01+C290 (EN10139) equivalent to IS 513  
Aluminum cladding of 50 microns

**Width :** 455-456 mm

- Strip is manufactured using cold rolling of carbon steel and aluminum strip.
- Approx. 2900 MT per unit requirement.



# Development Area in ACC (From Supply Point)

## Steam Isolation Valve

Design Code : AWWA 504/516  
Material : Carbon steel (Valve body/Disc)  
Diameter : 2.8-3m

- Approx. 10 number per unit requirement.
- POD Type test to be carried out in shop.



# Development Area in ACC (From Supply Point)

## Hogging Pump

- Liquid Ring Vacuum pumps
- 1 / 2 no. Hogger per unit required.
- Pump sized Air Capacity as per HEI
- During hogging, 22000 cu.m volume to be evacuated to achieve 10 inch mm Hg abs back pressure with 1/2 no. Hogger and 2 no. Vacuum Pump in 30 minutes.





# Major details of Startup Evacuation System (Hogging Pump) for ACC

- Scope of supply: Hogging pumps, associated motor, all accessories, associated piping, valves & fittings, specialties, duplex filter, instrumentation and control etc.
- Hogging pump and its accessories shall be mounted on common steel base plate. Pump shall be connected to motor by flexible coupling.
- Quantity: One or Two Nos. per unit
- Type : Single/ two stage liquid ring type with both stages(if two stages pumps provided) mounted on a common shaft.
- Capacity : To bring condenser pressure from atmospheric pressure to 10 inch of Hg (abs) within 30 minutes (when running together with 2x100% Holding Pumps) under standard conditions i.e. 760 mm of Hg. (abs) and 21.1 deg. C) at 10 inch (254 mm) of Hg (abs)
- Approximate Evacuation volume per unit: 22000 cubm
- Material of Construction:
  - Casing : 2% Ni Cast Iron (ASTM A48, Class 35)
  - Shaft : Carbon steel, EN-8 or better
  - Impeller : Nodular Iron (ASTM A536, Gr. 65-45-12) or better
  - Shaft Sleeve (if applicable): Stainless Steel
- Hogging Pump sealing water : ACW water (once thru' system)





# Development Area in ACC (From Supply Point)

## Cooling Air Fan

Type : Forced Draft Fan  
Material : FRP  
Diameter : 10.973m/36 ft

- Approx. 90 numbers per unit requirement.
- Full/Scaled Down Type Test to be conducted in the shop

