



**Topic :-
FLUE GAS DESULPHURISATION (FGD)
SYSTEM TECHNOLOGIES AND EXECUTION
EXPERIENCE OF GEPIL**



**Speaker :-
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FLUE GAS DESULPHURISATION (FGD) SYSTEM TECHNOLOGIES AND EXECUTION EXPERIENCE OF GEPIL

Roshan Singh Sales & Growth Leader GE Power India Limited Date: 26th June 2024

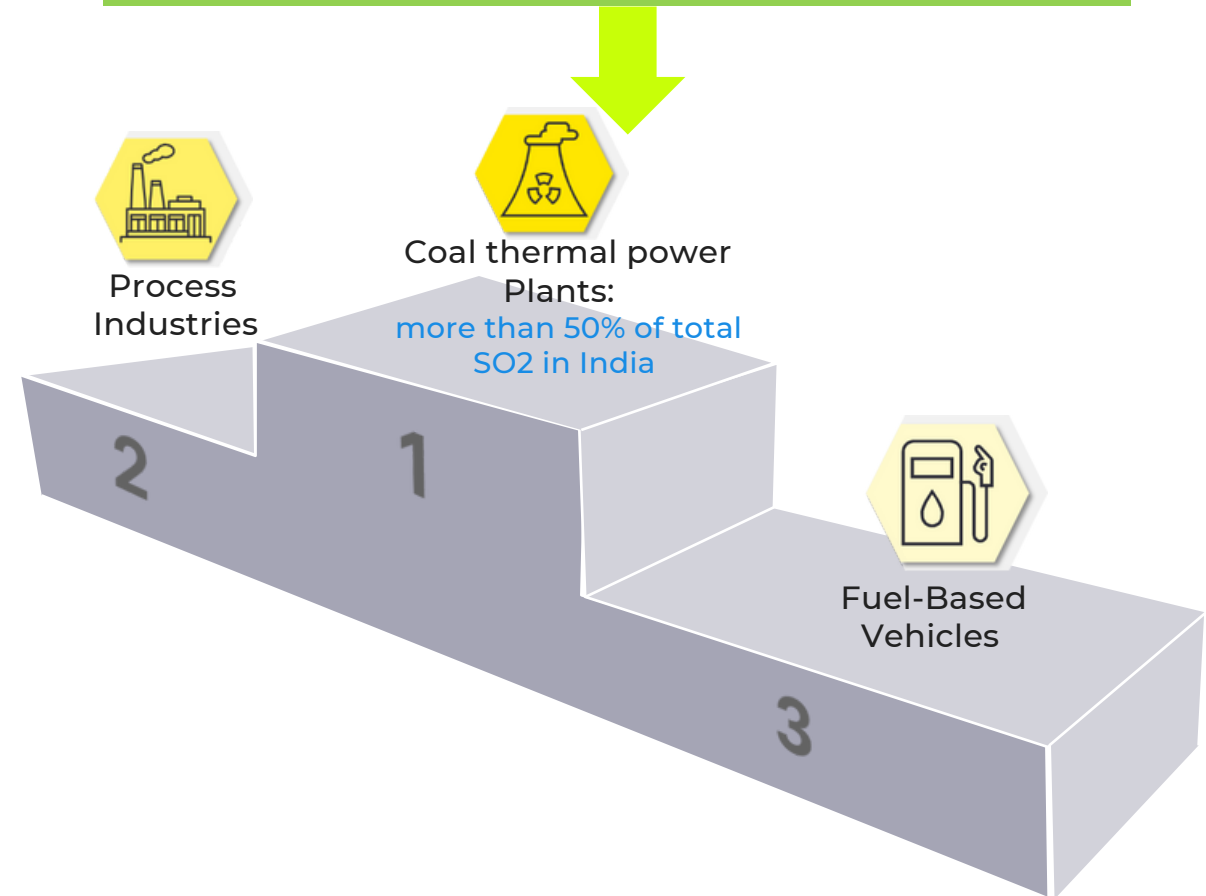
Air Pollution - second leading risk factor for death

SO₂ -A Silent Killer

- ▶ **India surpassed China** in year 2019 to become the largest SO₂ emitter in the world.
- ▶ SO₂ gas along with PM_{2.5} and PM₁₀ causes severe respiratory disorders like **asthma and chronic lung disease**.
- ▶ **Respiratory diseases like Chronic Obstructive Pulmonary Disease (COPD) was the second highest cause of death in India after heart disease in 2017, killing ~1 million Indians**
- ▶ Typically, the background levels of SO₂ in the ambient air of healthy environments are below 2 µg/m³ and its presence over 20 µg/m³ or 500 µg/m³ can have **severely deleterious effects on health**
- ▶ **Research has revealed that even slight increase in the SO₂ concentrations in the ambient air affects sensitive groups such as babies, pregnant women and people suffering from asthma or chronic lung disease**

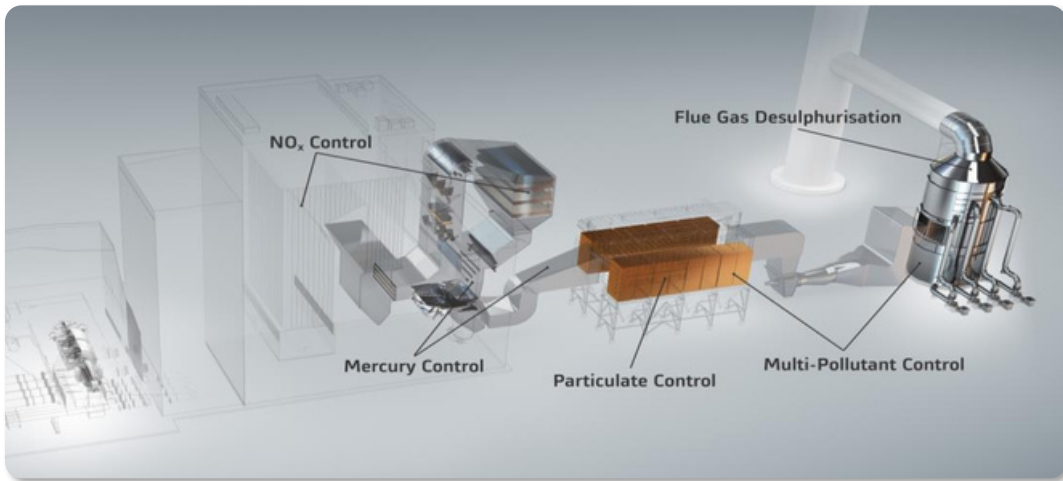
SO₂ Emitters in India-

One of the largest contributor in the world accounts for **more than 20%**



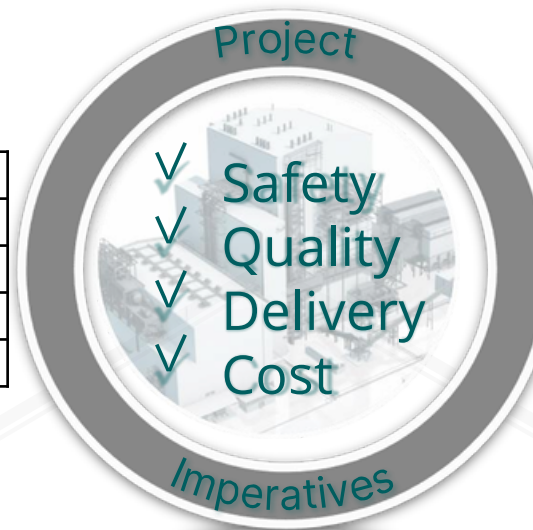
GEPIL Capabilities in Coal Fired Power Plants

~32 GW Boilers | ~20 GW NOx | ~20 GW FGD | ~12 GW Turbine | ~5 GW ESP



Engineering

- Technology Independence
- Process Engineering
- Basic Design/Specification
- Detail Engineering
- Quality Assurance Plans



Procurement

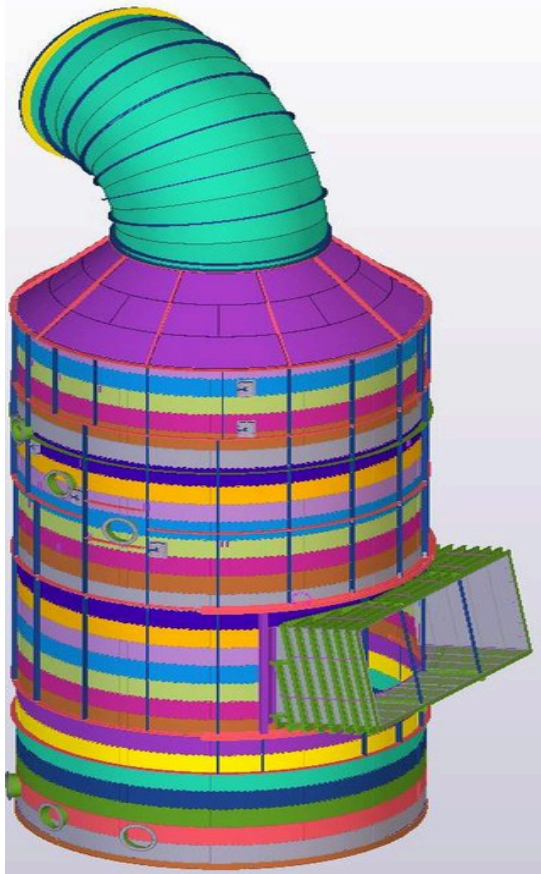
- Global Supply chain
- Vendor Development
- Logistics & Warehousing
- Product Cost Out & localization
- In house manufacturing

Site Services

- Technical Field Assistance
- Commissioning & Performance Tests
- Operation & Maintenance

NEW BUILD SERVICES & EMISSIONS | SPARES | UPGRADE & RETROFIT | OPERATION & MAINTENANCE

Key Drivers for FGD



#1 Driver: Environmental Compliance

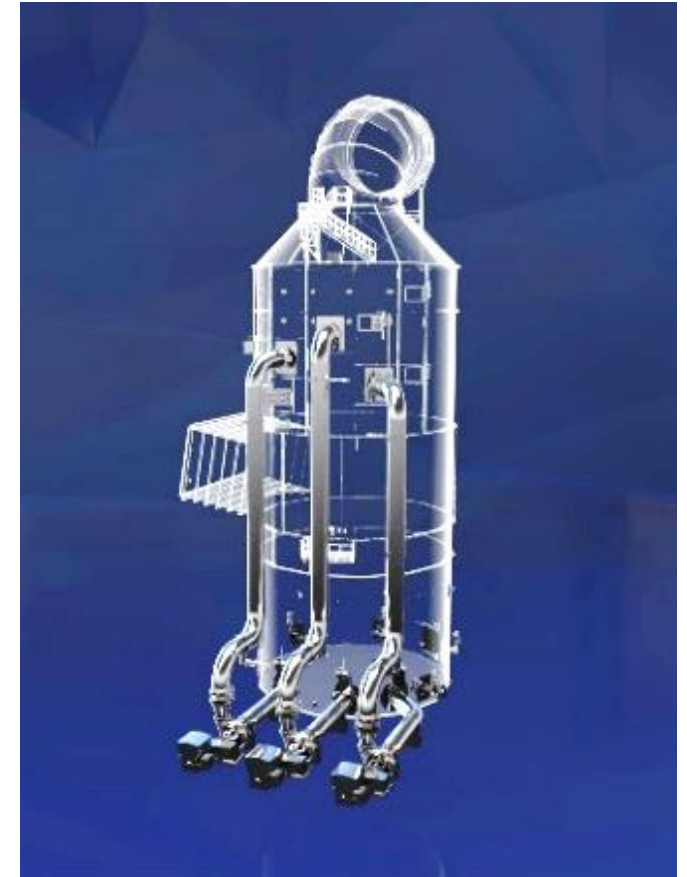
- Flue gas emissions removal efficiency (SO_x)
- System reliability & availability
- Environmental responsibility

#2 Driver: Compliance Cost

- Initial CAPEX investment + O&M costs
- Partial load operation cost
- Delivery / construction time

#3 Driver: Footprint and General Layout

- Flexibility in layout
- Optimal Footprint



GEPIL FGD Technologies

Wet FGD Open Spray Tower



- Up to 1300 MW
- Up to 4.5% sulphur coal
- SO₂ removal efficiency upto 99%

Cost Effective for larger units with high PLF and space availability

Semi Dry FGD



- Up to 4.5% sulphur coal
- Smaller foot-print, lower CAPEX & Multi-pollutant
- SO₂ removal efficiency upto 98%

Cost Effective for units <350MW, low PLF & residual life, space limitations

Wet FGD Seawater



- Discharged seawater exceeds environmental standards
- SO₂ removal efficiency upto 98%

Attractive for units with Open Circuit Sea Water cooled condensers

WFGD Innovation Timeline

3G OST Design:

- Dual flow nozzles improve SO₂ removal
- High nozzle density improves SO₂ removal and PM emission level
- PEP reduces SO₂ emissions > 40% at same L/G
- Higher gas velocities (up to 4.5 m/s) with improved mist eliminators

Sulfite Analyzer:

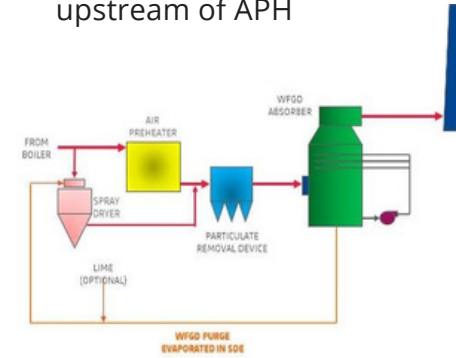
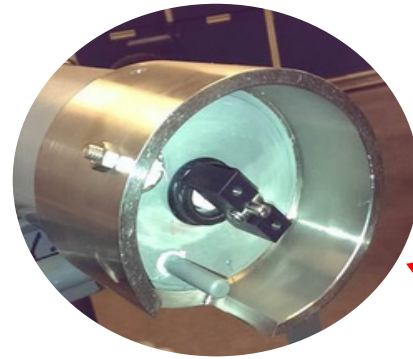
- Controlled lower oxidation air rate saves power
- 80%+ Reduction in Hg re-emissions
- Reduction of Hg & selenate in wastewater reduces CAPEX and OPEX
- Corrosion avoidance
- Improved gypsum color

SDE:

- ZLD solution for WFGD
- purge flow, other WW
- First power installation startup 2016
- Uses heat from small gas flow (3-10%) from upstream of APH

VFD

- VFD on one or more recycle pumps
- Saves power while maintaining SO₂ emission level



Integrated ACS:

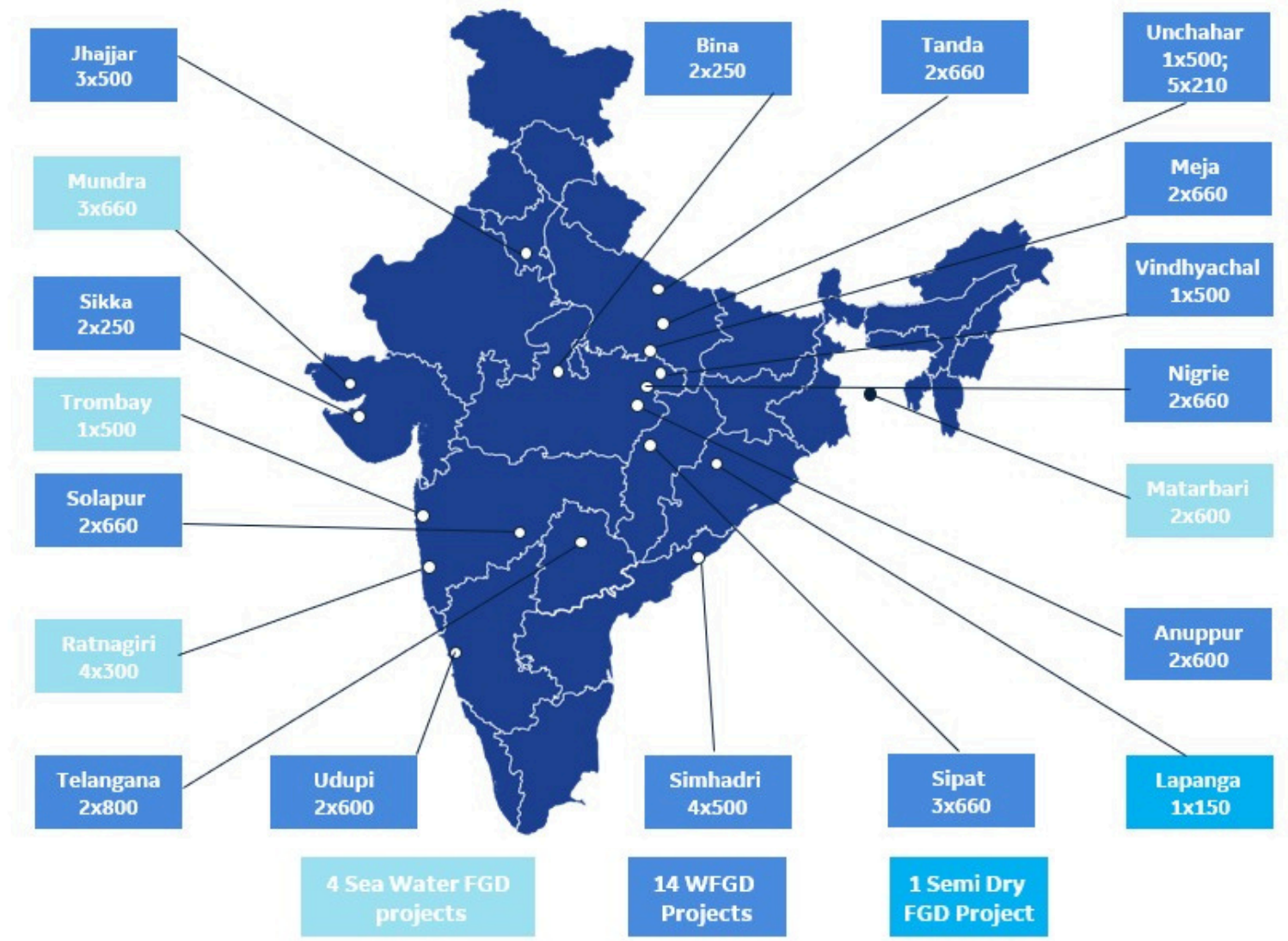
- Combines SDA, FF & WFGD
- Very low emissions < 1 ppm SO₃ emissions
- ZLD solution (no WWTS)
- Operating since 2012



- Egg Crate Nozzle Arrangement
- Potential to improve SO₂ performance
- Header design considerations needed

GEPIL- FGD footprint in India region

Project	OST Absorber Units
Vindhyachal Stg-V	1
Telangana Stg-IV	2
Solapur	2
Tanda	2
Meja	2
Unchahar Stg-IV	1
Jhajjar	3
Sipat Stg-I	3
Simhadri	4
Unchahar-Stg - I,II,III	2
Anuppur	2
Udupi	2
Sikka	1
Nigrie	2
Bina	1
TOTAL	30
Project	Semi-Dry FGD
Aditya Lapanga	1
TOTAL	1



GEPIL FGDs Executed/under Execution



Ball Mill Building



Gypsum Dewatering Bldg.



Absorber



Wet Stack Shell Completed



Borosilicate lining in progress



ME erection in progress

GEPIL FGDs Executed/under Execution



Electrical & Control Building



Limestone Handling System



Spray Header



Recirculation Pump House



Agitator & Oxy Air Lance



Gypsum Production

GEPIL Execution Experience & Lessons Learnt

Time schedule for execution

- oComplex project; 27-30 months as a minimum considering all constraints & challenges (without piling)

Distance between absorber and chimney:

- oSmaller distance caused delays in erection of absorber in parallel with chimney

Erection of absorber by Jacking method or Crane method-to be finalized early:

- o Depending on layout and space availability
- o Construction of internals and cone based on the type of construction
- o Engineering deliverables will change accordingly

CSRL piping: FRP can be an alternate to avoid rework (faster execution)

- oExtra spool pieces to ensure adjustments at site
- oProper marking and identification at site to avoid mismatch and rework
- oStrong quality checks of vendor engineering and manufacturing

Dewatering building: Pre-fab shed is better than concrete structure

- oSelf-compacting concrete and increase column lift height to 5m and parallel staging
- oTie beam along with brick work



GEPIL Execution Experience & Lessons Learnt

3 D modelling and clash checks for all disciplines especially civil , structural and piping

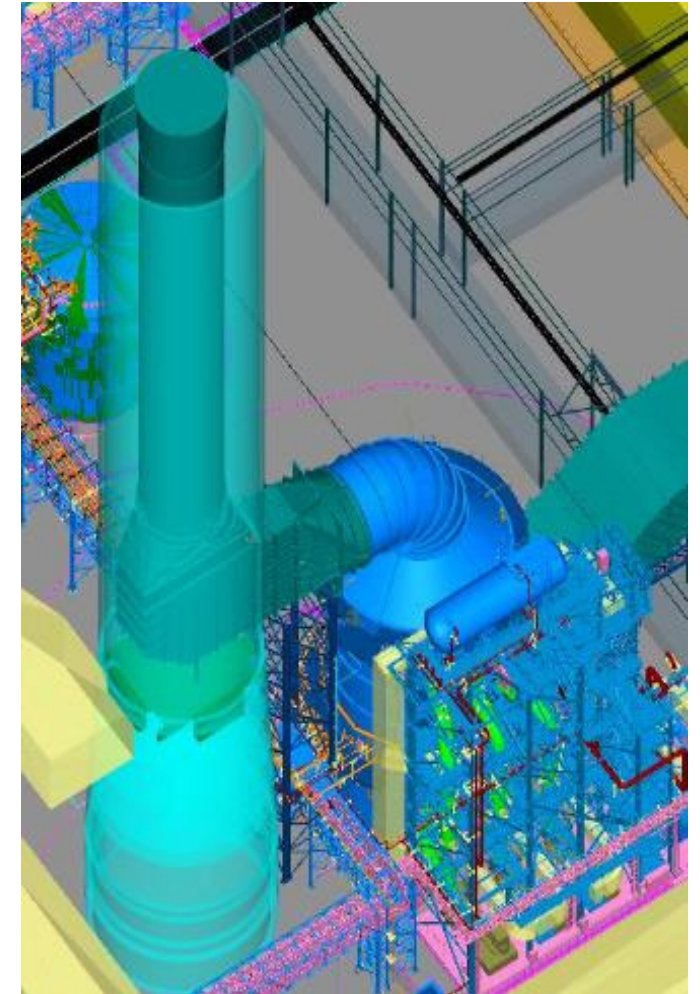
Scope finalization with suppliers to avoid interface issues:

- o Flange -counter flange, gaskets, foundation bolts, fasteners in scope of supplier wherever possible
- o Flange standards and orientation to be provided in advance; one standard (critical)

o Material handling system-Complex system: needs special attention

Over several years of execution in FGDs , we have developed expertise in

- o Optimal layout of FGD plant with focus on ease of construction
- o Engineering processes & drawings -easier execution, better performance
- o Manufacturing & field quality plans for control over fabrications, bought outs and site work
- o Erection procedures and schedules -lower lead time
- o Commissioning and O&M procedures -Long term plant performance



WFGD – Rules of Thumb

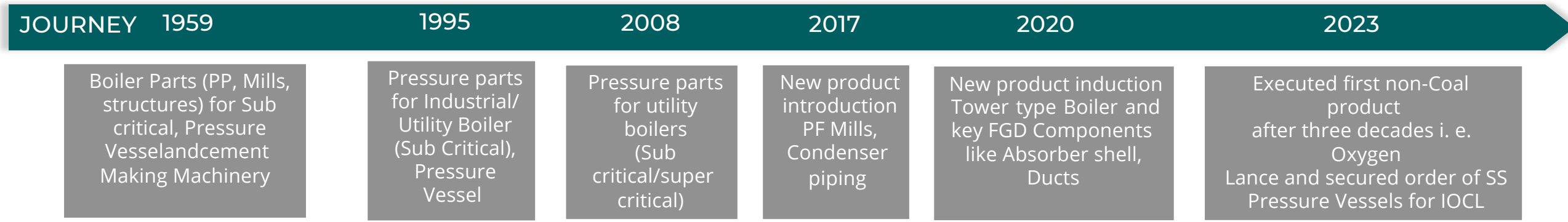
Limestone Usage	1.7 tonne limestone / tonne SO ₂ removed
Gypsum Production	3.1 tonne gypsum / tonne SO ₂ removed (90% purity, 10% moisture)
Water Consumption	0.3 - 0.4 m ³ /hr/MW
Power Consumption	Low S – 1.0 - 1.4% generation High S – 1.5 - 2.0% generation



Manufacturing Facility - Durgapur



The facility has strong capabilities in Engineering, Sourcing, Manufacturing, Project Management and supply of products and solutions for heavy engineering an Infrastructure sector.



Site Details



Covered Area
69,000 m²



Factory Area
1,215,000 m²



Township Area
1,460,420 m²



Employees-
1000+



Installed Capacity
42 GW



Internal Auditors
15+

Capability and Capacity

- Coal, Industrial, process industries applications
- 12,000 MT/ year production
- 1.2 GW/ year

1ST Boiler Manufacturing Facility in India



GE VERNOVA

**Thanking You
on Behalf of!**

