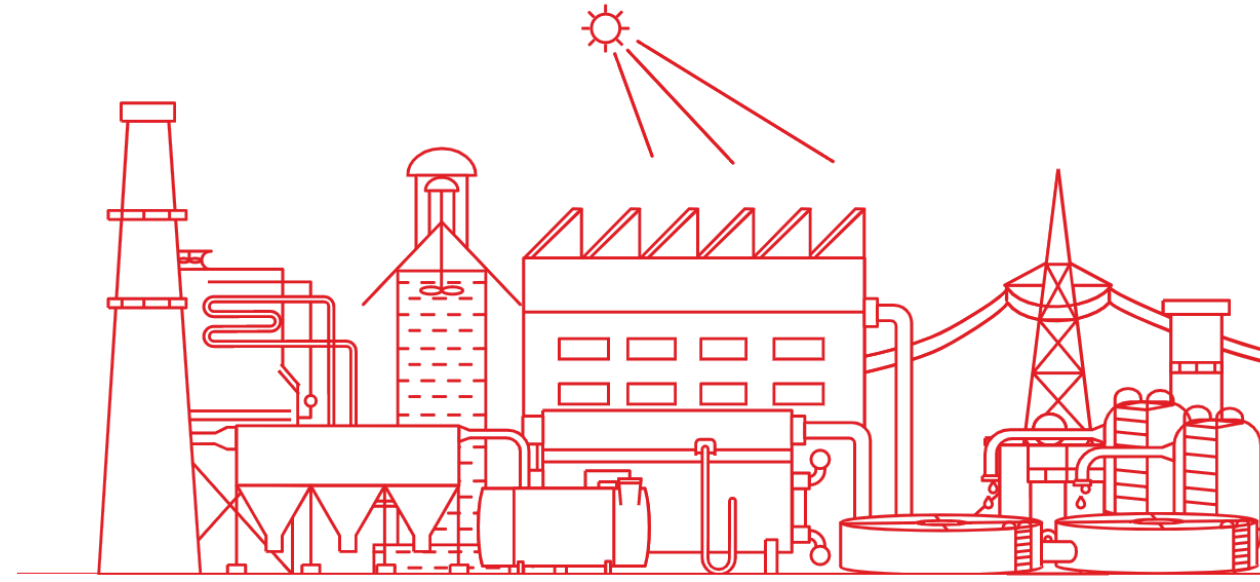


# Coal Gasification: Way Forward

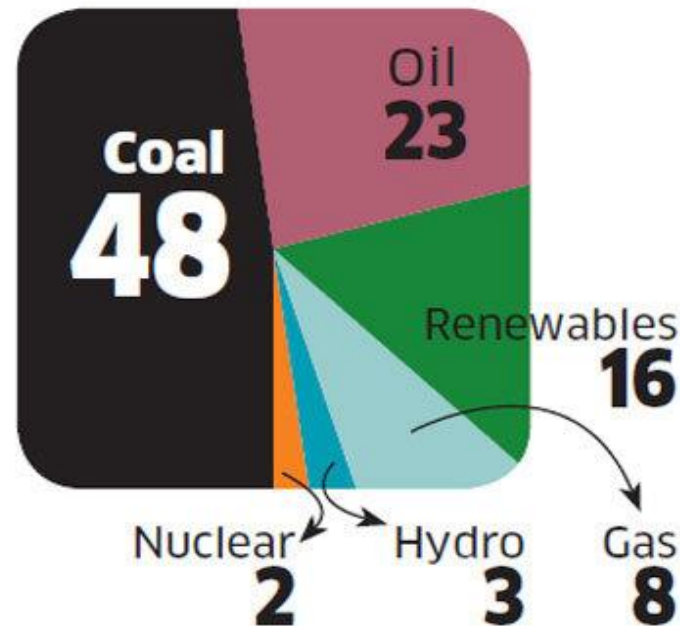
6<sup>th</sup> May 2022



# Coal is here to stay despite India's ambitious goals for renewable energy

- India has a coal reserve of 307 Billion Metric Tons -**fourth** largest global reserves
- India's continued industrialization and urbanization will need **affordable and reliable** source of energy

Projected share in primary energy consumption in 2040 (%)



Source: BP Energy Outlook 2019

With rising environment concerns, diversification of coal for its sustainable use is inevitable

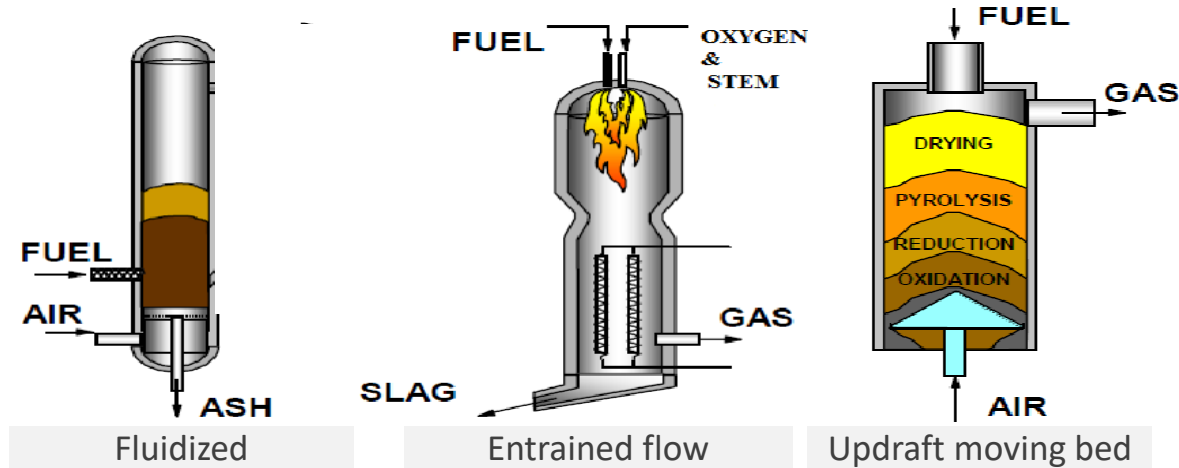
# Carbon capture and coal gasification can be a game changer for India



- To meet the ambitious target of net zero emission by 2070, coal needs to be used sustainably by leveraging clean coal technologies like gasification, carbon capture technologies
- Proven gasification technologies in several countries, use low ash coal (up to 25%), **whereas most of Indian coal has high ash content (above 35%)**
- The indigenous gasification technology can help India overcome the shortage of oil, gas, methanol, ammonia, urea and other products, making the country **Aatmanirbhar**. It can help in conversion into precious chemicals mainly ethanol, blue hydrogen, and synthetic diesel
- Along with gasification of coal, **carbon capture, use and storage (CCUS)** is one of cornerstones for enabling a clean-coal based economy
- **Thermax has been able to successfully pilot the coal gasification technology on high ash Indian coal thus making it ready to scale up at commercial level.**

# Fluidized Bed technology most suitable for high ash Indian coal

## Types of gasifier`



Parameters	Fluidized bed	Entrained Flow	Moving bed
Max. ash in coal (wt.%)	25 - 42%	<20%	<30%
Suitability to India's high ash coal	Suitable	Not suitable	Limited
Coal Size	<6mm	pulverized	Sized 25-50 mm

## Fluidized Bed technology (FBT)

- **74%** of Indian coal has ash content of more than **40%**
- **FBT** only technology that can handle **high ash coal (non washed coal)**
- Provides **higher surface area** for reactivity (No pulverized or lump coal needed), Ideal **operating temperature** regime to minimize slag formation
- **Better Heat recovery & integration** (char, sensible heat, waste heat), **Less oxygen** consumption due to 1000 degC temperature of operation
- **Indigenous** components leading to lower CAPEX of plant for high ash coal
- Better **refractory life**

# Thermax has been able to successfully pilot the coal gasification technology on high ash Indian coal

(2012-14)

Gen-1



**Gen 1** 2.4 TPD coal Gasification facility EIL Gurgaon

- Turbulent Bed with char circulation
- Oxy-blown, upto 30 bar design
- V shape distributor
- 200 mm diameter
- **High Coal loading/bed area (>4000)**

(2014-2018)

Gen-2



**Gen 2:** 6 TPD coal Gasification facility Thermax Pune

- Bubbling Bed, Air blown
- Atmospheric & Pressurized <6 bar
- **Low to medium coal loading/ bed area (700-2500)**

(2019-22)

Gen-3



**Gen 3:** 6 TPD coal Gasification and methanol facility Thermax Pune

- Profiled Bubbling fluidized Bed
- Oxy-blown
- Flat plate distributor
- Gasifier diameter: 500 mm
- **Reduced coal loading/bed area (900-1200)**



## Key features

- **Bubbling Fluidized bed Gasifier**
- **Tested with high ash Indian coal (HAIC: 30 –50 % by Wt.)**
- **Gasifier operation till 6 bar, 1000degC (Gen1, 2 & 3)**
- **Successfully tested on imported coals (SA coal/ Indonesian)**

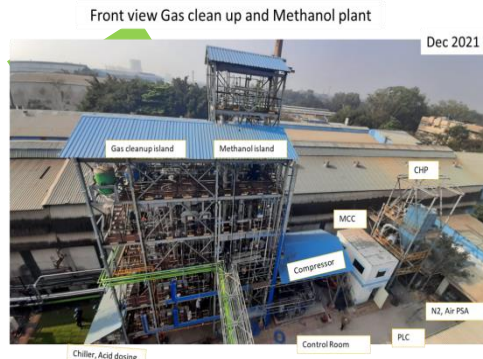
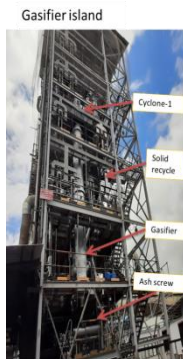
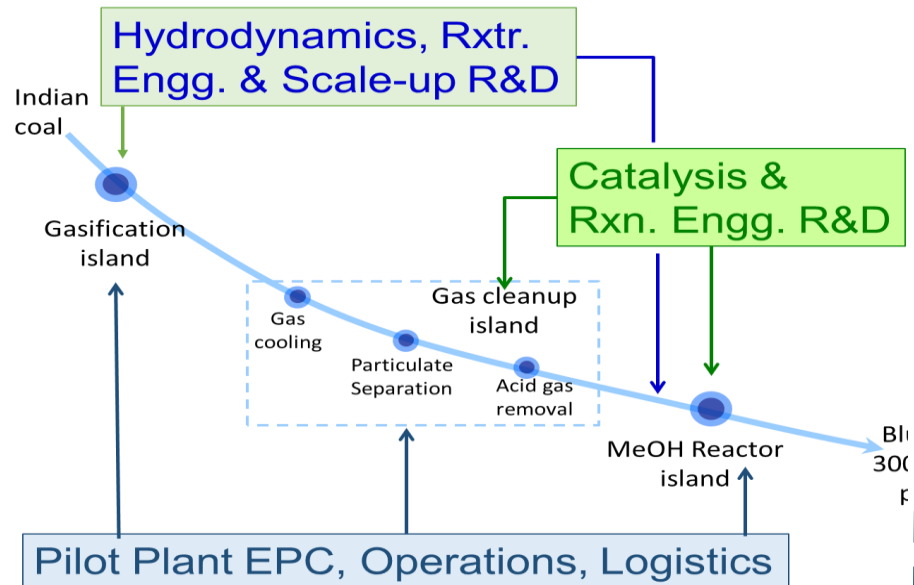


# First batch of Methanol produced at our pilot plant in Pune

- **Gasification Technology:** Oxy-blown Bubbling Fluidized Bed Gasification (medium pressure)
- **Gas clean-up :** Multiple scrubber and guard beds
- **Methanol Reactor:** Fixed bed type (80 bar)
- **Plant capacity:** -1.0 TPD methanol
- **Plant commissioned :** Feb 2022



# Support required for scaling up to 50-60 TPD Coal to Chemical Plant



Pilot demonstration successful

2022



50X  
Scale up



Scale up to 50 TPD plant will require government support to the tune of Rs 500 cr. which can enable capability to produce multiple precious chemicals mainly methanol, ethanol, blue hydrogen, and synthetic diesel

# Appendix



# 3 Decades of Experience in Fluid Bed Boilers

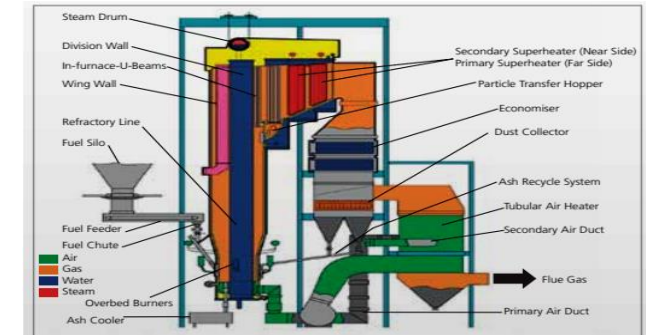
## Fluidized bed Combustor/boiler (AFBC)

Distillery waste : Spent Wash Boilers  
High Alkali fouling fuel

Spent wash boiler

**Open hopper bottom** design of  
AFBC boilers specially for firing  
high alkali biomass fuels

## Circulating Fluidized bed Combustor/boiler CFBC



9 Boilers, (500 tph each)  
100 % Indonesian/Indian Coal/Pet coke

12  
installations

300 TPH  
cum.

45 TPH  
largest

53  
installations

2600  
TPH  
cum.

165 TPH  
largest

30  
installations

6400  
TPH  
cum.

500 TPH  
largest