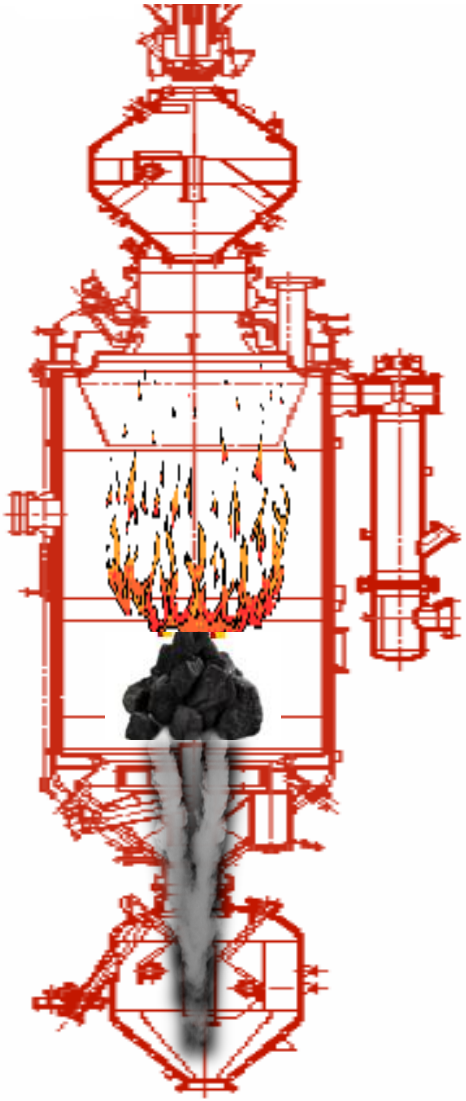
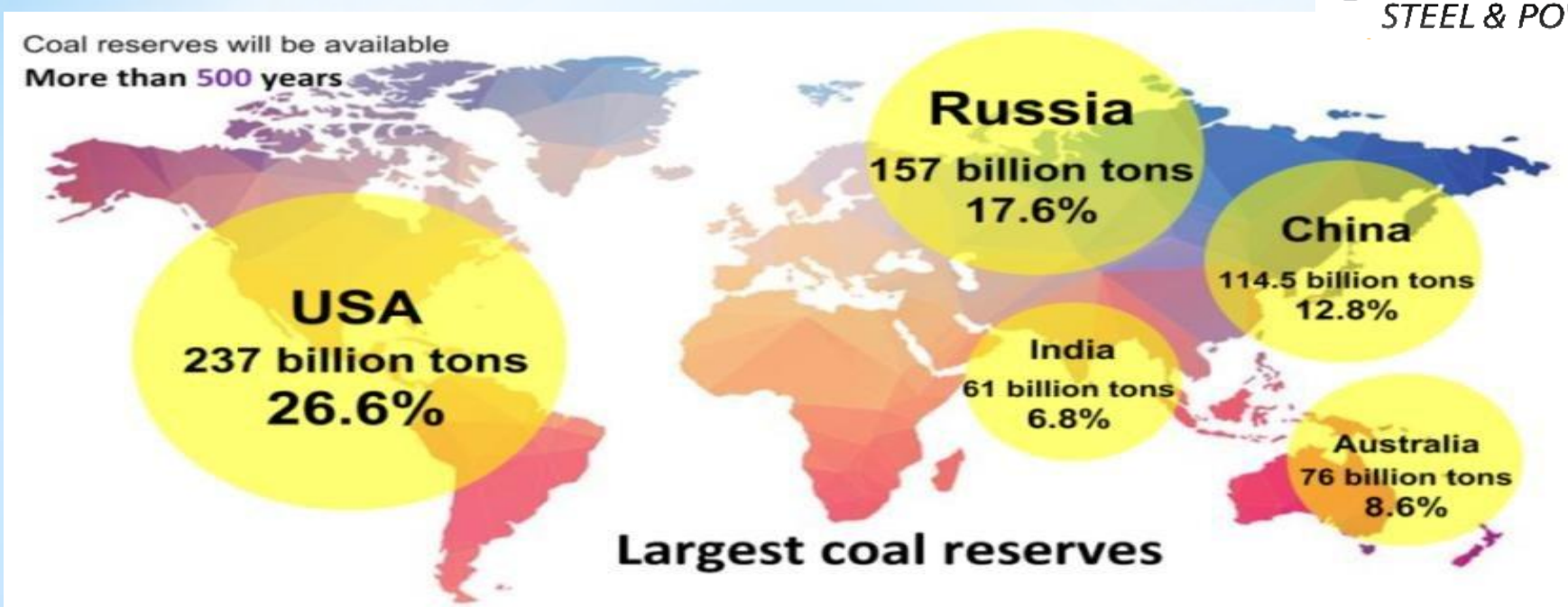


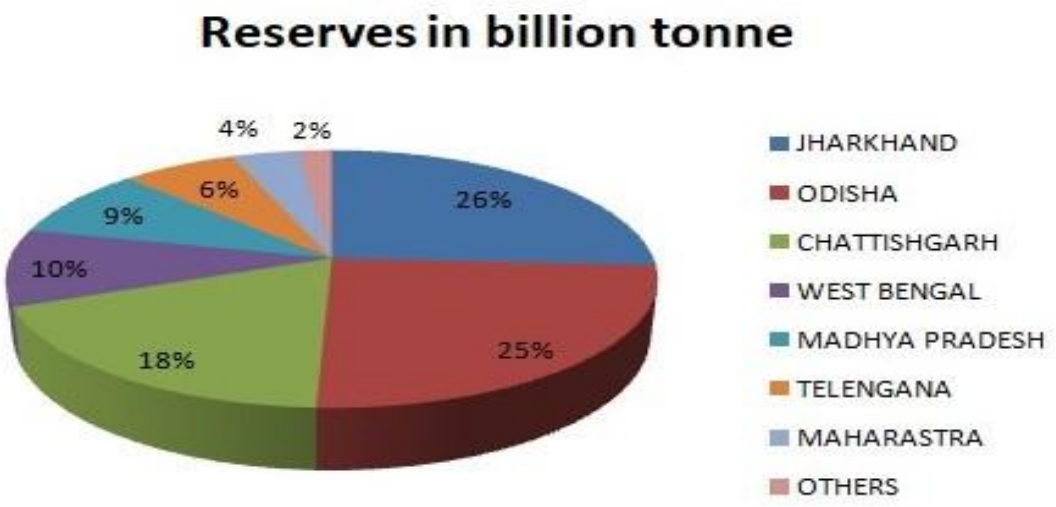
COAL GASIFICATION JOURNEY AT JSPL

PRESENTATION ON 6TH MAY, 2022

Global & Domestic Coal Reserve



Coal reserves in India:
Coal for more than 236 years



Coal reserves concentrated in Eastern India, hence Coal Gasification project based in Angul, Orissa

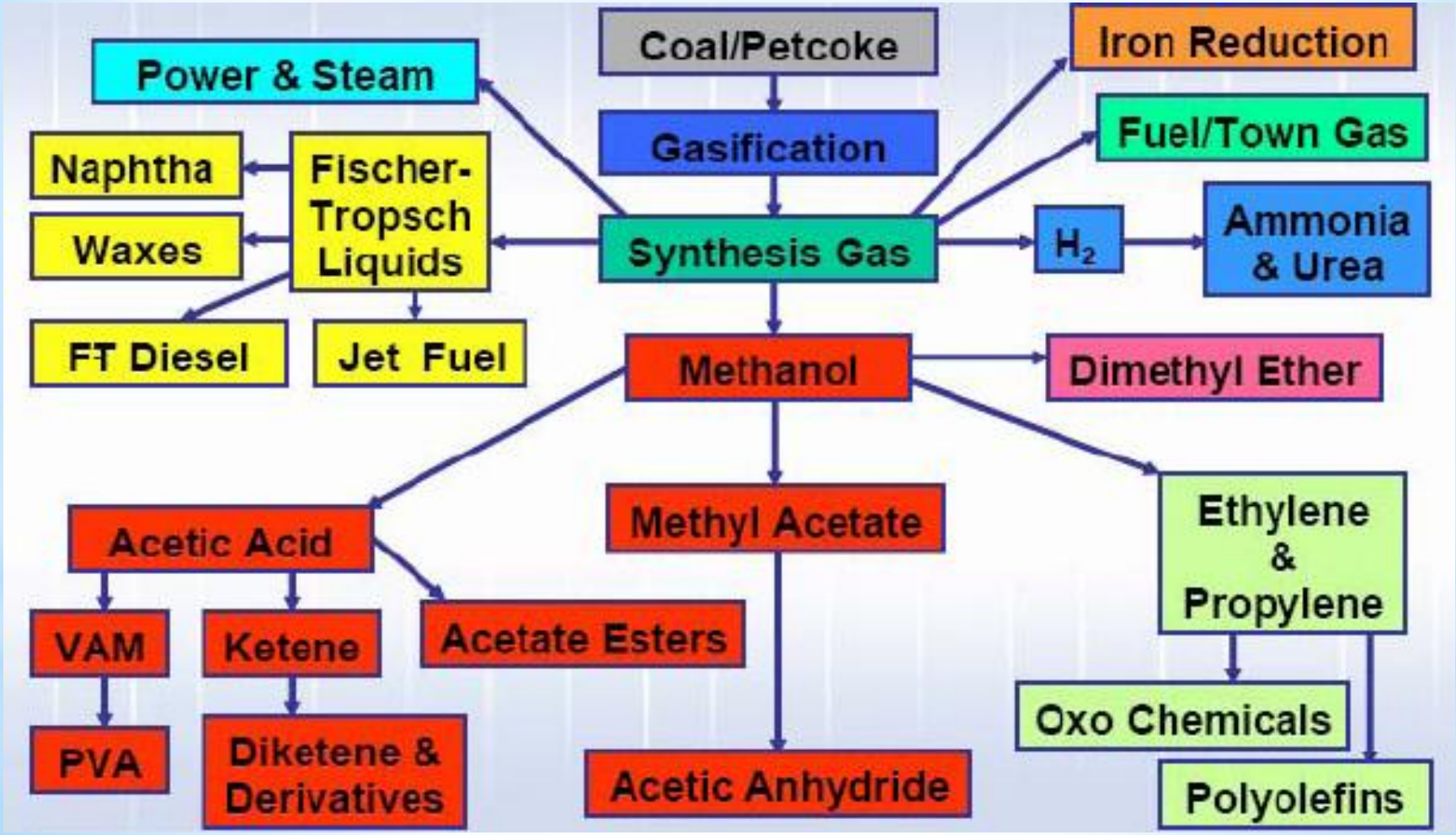
What is Gasification

- Gasification converts any **Carbon** containing material into **Synthesis gas**, composed primarily of Carbon monoxide and Hydrogen
- Uses high pressure combined with **Oxygen** or air & steam to convert carbon based materials directly into **Syngas** by **partial oxidation**
- Gasification process breaks carbon based materials down to the **molecular level,** so impurities can be relatively easily and inexpensively removed

Benefits of Gasification

- Gasification plants produce significantly **low quantities of air pollutants**.
- Gasification can **reduce the environmental impact of waste disposal** because it can use waste products as feedstock - generating valuable products from these waste materials.
- Gasification's **by-products** are non-hazardous & are readily marketable.
- Gasification plants use significantly **less water** than traditional coal-based power generation, and can be designed so they fully **recycle the process water**, discharging none into the surrounding environment.
- **Carbon dioxide (CO_2) is being** captured from an industrial gasification plant using commercially proven technologies.
- Gasification offers the **cleanest**, very efficient means of producing chemicals & electricity from coal and the lowest cost option for **capturing CO_2** .

Gasification – Polygeneration Opportunities



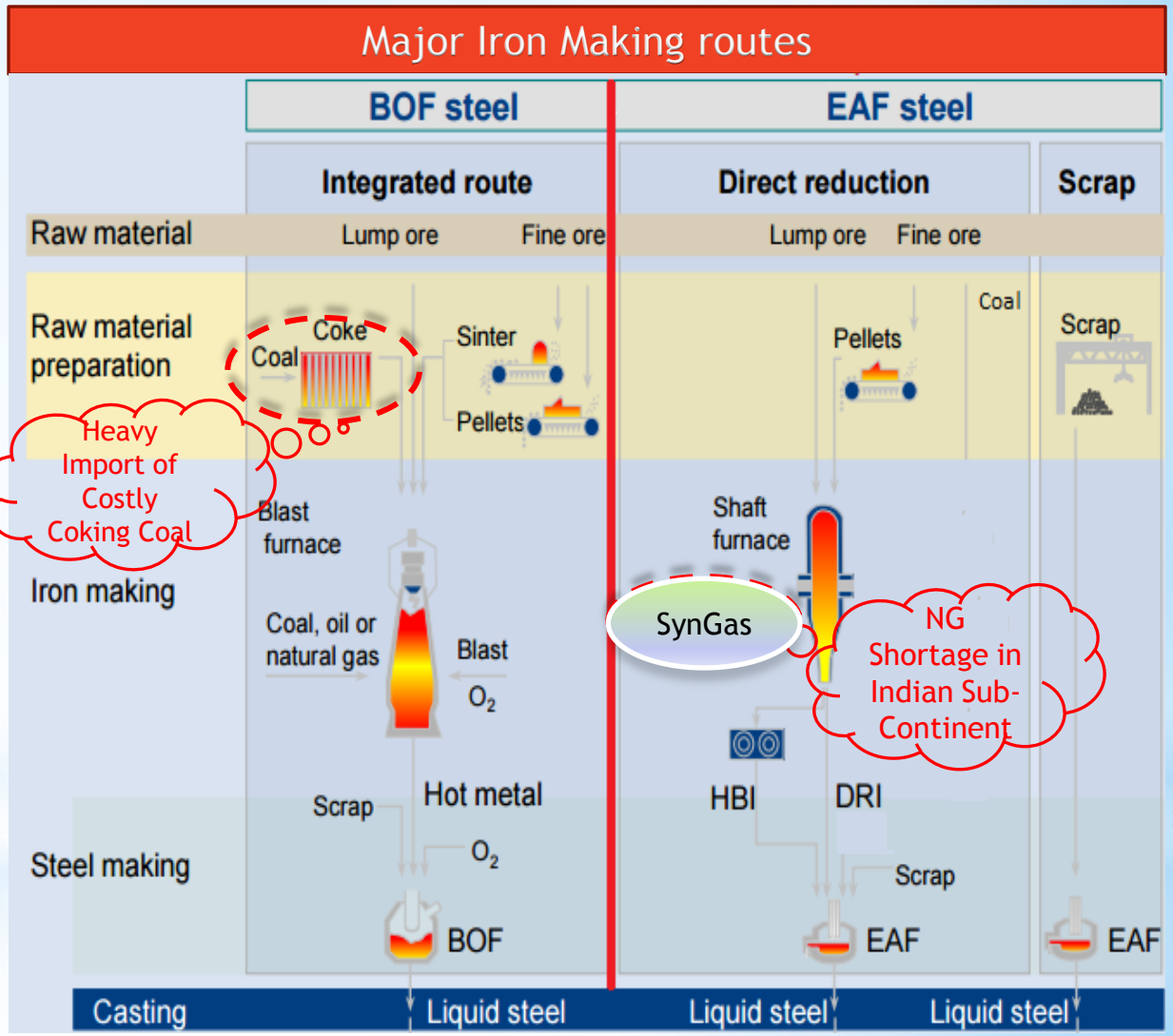
Why renewed interest in Coal Gasification

- Skyrocketting energy prices
- Availability of abundant non-coking coal in India
- Coal is more evenly distributed geographically, unlike oil
- Availability of now matured technology
- Coal gasification is widely used in SA & China and is a success story there

Selection of Coal Gasification Technology

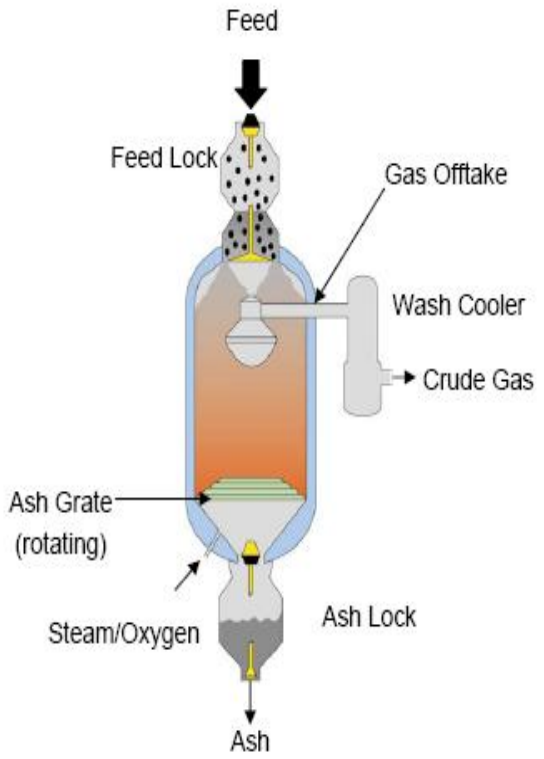
Selection of Coal Gasification Project

1. Both of the Current Clean Conventional Routes of Iron making are dependent on Imports.
2. However, JSPL also being a supporter of “Make In India” Ideology, tried to use non-coking coal in Clean Steel making.
3. Same is abundantly available in India & can be used effectively.



Selection of Fixed Bed Technology

- Well demonstrated, mature and Proven Technology with low risk. More than 100 Gasifiers in operation incl. China.
- Suitable for low Rank, high ash content Coal.
- High Carbon conversion efficiency (approx. 95%).
- High Cold Gas efficiency (85%) due to counter-current operation.
- Low Oxygen consumption.
- Gas Composition suitable for Steel / Fertilizer Industry.
- Ash fusion temperature of Indian Coal is high, therefore, dry bottom type is preferred.
- No Coal drying & grinding required, hence less energy consumption & not hazardous.
- Valuable By-Products like Tar, Oil, Phenol, Ammonia etc.

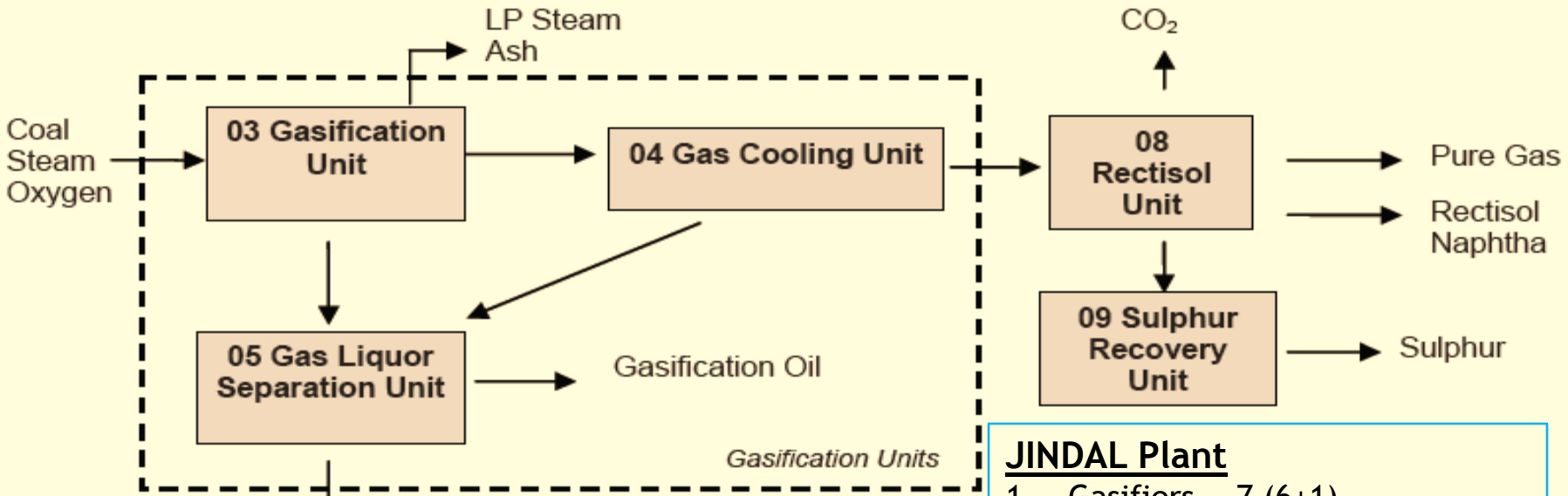


Fixed Bed Dry Bottom Gasifier

Salient Features of Coal Gasification plant, JSPL

- **No of GASIFIERS : 06 + 01**
- **Feed stock : Non coking coal of 34-35% ash**
- **Technology : SLTC, S Africa & Lurgi , Germany**
- **Coal requirement : 270 ton/hr**
- **Syn gas produced : 2,25,000 Nm3/h**
- **Calorific value : 3450 kcal/Nm3**

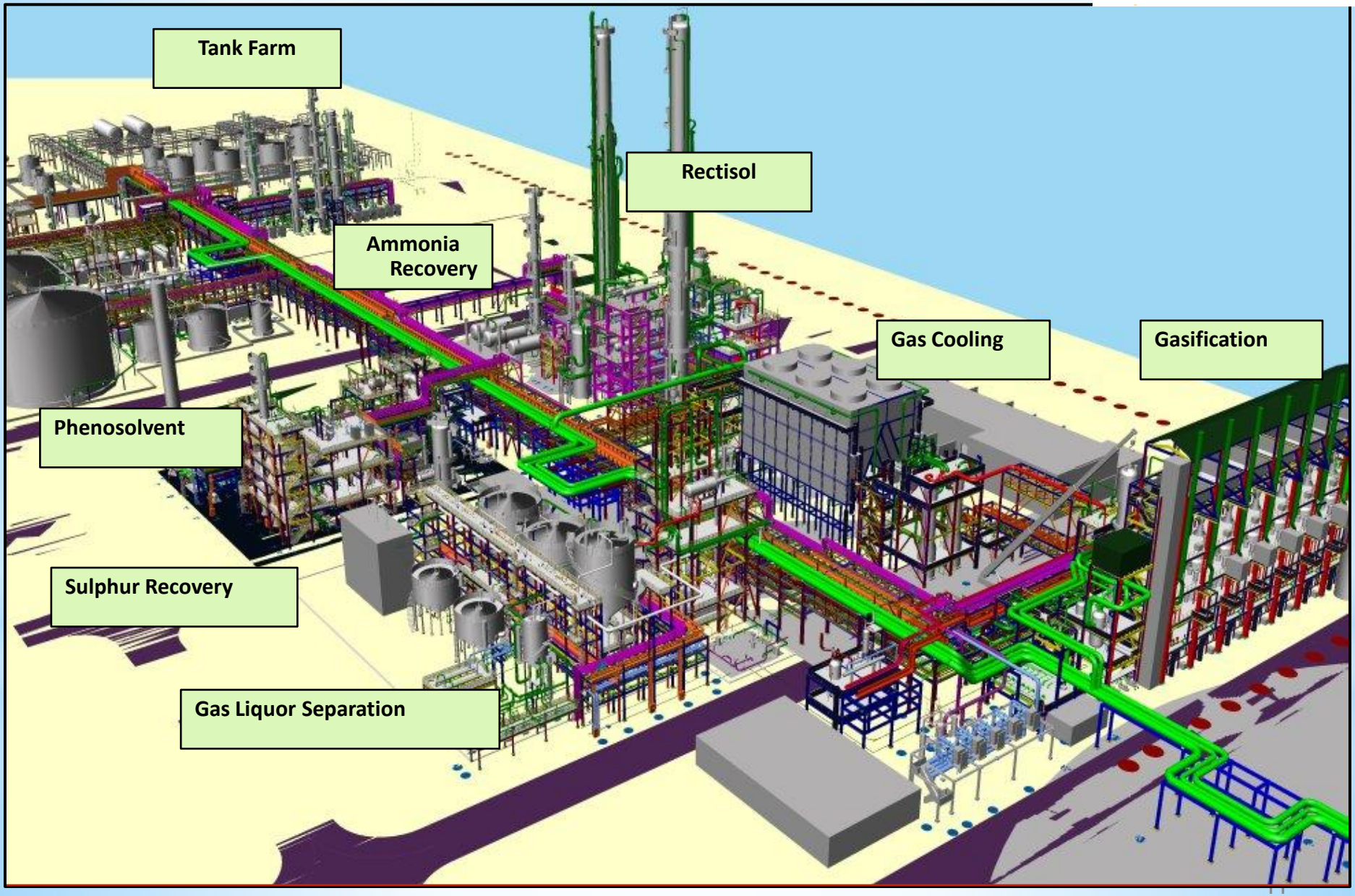
* Syn-gas Production route & Units in CGP



JINDAL Plant

1. Gasifiers - 7 (6+1)
2. Coal Required - 2.4 MMTPA
3. Syn-gas Production -225,000 Nm3/hr.
4. Syn-gas Utilization –
   a) DRI - 160,000 Nm3/hr
   b) Fuel gas – 65,000 Nm3/hr
5. Liquid By-products - 125,000 MTPA.

Coal Gasification Complex at a Glance



Coal Gasification Project Journey

15/05/09
to

31/12/201
3

Gas Cooling Unit

Gas Liquor Separation Unit

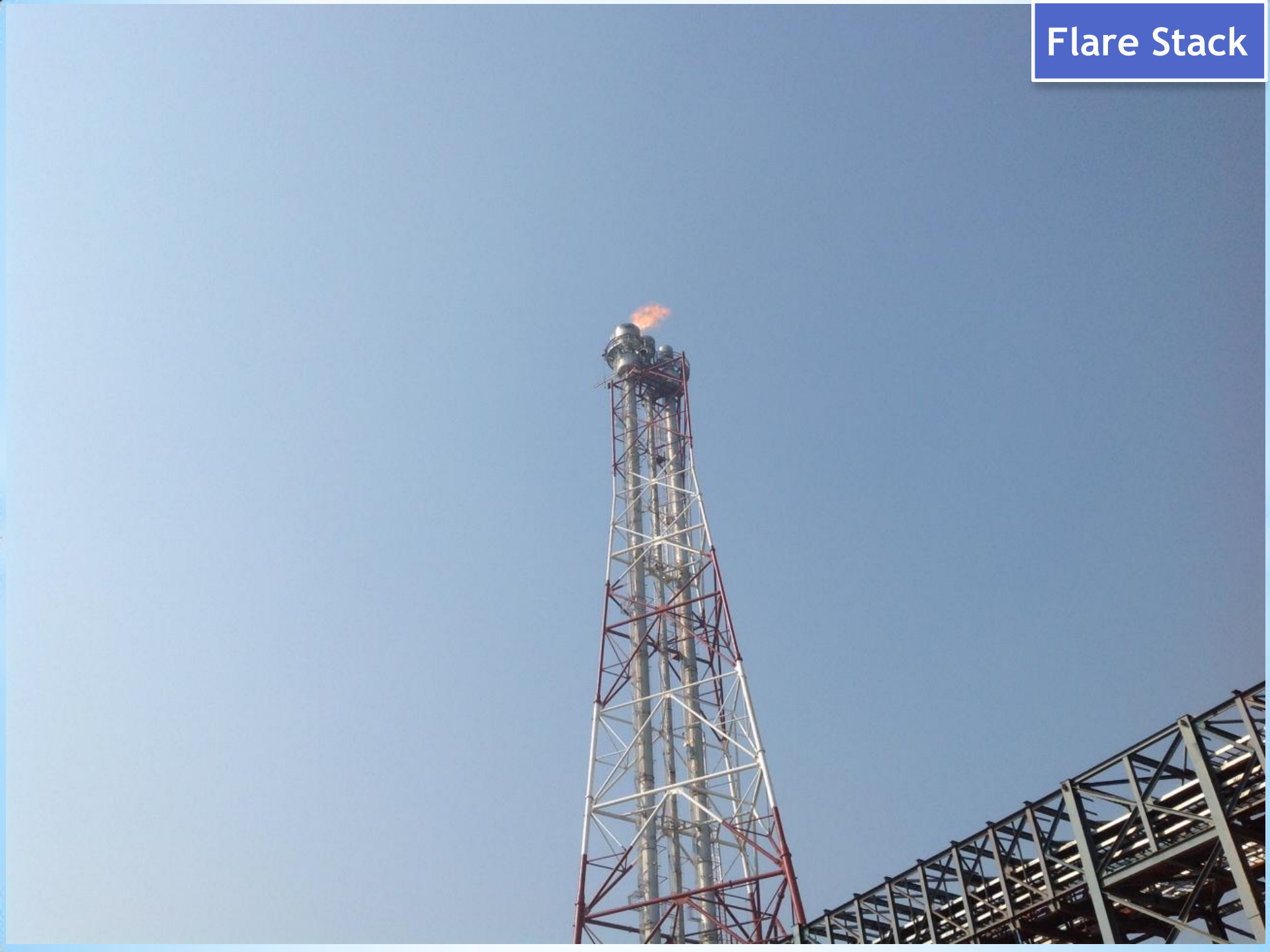

* Rectisol

* Phenosolvan unit

Ammonia Recovery Unit

Sulfur Recovery Unit

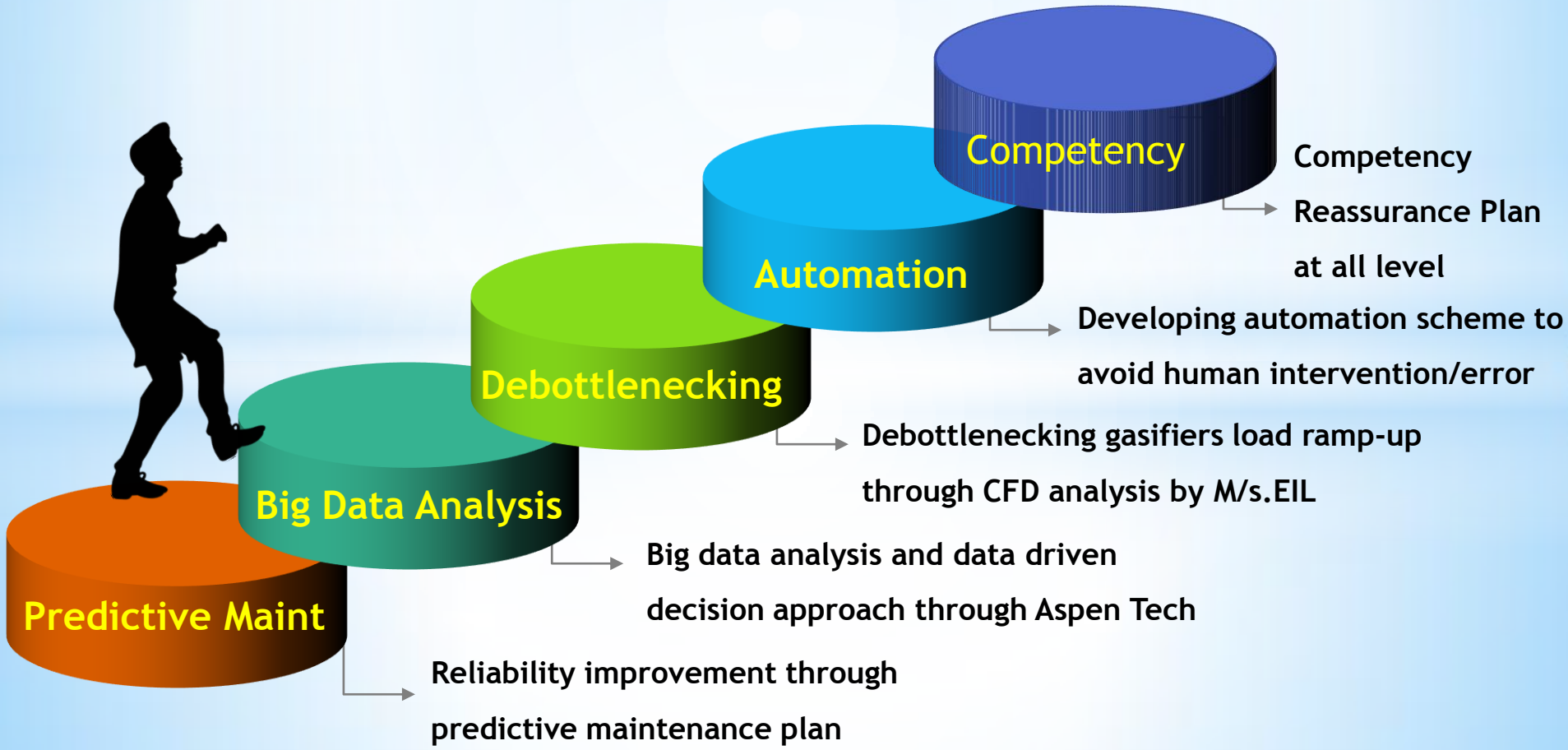
Cooling Tower


Flare Stack

Steps taken for stable operation of Gasification Plant

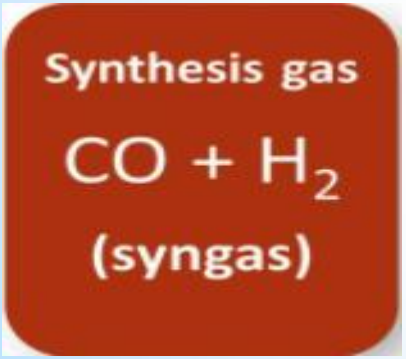
- Establishing **Good Operating Zone** for efficient and stable operation
- **Make in India initiative** by developing facilities at our Machinery Division at JSPL, Raipur for manufacturing gasifier components, cost benefit **Rs 6.5 Cr/Set**.
- **In house competency** developed at CGP Angul for repairing facility for Ash lock top cone, Ash lock bottom cone, Bosman skirt and Angular Valves
- **Coal no-flow detector** based on microwaves installed in coal feeder for **automation cycle**
- Welded plate type heat exchangers replaced with more efficient **corrugated shell and tube type exchangers** for stable operation in ammonia recovery unit

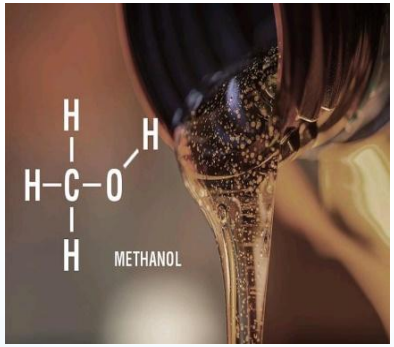
Plan for sustainable operation of Gasification Plant



Carbon Capture and Utilization Initiatives at JSPL

- **Only Steel Plant in India to Capture 2000 TPD Concentrated CO_2**
- Using CO_2 through **Bio reactors** to produce an algae, **Spirulina (Dietary supplement)**
- CO_2 to Bio-Ethanol Pilot Project
- CO_2 to Methanol through Catalytic hydrogenation route
- CO2 to Soda Ash Pilot project
- Steel making (DRI) through **blue hydrogen (Syngas/COG PSA route)**
- Substituting **Coke with Bio-mass**





Thank You