

Perspective on Coal Utilization Technology

21st Annual International Pittsburgh Coal Conference
on 14 - 16 September, 2004

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Agenda

- **About J-Power/EPDC**
- **Example of CCT Application for New P/S**
- **EAGLE Project Progress Report**
- **Potentiality of Coal Gasification Technology**

about J-Power/EPDC

- was established in 1952 based on the Electric Power Development Promotion Law.
- has deployed its business along the national policy and constructed many large power stations.
- **Power Generation Capacity (as of September, 2004)**
Hydro Power : 8,550.5MW (59 stations)
Thermal Power : 7,824.5MW (8 stations)
- was privatized in October, 2003 based on the abolishing the above law.
- **New Communication name of EPDC is J-Power.**

J-Power's Business Domains

Under the key words

“Environment and Energy”

- Domestic Power Supply as a Wholesaler
- Overseas Power Business including
Environmental Protection
- New Business creation using
New Technology

Example of J-Power CCT application

- **The Newest Power Station in J-Power is Shin-Isogo Power station, which is 600MW PCF plant adopting USC(600/610°C, 25MPa) and Dry Activated coke desulfurization.**
- **This Power Station is located at 40km south from Tokyo, it is watched that it is an urban style coal power station.**

Shin-Isogo Unit. 1 Coal fired Power Station

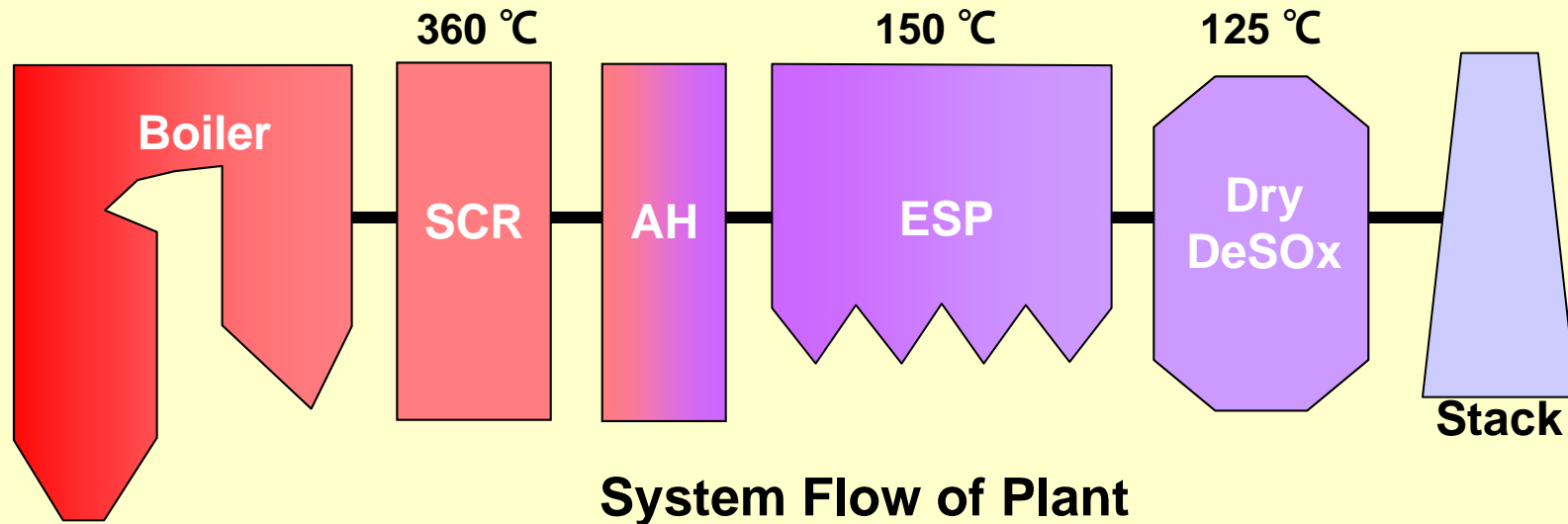


Photo of Shin-Isogo Unit. 1

Requirements for Plant Replacement:

- Due to meet required capacity from grid, it was constructed the capacity over twice.
- In addition, this plant was constructed under the existed plants operation.
- The location is in Yokohama city. It is about 40 km south from Tokyo.
- Required Flue gas emission is the same level as LNG.

Shin-Isogo Unit. 1



System Flow of Plant

Outline of the plant

Commissioning	April, 2002
Gross Efficiency	43%
Capacity	600MW
Steam Condition	25MPa 600/610°C

Emission

Flue Gas
SOx : 24 ppm
NOx : 20 ppm
PM : 10 mg/m ³ N

EAGLE Project

Origin of the Project Name “EAGLE”

Coal **E**nergy **A**pplication for **G**as, **L**iquid & **E**lectricity

means

Multi-Purpose Gasifier

Overview of EAGLE Project

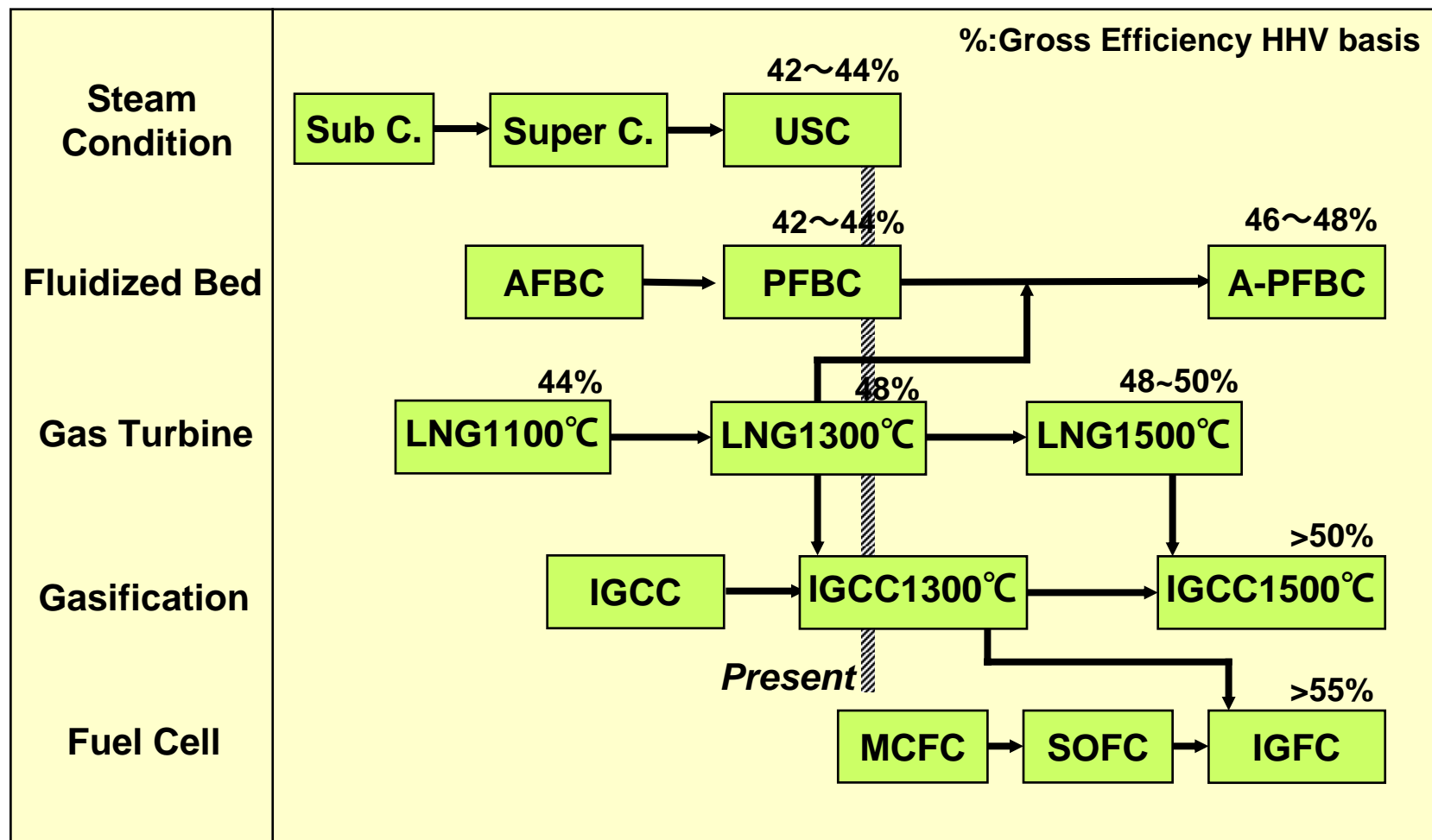
Project Objectives

- Final Target of the EAGLE Project is to toward IGFC, which is combined with Fuel Cell, GT, and ST. It calls triple combined cycle.
- Coal must be converted into an ash-free combustible gas with gasification and clean-up to produce a gaseous handling fuel equivalent to LNG.
 1. Development of Oxygen-blown entrained-flow gasifier
 2. Establishment of Gas cleanup technology for fuel cells

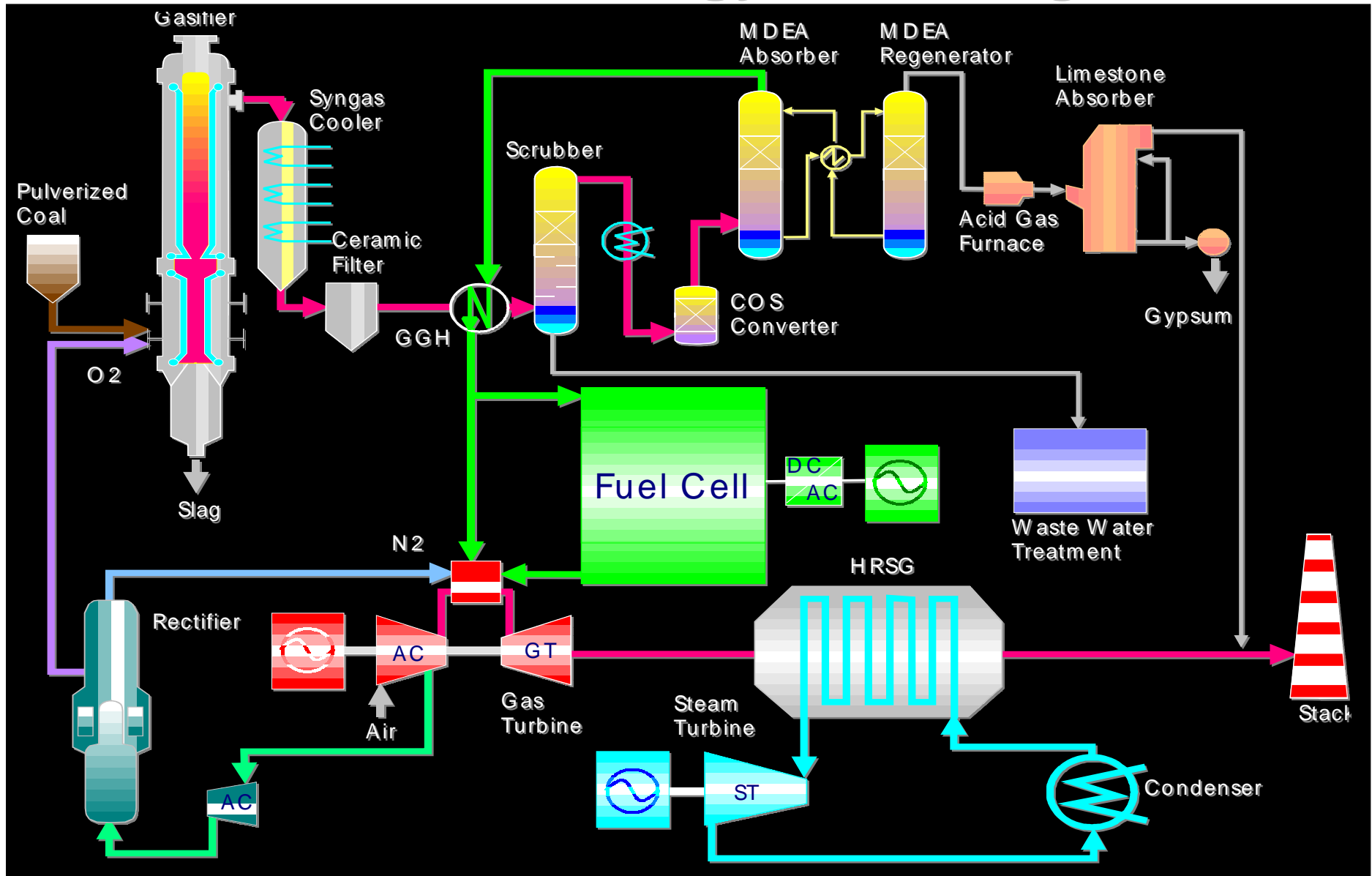
Project Support

- METI & NEDO

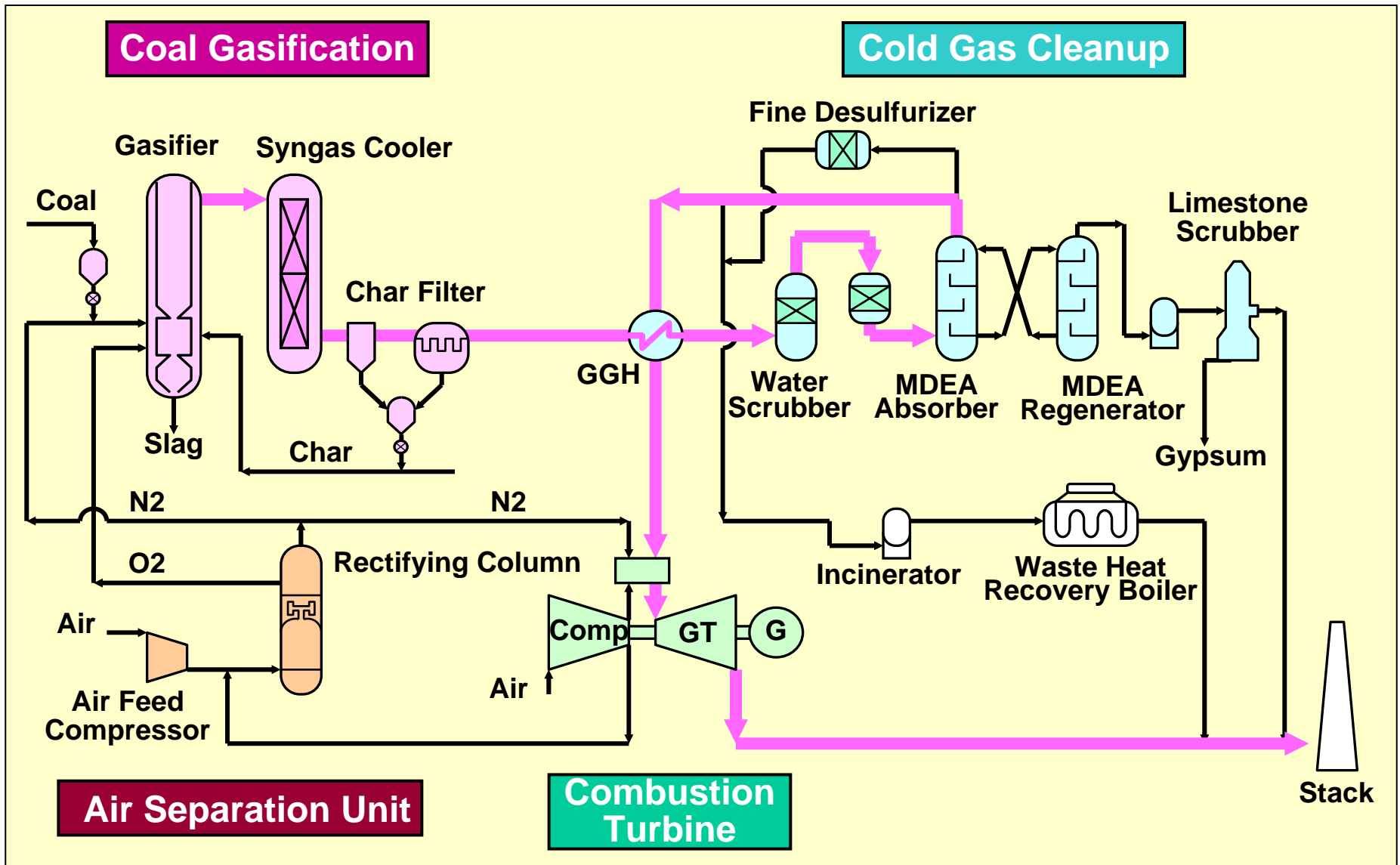
Coal Based High Efficiency Power Generation Technologies



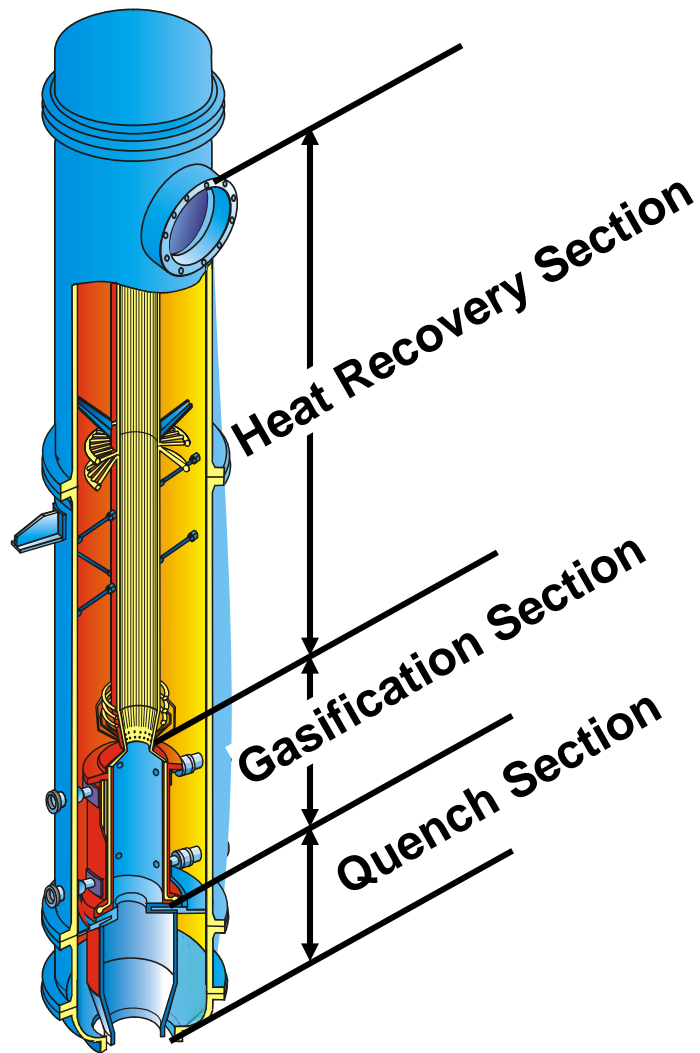
IGFC Technology Flow Diagram



EAGLE pilot plant system flow

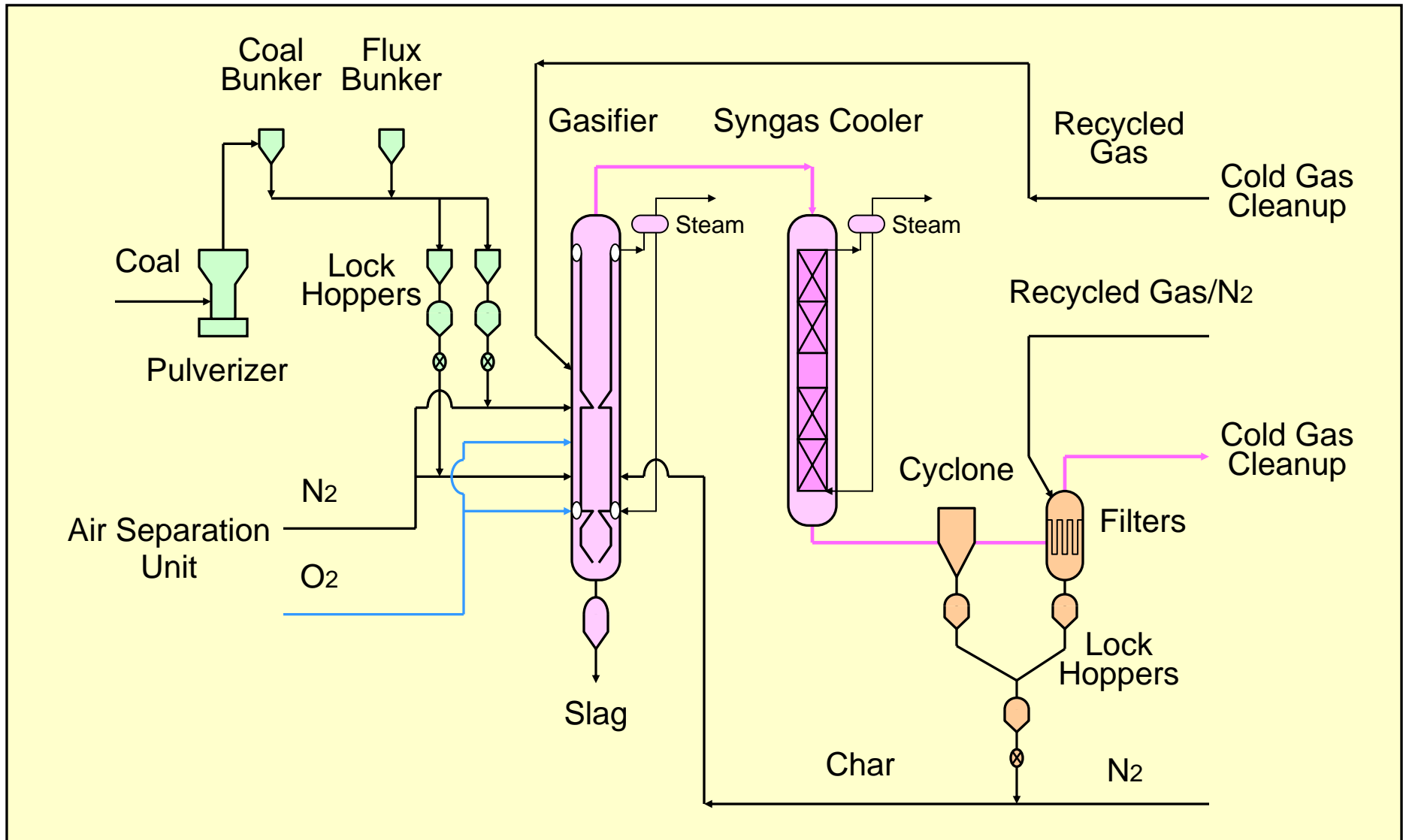


EAGLE Gasifier

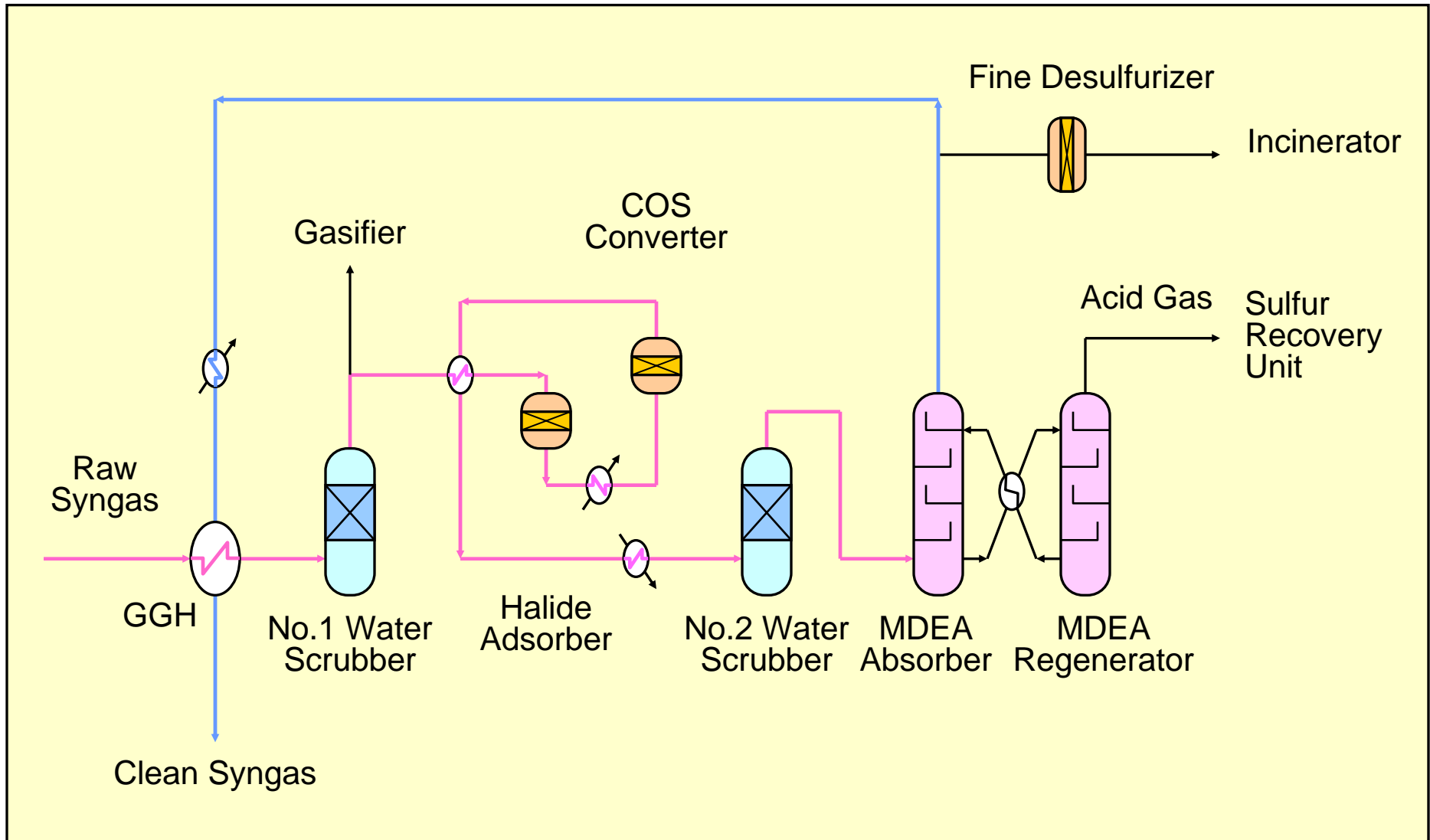


Gasifier Type:
Oxygen-Blown 1 Chamber
2 Stages Spiral Flow Gasifier
Coal Feed Rate: 150 t/d
Gasification Pressure: 2.5MPa

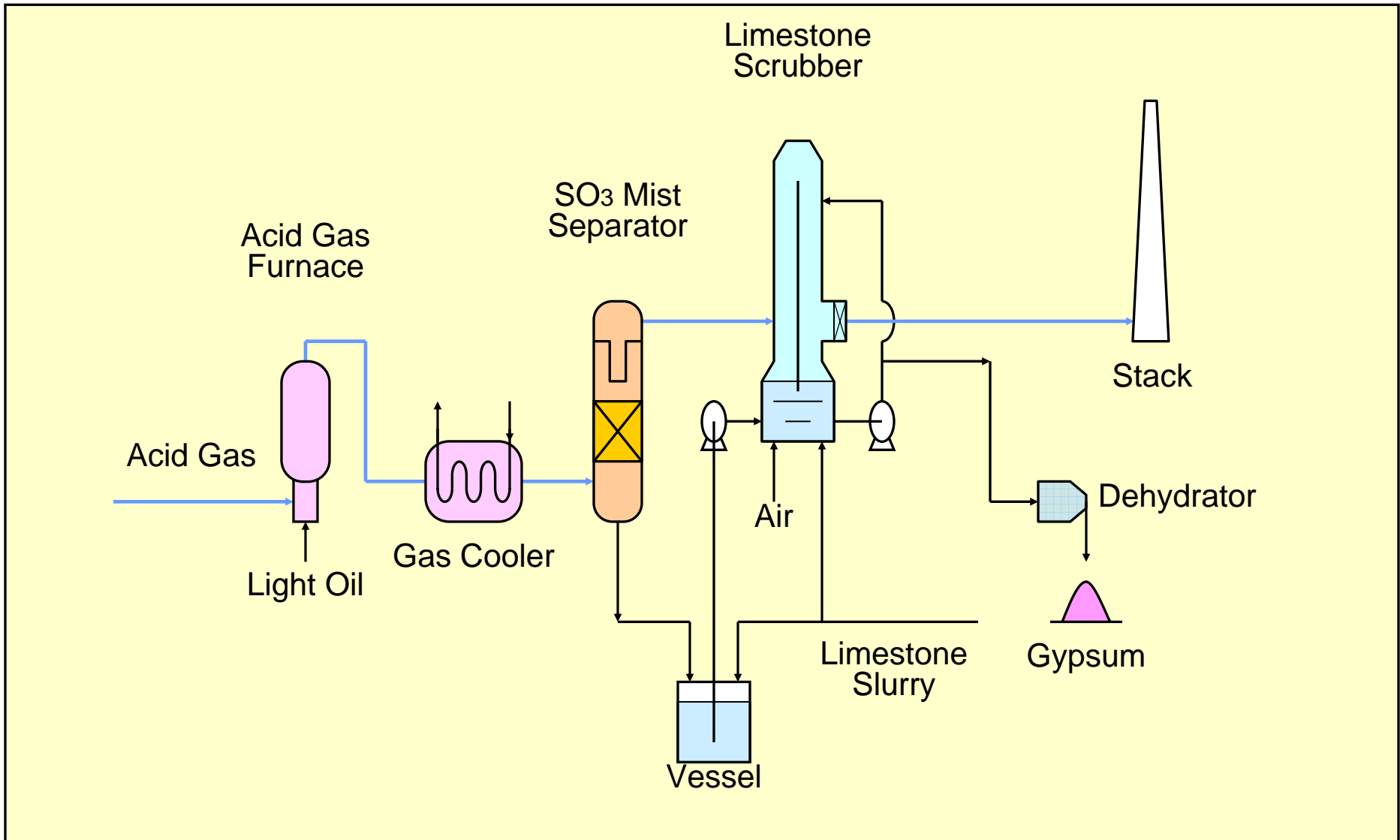
Coal Gasification of the EAGLE Pilot Plant



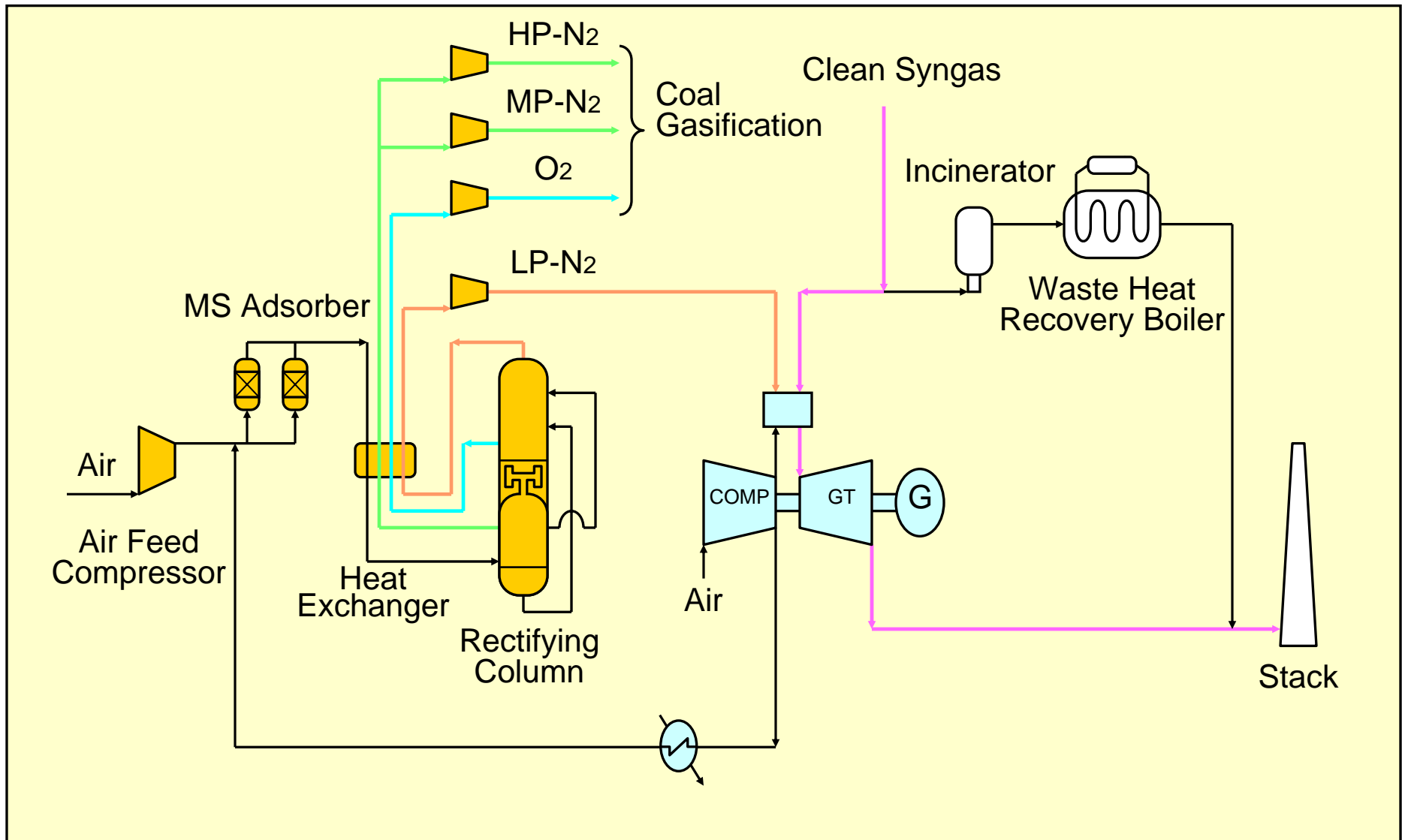
Cold Gas Cleanup of the EAGLE Pilot Plant



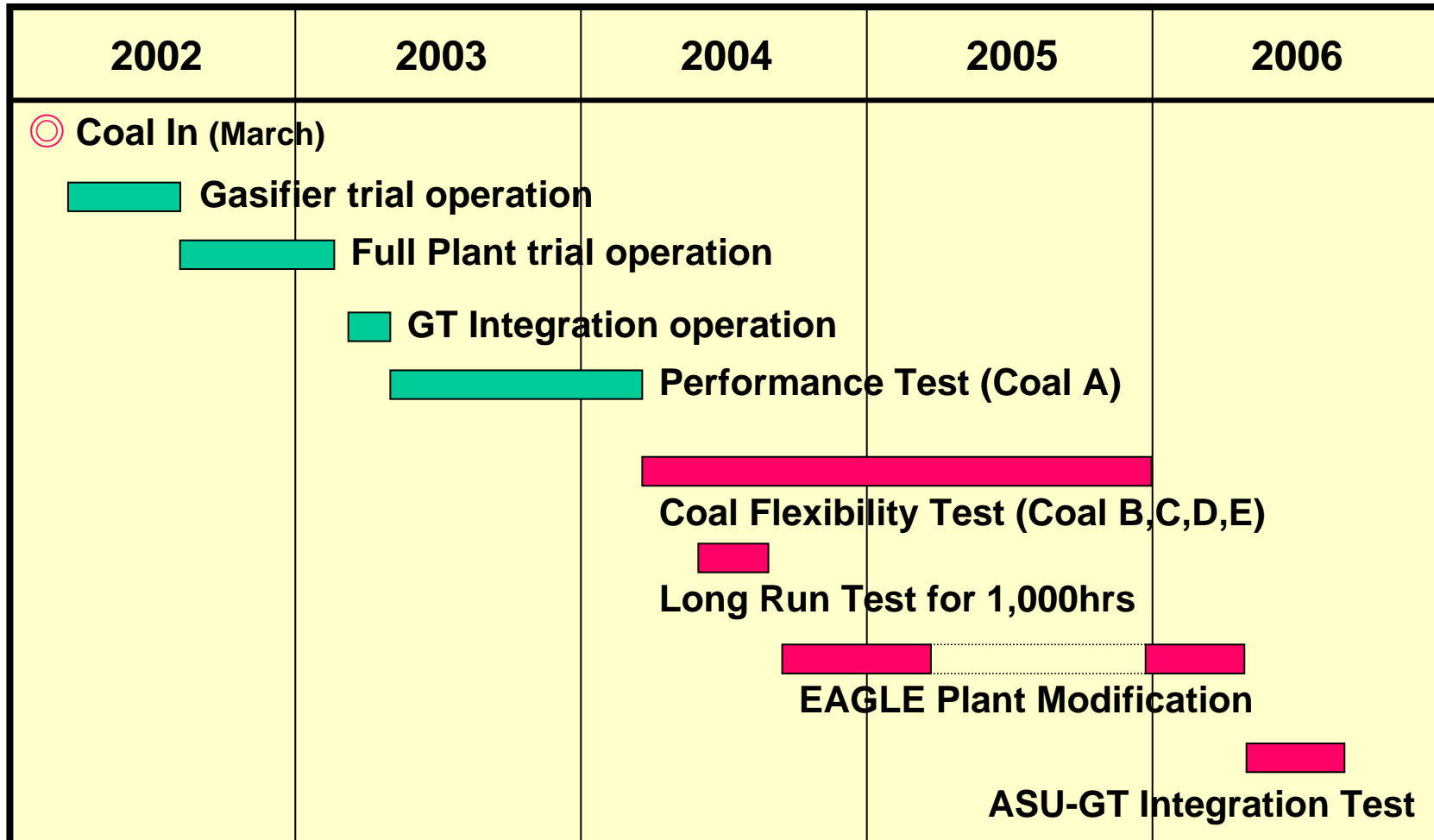
Sulfur Recovery Unit of the EAGLE Pilot Plant



ASU & GT of the EAGLE Plant



Major Test Items during the Operation period



Highlights in 2002 & 2003

After the construction of EAGLE pilot plant, we confirmed as follows;

- Settled on Basic Operation Manual.**
- Confirmed that load change rate 8% of ASU was achieved in the dynamic operation test.**
- Confirmed that we could operate the full plant integration with 100 % plant capacity.**
- Confirmed high efficient dust removal without filter breaking.**
- The volume of quench gas was reduced from initial 50% to 30%.**
- GT was satisfactorily operated with Syngas.**
- 291 hrs continuous operation was achieved.**

Project Targets and Results

Item	Targets	Results
Carbon Conversion Efficiency	>98 %	≥99 %
Cold Gas Efficiency	>78 %	≥78 %
Calorific Value (HHV)	10,000 kJ/m ³ N	≥10,100 kJ/m ³ N
Continuous Operation Time	1,000 hrs	291 hrs
Kinds of Coal	5 kinds	2 kinds
Sulfide Compounds	1 ppm	<0.1 ppm #1
Halogenated Compounds	1 ppm	1 ppm
Ammonia	1 ppm	1 ppm
Particulate Matter	1 mg/m ³ N	1 mg/m ³ N

Total Operation Time : 2,073 hrs
 Total Coal Consumption: 9,547 ton

#1: Outlet of Fine Desulfurizer

1,000 hrs Long Run test will be started soon !

Test Schedule of the EAGLE Project

(1) The Long Run Test is the most important test item in this year to confirm reliability.

We will start the Long Run for 1,000 hrs. soon.

(2) Coal flexibility test is also important test item for the design of the next large scale plant.

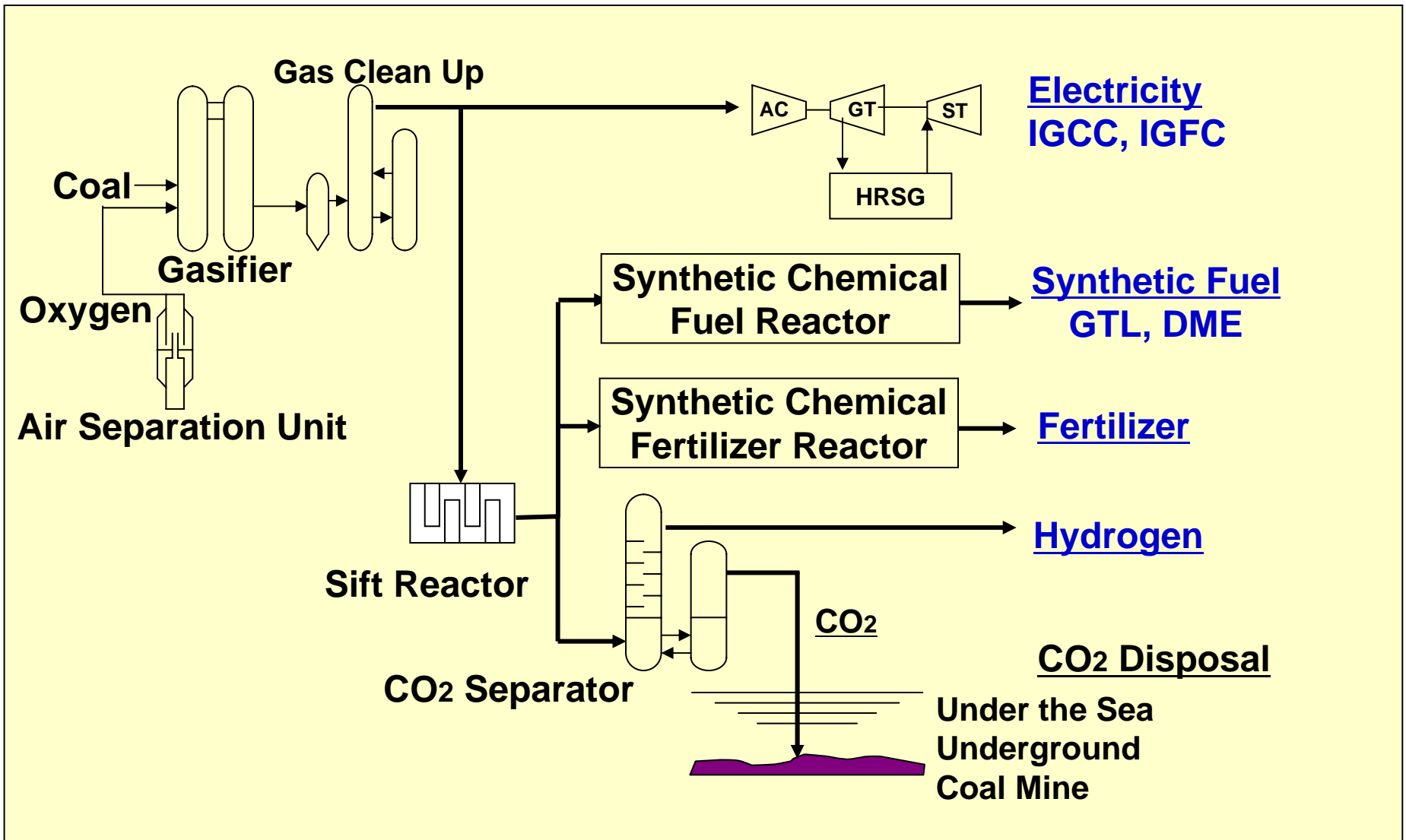
We will test at least 5 kinds of coals including 2 kinds we have already tested.

(3) We are planning to examine the possibility of EAGLE gasifier for scale up. One of the tests is that operation condition such as coal injection velocity, etc. will be changed to obtain the design data.

Potentiality of coal gasification technology

- **CO₂ issue is increasingly getting hot topics, requirement of High Efficiency Technology such as IGCC or IGFC, will be increased in future.**
- **It is necessary to proceed CCT program included outlook of CO₂ recovery and sequestration as a final target.**
- **In this case, Coal Gasification will be Key Technology considering of coal utilization potentiality in future.**
- **Coal Gasification is also possible to apply for NH₃, GTL, and H₂ production, it can be said that the technology expandability is so wide range.**

Potentiality of coal gasification technology



Summary

- Coal Gasification will be **Key Technology** in future.
- J-Power will complete the EAGLE project and create New business internationally using this technology.
- J-Power will proceed the management persisted in coal.