

# GE Energy

## Gasification

Montana's Energy Future Symposium  
October 18-19, 2005

Tim Huskey



imagination at work



# GE Energy



## Products

- Gas Turbines (50 – 500MW)
- Steam Turbines (18 – 1,400MW)
- Wind Turbines (900kW – 3.6MW)
- Hydro Turbines (45 – 800MW)
- Gasification/IGCC



## Aero

- Turbines (5 – 100MW)
- Distributed Power
- Equipment Leasing



## Services

- Contractual Services
- Installation, Inspections & Repairs
- Performance Improvements
- Asset Optimization



## Nuclear

- ABWR's
- Services/Advanced Nuclear Fuel



## Oil & Gas

- Mechanical Drives
- Compressors
- Centrifugal Pumps
- Refinery Reactors
- Pipeline Integrity & Inspections



# GE Gasification



## June 30, 2004

- GE acquires CVX Gasification Technology Combines leader in gasification with leader in power systems

## October 4, 2004

- GE/Bechtel Alliance for 630 MW US IGCC Reference Plant & single point coal-to-power responsibility

## Ongoing Activity

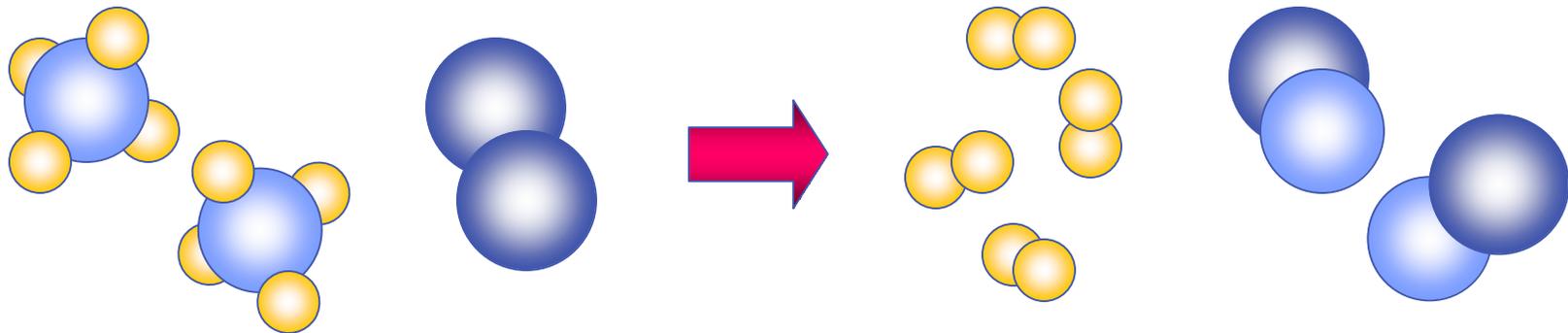
- Working with US utilities for IGCC launch (630 MW Reference Plant – 207FB Power Block).
- New product Initiatives (NPI) and Multi-Generational Product Planning (MGPP) for:
  - Lower capital cost / operating cost
  - Higher RAM
  - Low rank coals
- Polygen – H<sub>2</sub>, chemicals, power & steam, liquids
- Chemical / refinery process applications

# Gasification Fundamentals

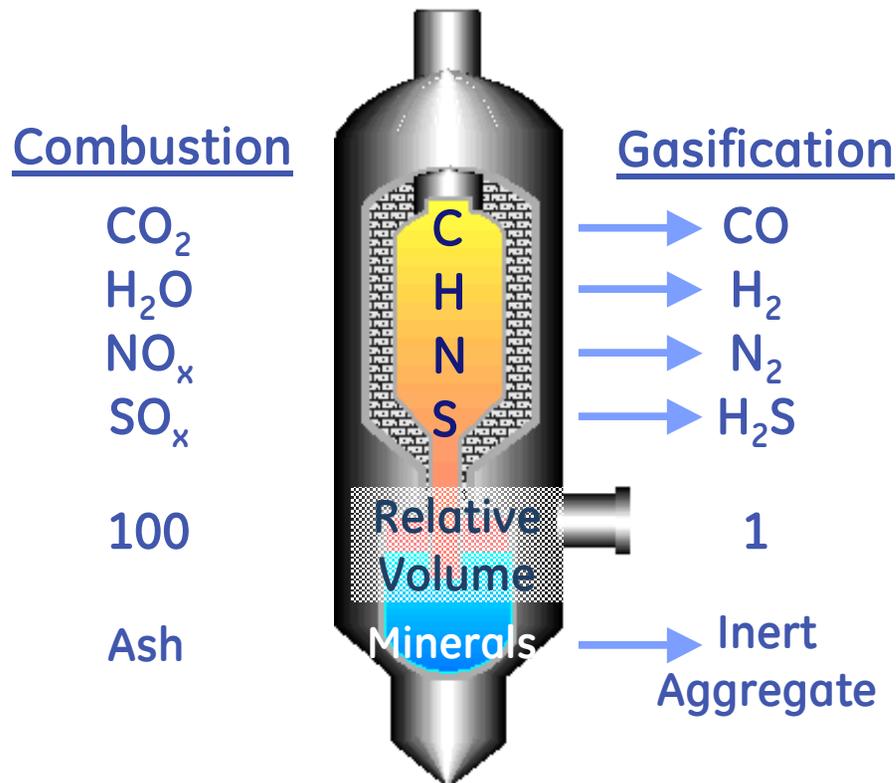
**Gasification is a *partial* oxidation process that can convert any hydrocarbon into carbon monoxide and hydrogen (syngas).**



For example:



# Gasification versus Combustion



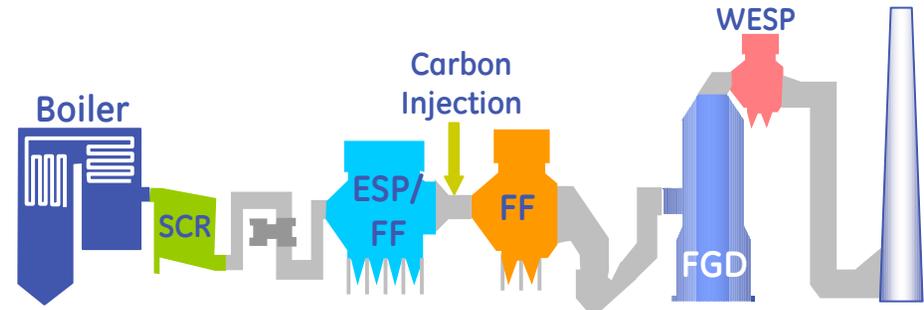
**IGCC** - Syngas fuels a GT combined cycle to generate electric power while producing significantly lower emissions compared to Pulverized Coal plants.

# IGCC - Cleaner By Design

Pollution Prevention

vs.

Pollution Control



**High Temperature, High Pressure, Reducing Conditions**



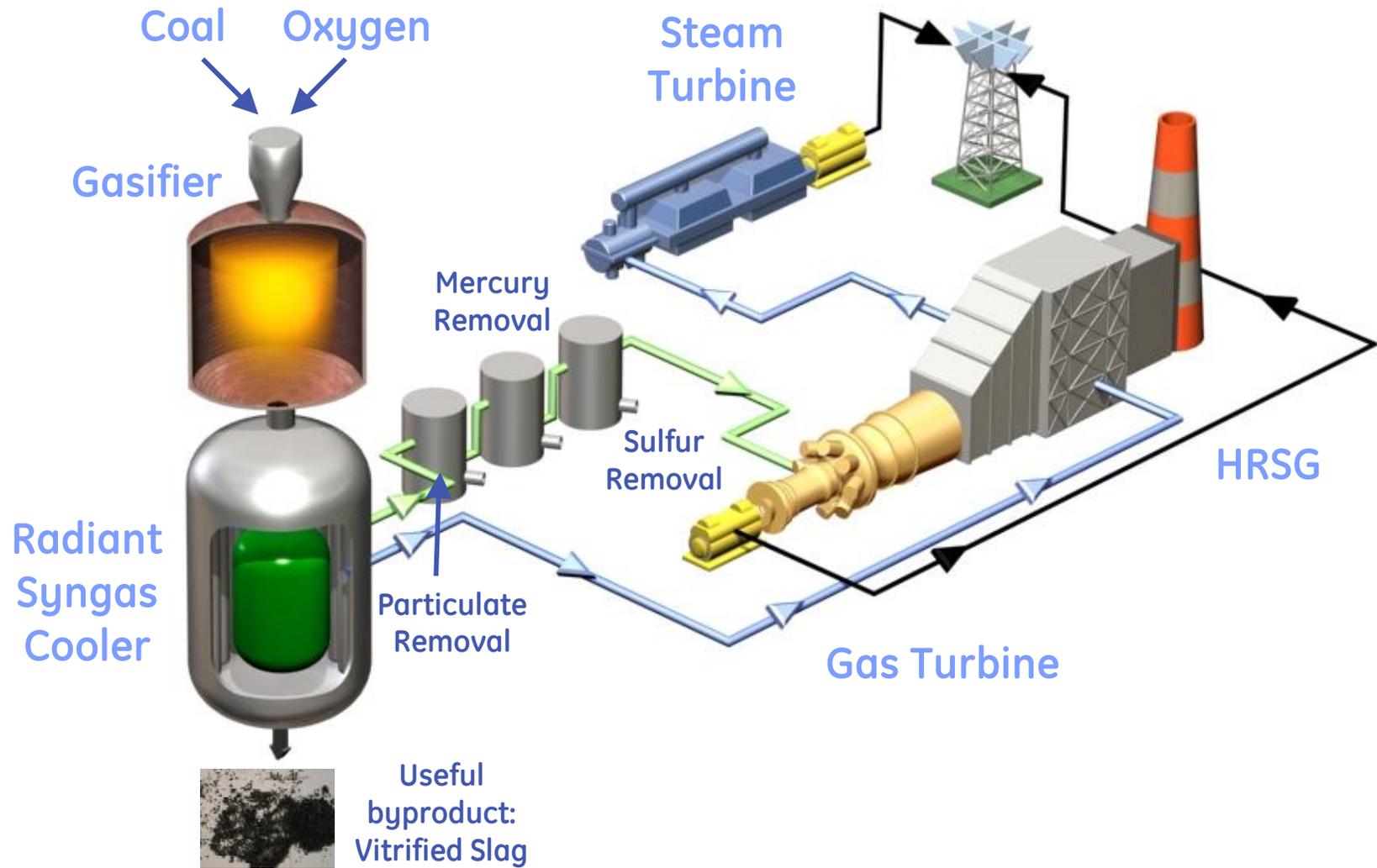
Minerals -> Vitrified Slag (non-leachable)

Sulfur Compounds -> Elemental Sulfur (Valuable Byproduct)

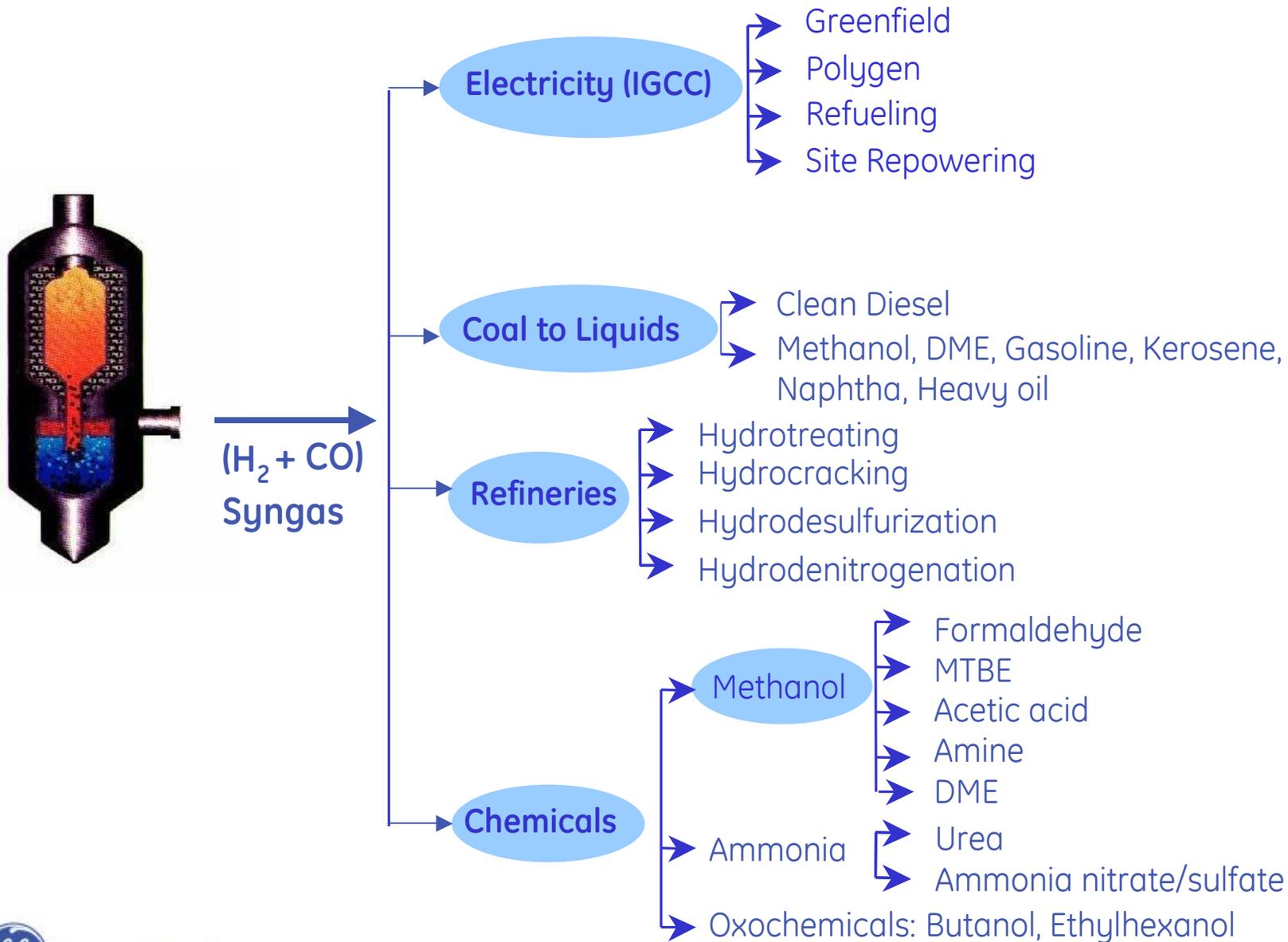
Mercury -> >95% Removal Rate

***Gas Cleanup at High Partial Pressure, Low Volume***

# GE IGCC Process Schematic



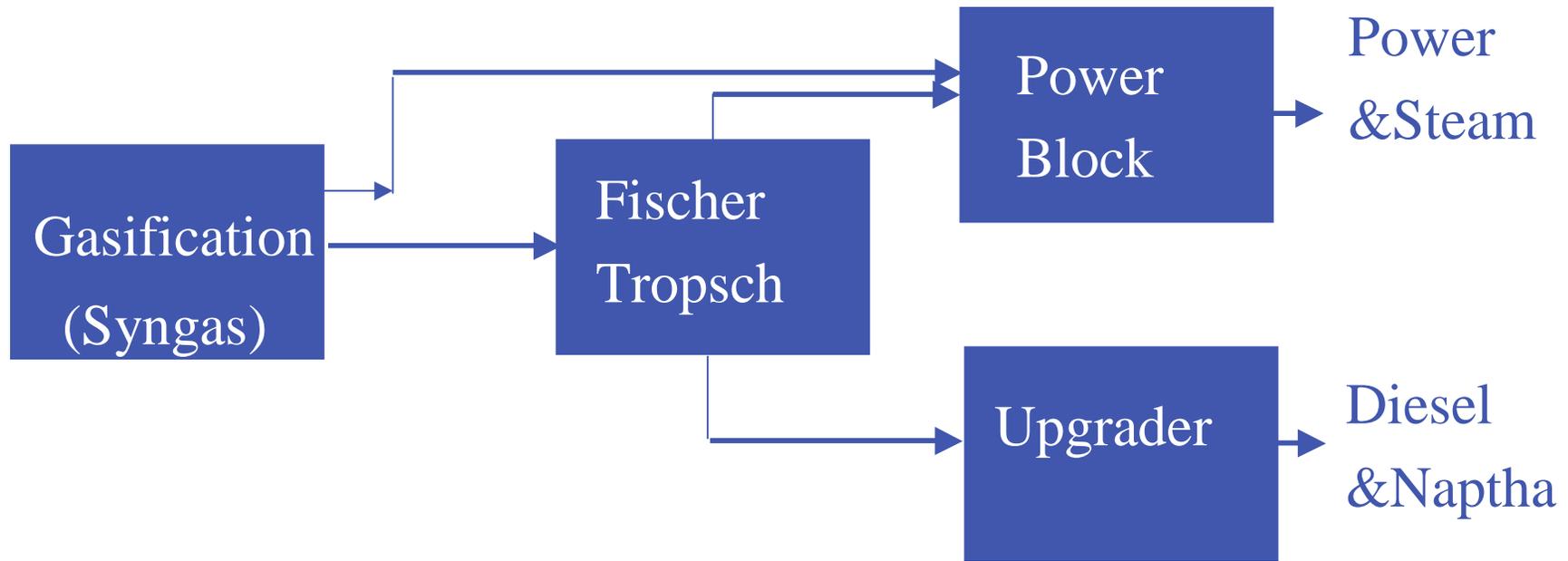
# Deriving Maximum Value From Coal



# GE Coal-to-Chemicals Experience

<u>Location</u>	<u>Feedstock</u>	<u>Product</u>	<u>Commercial Operation</u>
USA	Coal	Methanol/Acetic acids	1983
Japan	Coal/coke	Hydrogen/Ammonia	1984
P.R. of China	Coal	Hydrogen/Ammonia	1993
P.R. of China	Coal	Town gas/Methanol	1995
USA	Coal/Pet Coke	Power	1996
USA	Petroleum Coke	Power	1996
P.R. of China	Coal	Hydrogen/Ammonia	1996
P.R. of China	Coal	Methanol/Acetic Acids	1997
P.R. of China	Coal	Hydrogen/Ammonia	2000
USA	Petroleum Coke	Hydrogen/Ammonia	2000
USA	Fluid Coke	Power & Steam	2001
P.R. of China	Coal	Hydrogen/Ammonia	2004

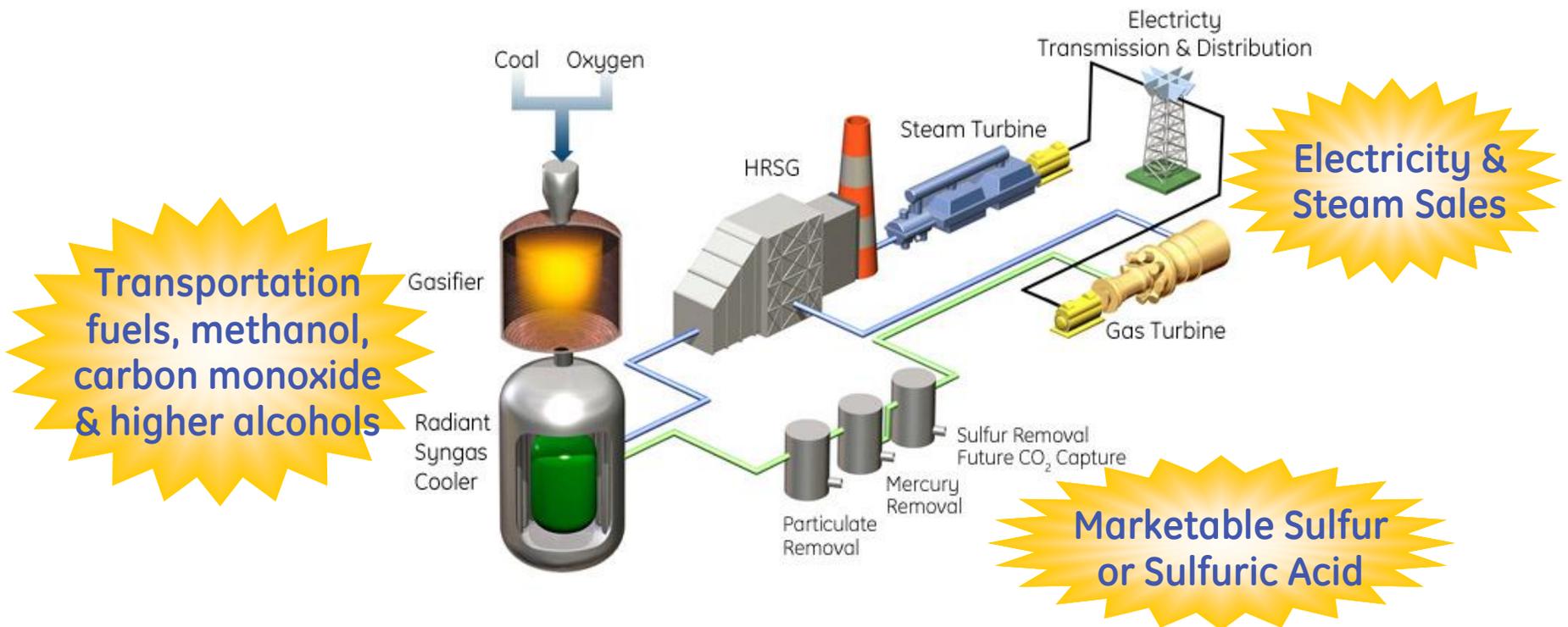
# Fischer-Tropsch Liquids Production



Coal ————— to —————> Liquids

# Flexibility for Additional Value

- Produces power and hydrogen, fertilizer, methanol, ammonia and transportation fuels
- Generates maximum value from coal



# Resources for Technology Innovation

**Global Research  
Center Headquarters**  
Niskayuna, New York



**Global Research  
—Europe**  
Munich, Germany



**John F. Welch  
Technology Centre**  
Bangalore, India



**China  
Coal Center of  
Excellence**  
Shanghai, China



# GE's Corporate Commitment to Gasification/IGCC

- > Acquisition of CVX Gasification
- > Resource hiring (2x)
- > Increased development budget by 15x
- > Sustained long-term product development
- > Technology synergies



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