Western Regional Air Partnership
Salt Lake City, Utah
April 5, 2006

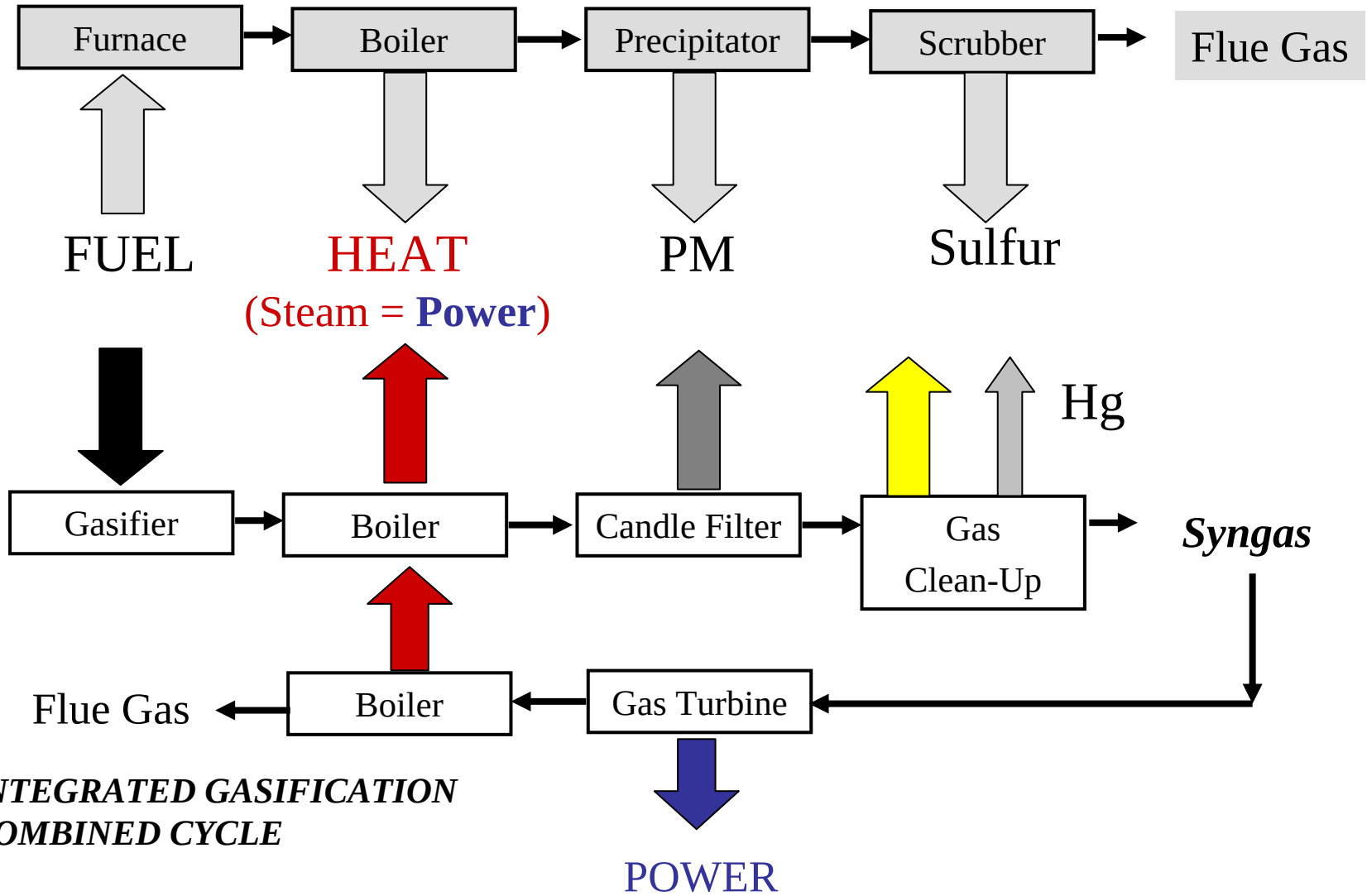
Can IGCC Work in the West?

Phil Amick, Technology Director Gasification

ConocoPhillips

E-Gas™ Technology for Gasification

CONVENTIONAL COAL POWER GENERATION



INTEGRATED GASIFICATION COMBINED CYCLE

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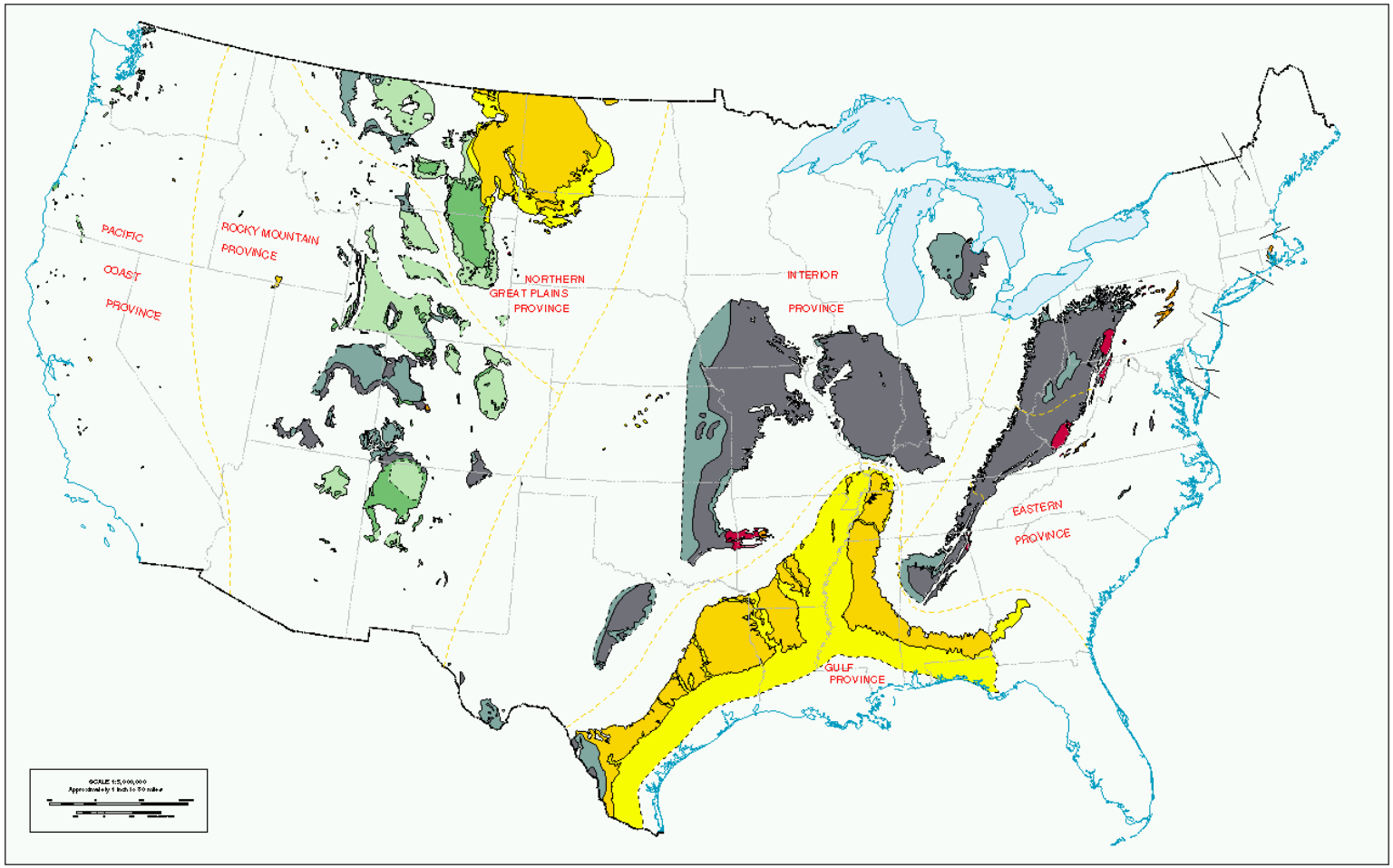
U.S. Coal Resource Regions (Lower 48)



Source: Energy Information Administration

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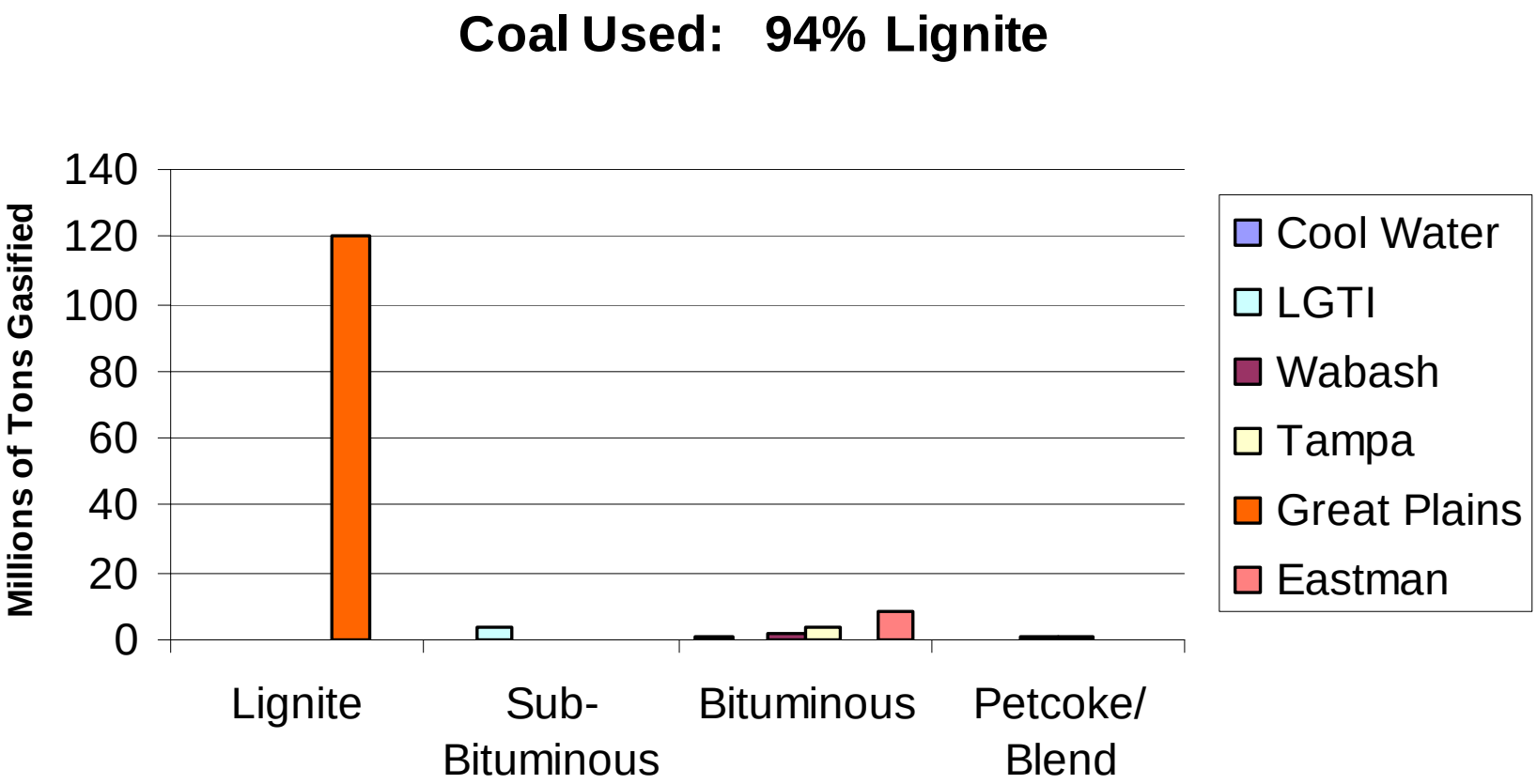
Coal - THE US Energy Resource

- Demonstrated Reserves
  - 508 B tons (275 B tons recoverable)
  - 185 B tons (36%) Sub Bituminous
- Current Annual Production (2004)
  - 1.1 B tons
  - 0.37 B tons (34%) Sub Bituminous
- Electric Utility Consumption (2004)
  - 1.0 B tons (>90%)

Source: Energy Information Administration & National Mining Association

Modern Era Coal Gasification – Power & Industrial



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Source: Gasification Technology Council

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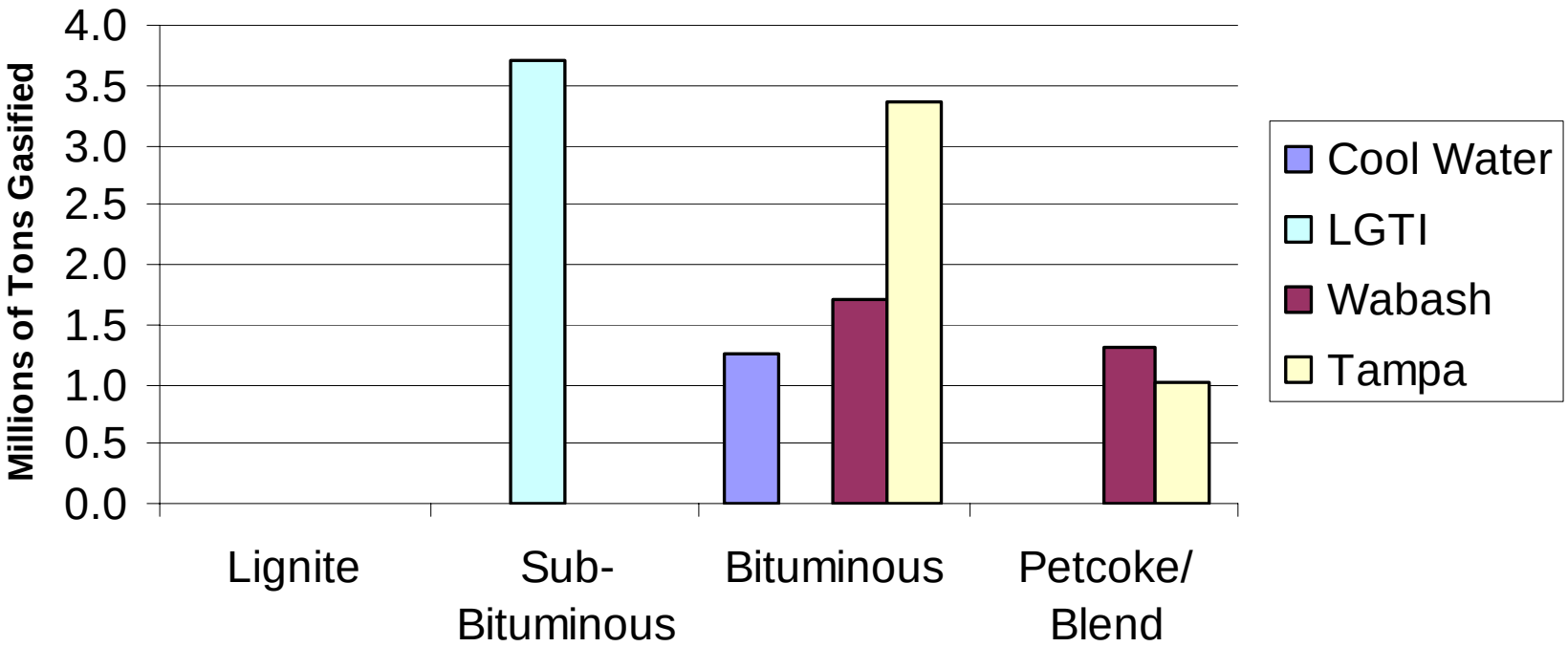
U.S. Coal-to-Power Gasification

Coal Used: 37 % Sub-Bituminous - 63% Bituminous



E-Gas™ Technology for Gasification

Source: Gasification Technology Council

ConocoPhillips

LGTI – Louisiana Gasification Technology, Inc

One Third of the Coal-to-Power Gasification in U.S.

- 2400 tpd Sub Bituminous coal feed
- Commercial Operation 1987 – 1995
- Processed 3.7 MM tons
- Fueled (2) Siemens SGT6-3000E GTGs (a.k.a W501D5)

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Feed Design Considerations

Attribute	Impact	Mitigation [1]
Moisture	High moisture = lean Slurry (50-55%)	Slurry heating plus FSQ in 2 stage gasifier improves HR
Sulfur	Low Sulfur = lean acid gas	Selexol ™ provides high CO_2 selectivity
Ash	Slag quantity	N/A – high ash degrades HR, low ash requires flux addition
Slurryability	Moisture limits slurry concentration	N/A - (ALS and feed drying are not economical)
T_{250}	Determines 1st stage operating temperature	N/A – High value requires flux addition
Fixed Carbon	Determines feed rate & RXR sizing	N/A - “spike” with petcoke
Oxygen	Determines ASU size	N/A – (high O2 reduces ASU size)

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Notes:
[1] N/A indicates mitigation not applicable to /required for Sub Bituminous feed

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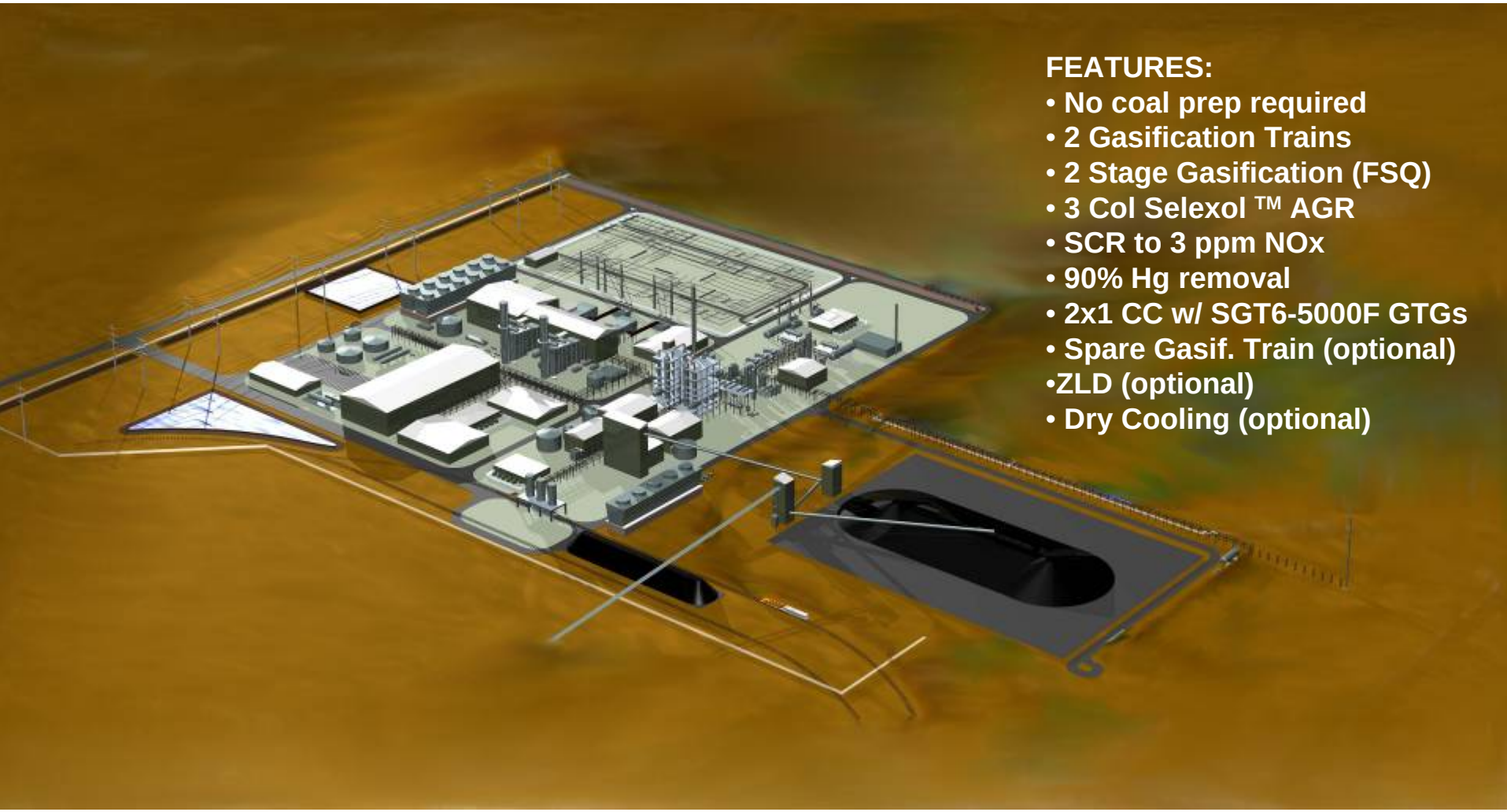
600 MW Sub Bituminous IGCC Design Template



FEATURES:

- No coal prep required
- 2 Gasification Trains
- 2 Stage Gasification (FSQ)
- 3 Col Selexol ™ AGR
- SCR to 3 ppm NOx
- 90% Hg removal
- 2x1 CC w/ SGT6-5000F GTGs
- Spare Gasif. Train (optional)
- ZLD (optional)
- Dry Cooling (optional)

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3D Rendering Provided by Fluor/Siemens/ConocoPhillips

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600 MW Sub Bituminous IGCC Case Description

	Midwest	Mine Mouth
Site Conditions	500 ft, 50 F avg. amb.	5,000 ft, 45 F avg. amb.
Q Coal (AR, HHV), Btu/lb	8,340	
Composition:		
Carbon (dry basis), wt%	69	
Sulfur (dry basis), wt%	0.5	
Ash (AR), wt%	5	
Moisture (AR), wt%	30	
Acid Gas Removal	3 Col. Selexol ™	
Steam Conditions psig/F	1800/1050/1050	
Heat Rejection	Cooling Tower	Air Cooled
GTG Emissions Control	15 ppm NOx (diluent) plus SCR	
Process Wastewater	SW recycle via R.O.	SW recycle + ZLD

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600 MW Sub Bituminous IGCC Estimated Plant Performance

	Midwest	Mine Mouth
Feed Rate, tpd (AR)	8,300	7,300
Oxygen, tpd (95% vol)	4,700	4,100
Gross Power, MW	780	670
Aux. Power, MW	130	120
Net Power, MW	640	560
Net H.R., Btu/kWh (HHV)	9000	9,100
Emissions [1]:		
NO_x, lb/MMBtu	0.02	
SO_2, lb/MMBtu	0.01	

Notes:
[1] Target permit levels

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600 MW Sub Bituminous IGCC Plant – Indicative Economics

Economic Parameters

	Midwest	Minemouth
EPC Cost, $MM [1]	935-1130	870-1050
Owner's Costs, $MM [2]	70	150
Annual O&M, $MM [3]	40	40
Availability, % [4]	80-85	80-85

Notes:

1. ISBL, overnight cost, 3Q05$ (includes 20% P&C)
2. OSBL costs: transmission, permitting, FEED, license, land, etc.
3. O&M (non-fuel) calculated at 4% of EPC
4. Two gasification trains, no spare

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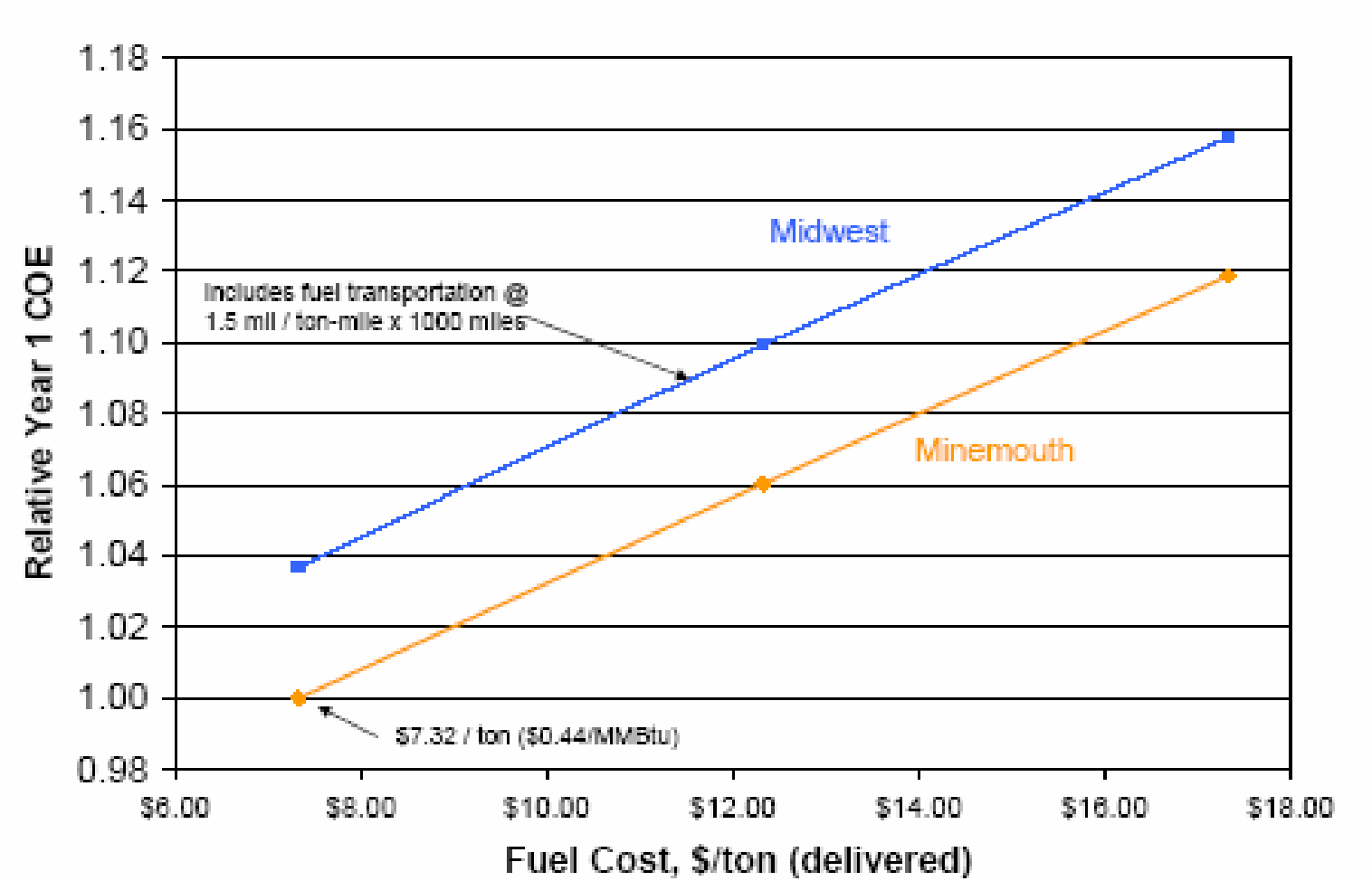
COE vs. Fuel Cost ($2010)



E-Gas™ Technology for Gasification

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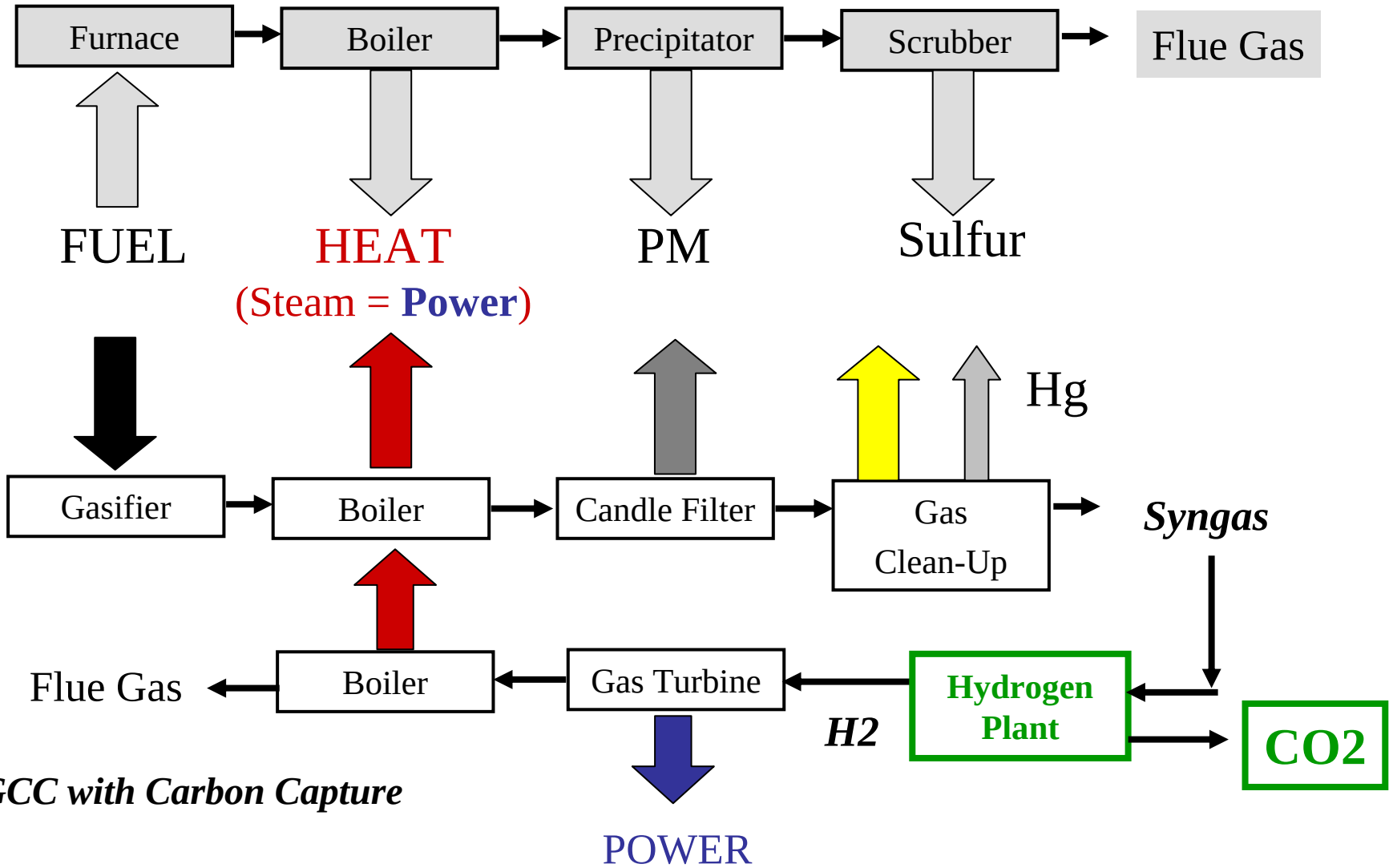
CONVENTIONAL COAL POWER GENERATION



IGCC with Carbon Capture

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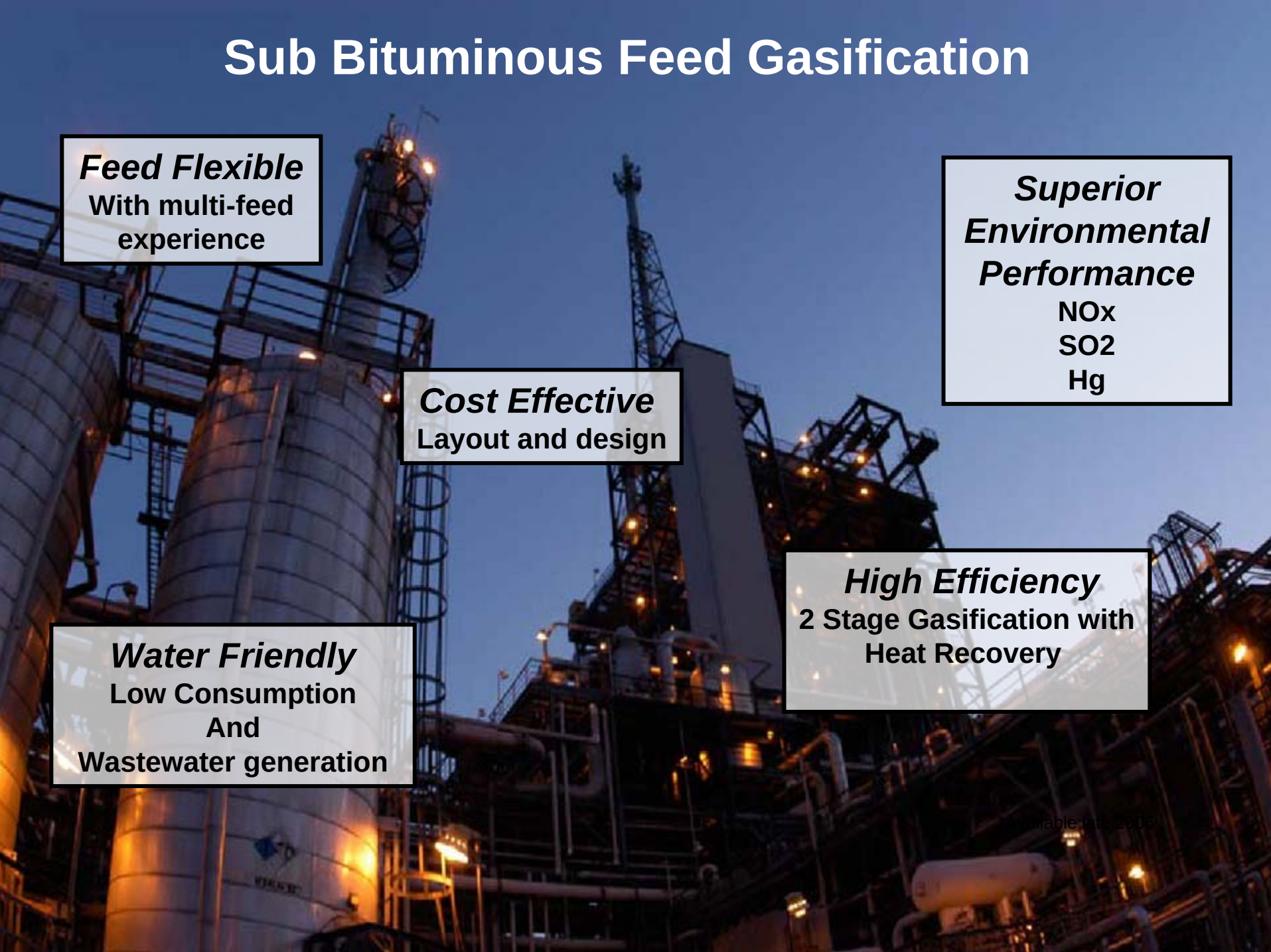
Sub Bituminous Feed Gasification



Feed Flexible
With multi-feed experience

Cost Effective
Layout and design

Water Friendly
Low Consumption
And
Wastewater generation

Superior Environmental Performance
NOx
SO2
Hg

High Efficiency
2 Stage Gasification with Heat Recovery