GASIFICATION TECHNOLOGIES 2005

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E-Gas Applications for Sub-Bituminous Coal

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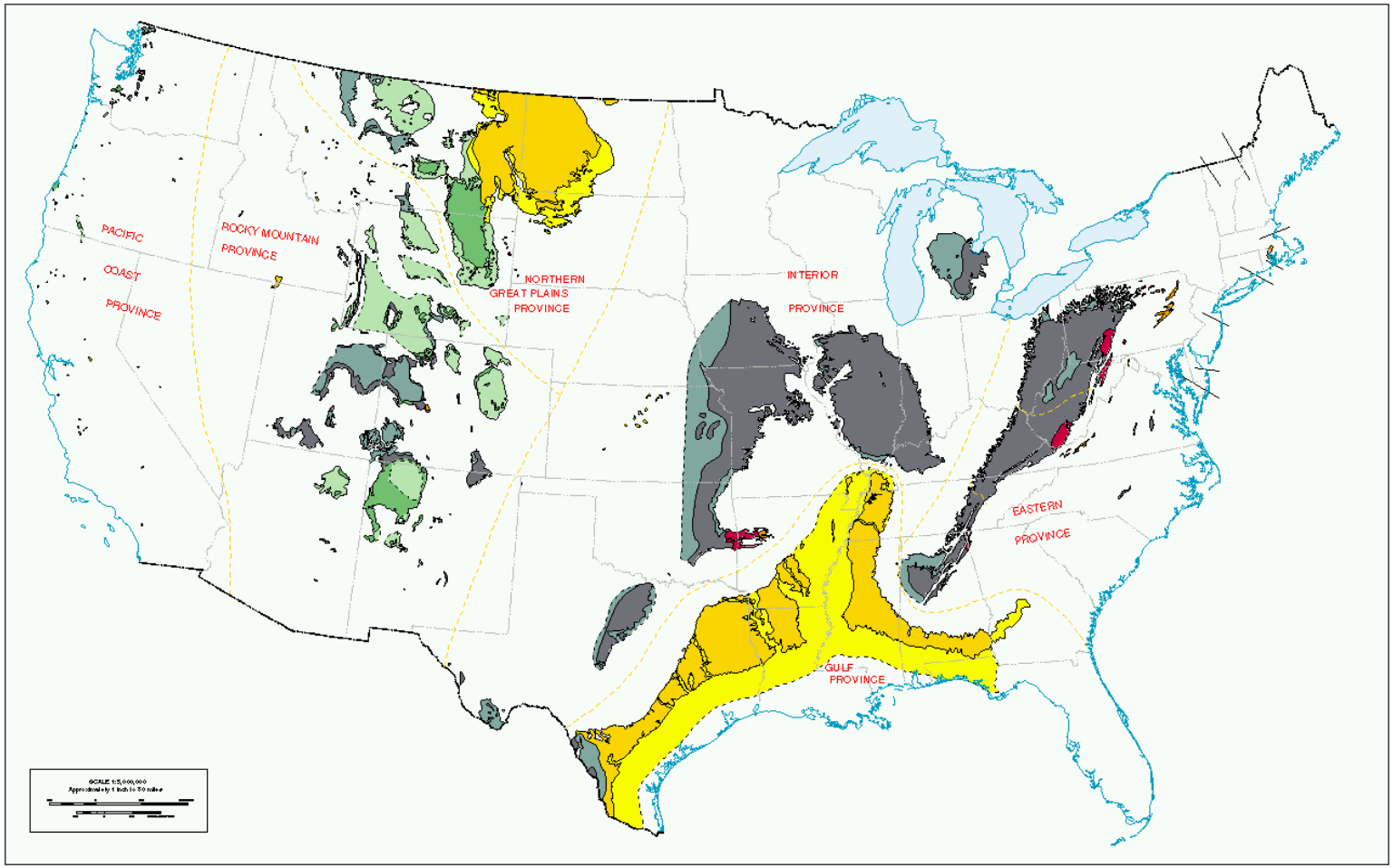
ConocoPhillips

E-Gas
Technology for Gasification

U.S. Coal Resource Regions (Lower 48)



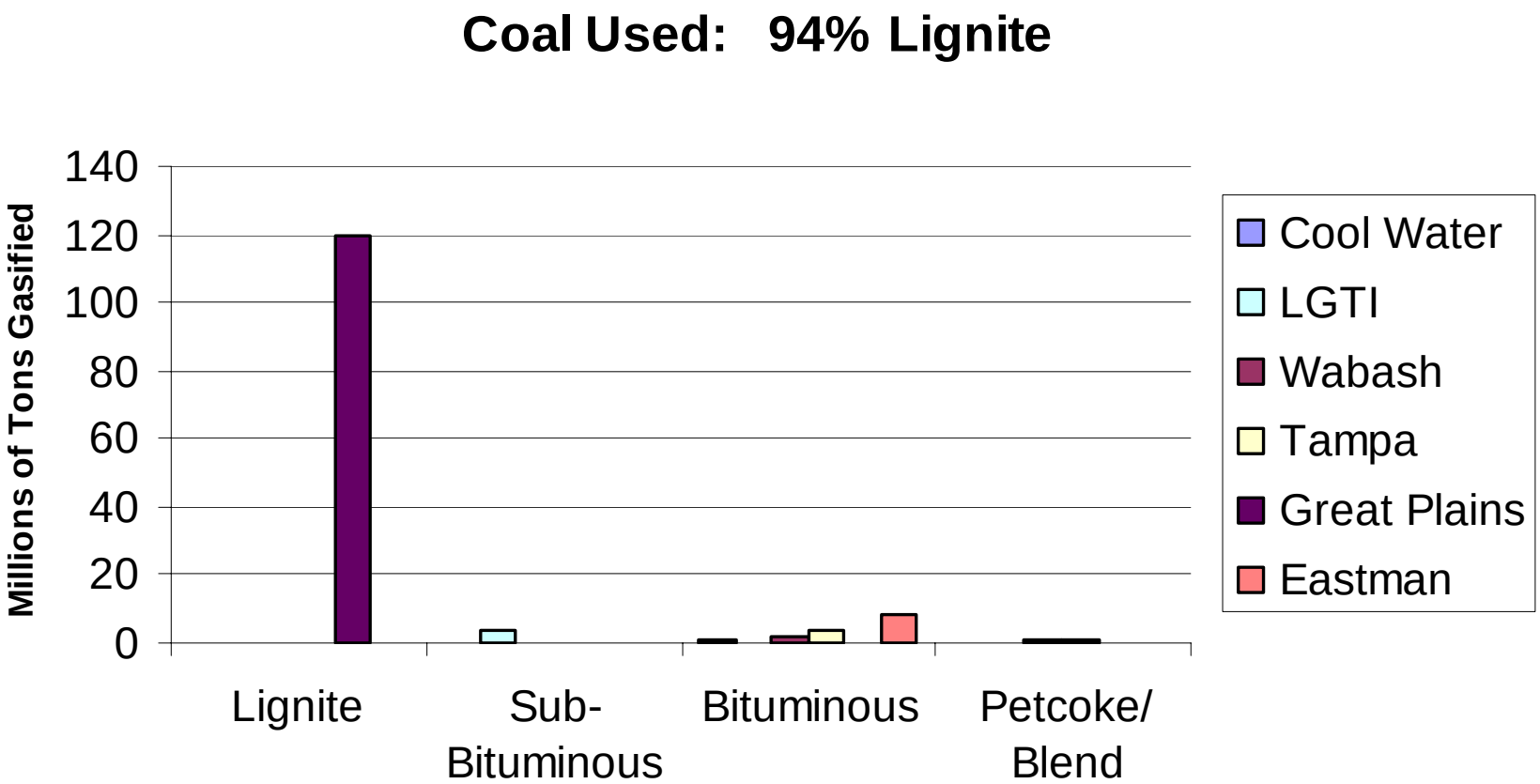
Source: Energy Information Administration

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



Source: DOE NETL

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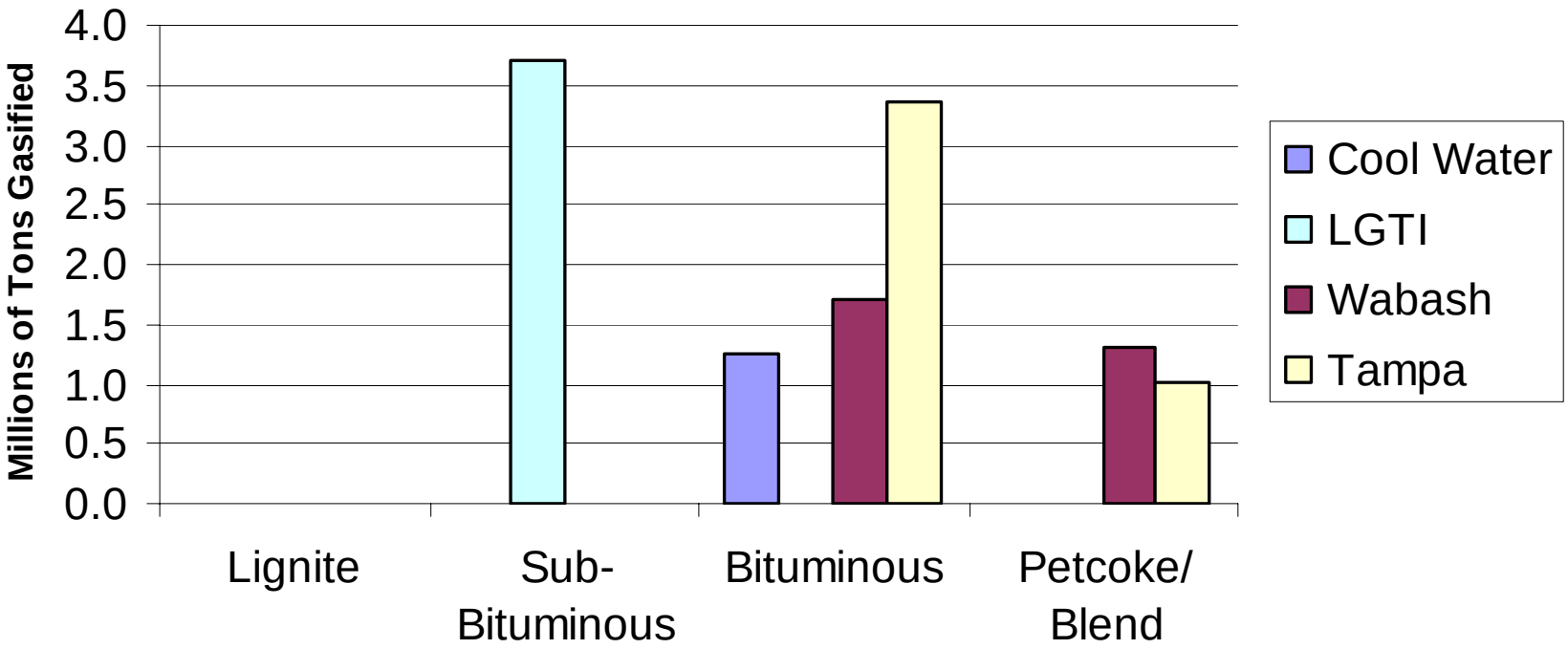
U.S. Coal-to-Power Gasification

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



Source: DOE NETL

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LGTI – Louisiana Gasification Technology, Inc

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

- 2400 tpd Sub Bituminous coal feed
- Operated 1987 – 1995
- Processed 3.7 MM tons
- Fueled (2) S-W SGT6-3000E GTGs (a.k.a W501D5)
- 75% Availability (1994-1995)

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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
Slurry-ability	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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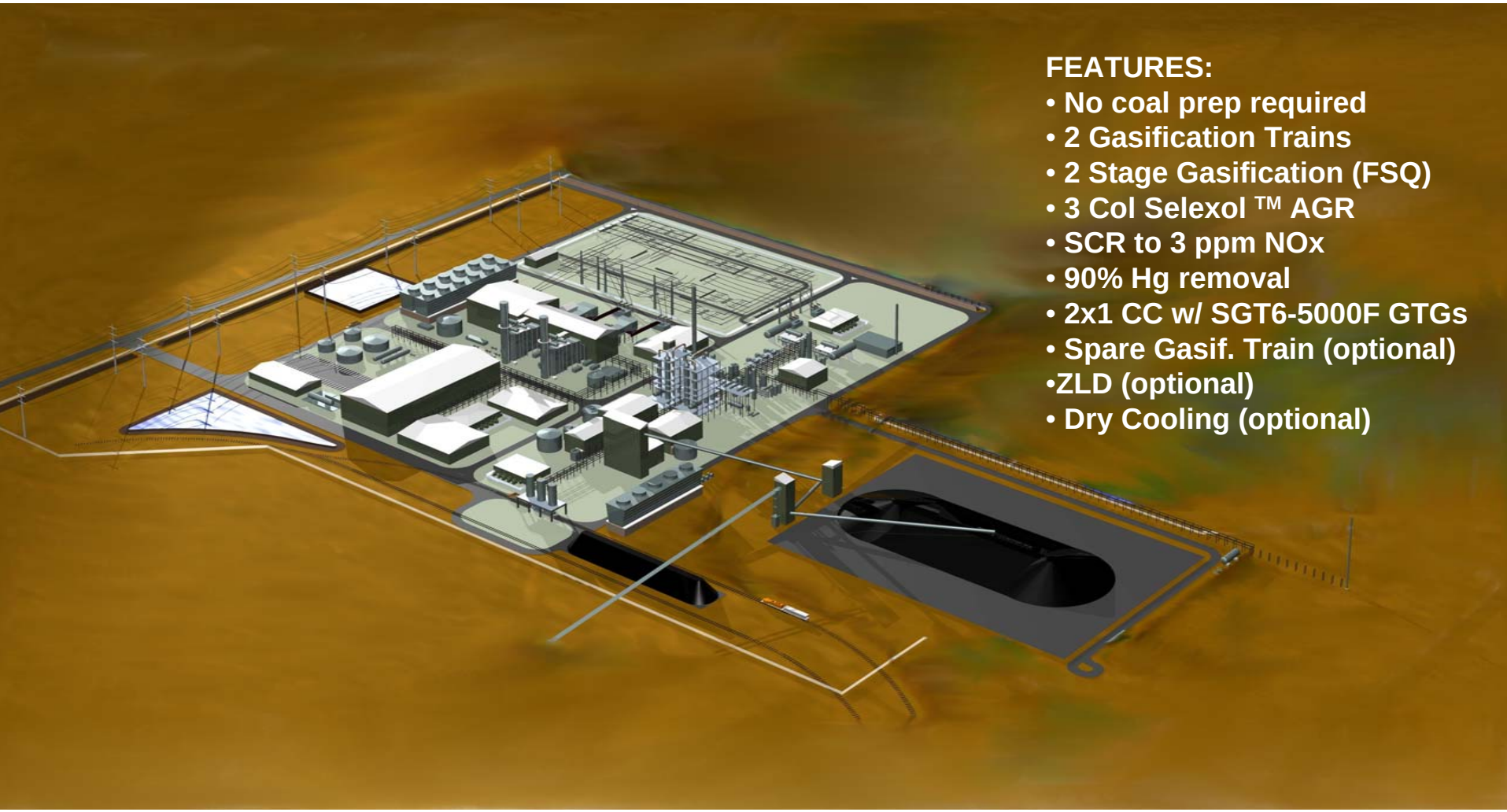
600 MW Sub Bituminous IGCC Design Template



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%	69.07	
Sulfur (dry basis), wt%	0.53	
Ash (AR), wt%	5.32	
Moisture (AR), wt%	30.24	
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)	8,341	7,259
Oxygen, tpd (95% vol)	4,732	4,132
Gross Power, MW	778.1	671.4
Aux. Power, MW	133.8	115.9
Net Power, MW	644.3	555.9
Net H.R., Btu/kWh (HHV)	8,996	9,075
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	Mine Mouth
EPC Cost, $MM [1]	935 - 1131	868 - 1051
Owner's Costs, $MM [2]	70	150
Ann. O&M, $MM [3]	37	39
Availability, % [4]	80 - 85	80 - 85

Notes:
[1] ISBL, Overnight cost, $3Q05 (incl. 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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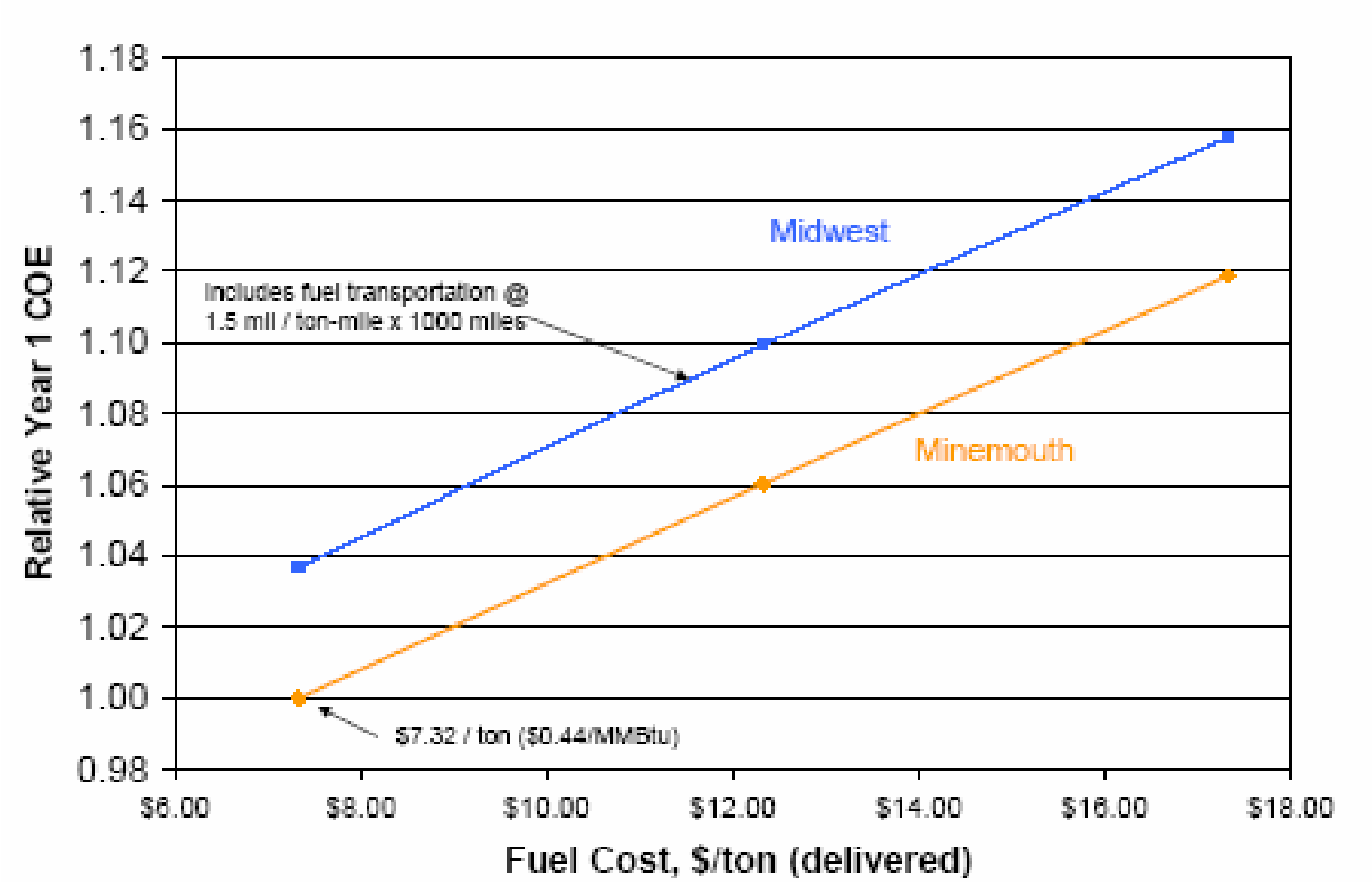
COE vs. Fuel Cost ($2010)



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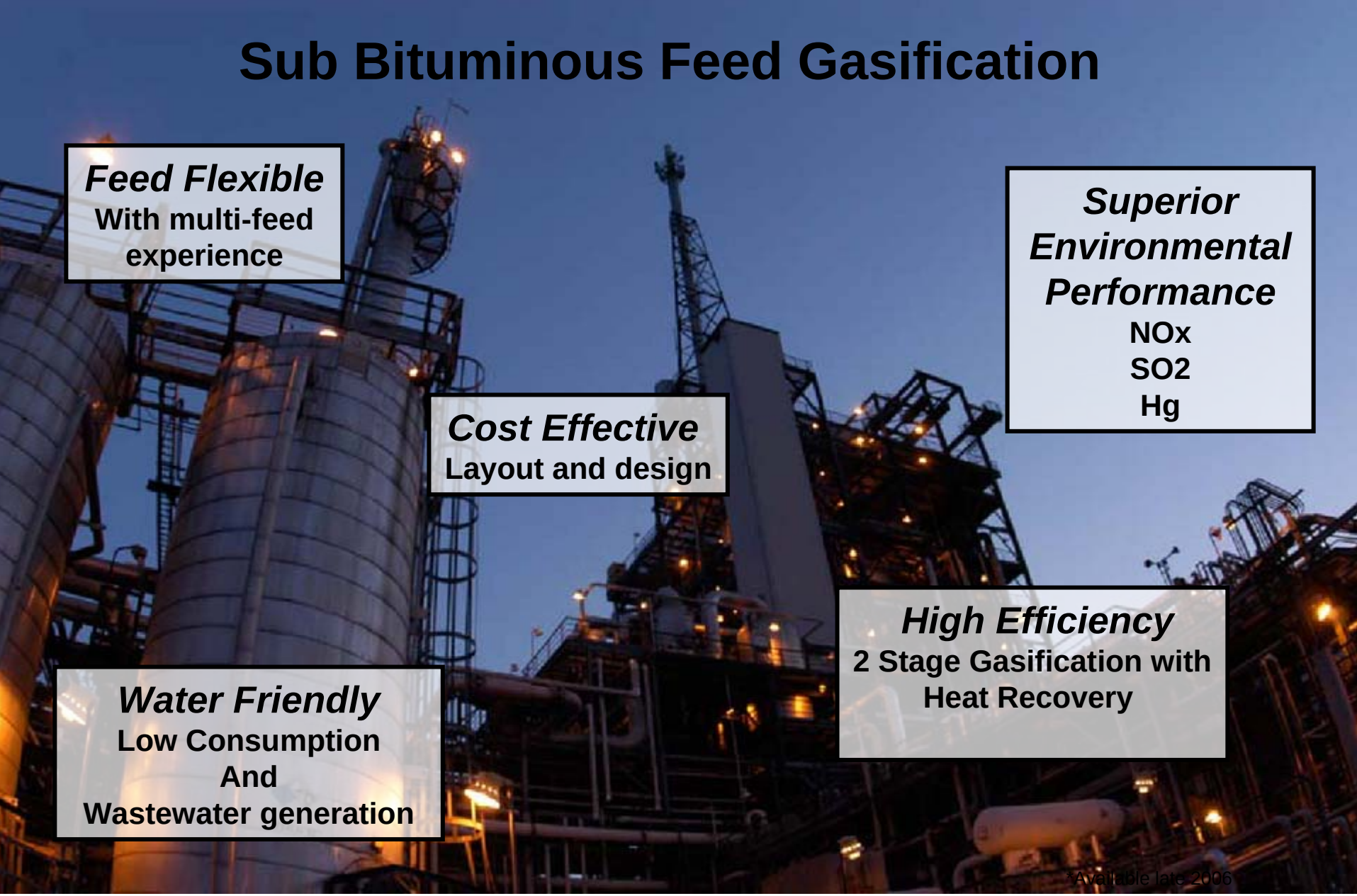
Sub Bituminous Feed Gasification



Feed Flexible
With multi-feed experience

Superior Environmental Performance
NOx
SO2
Hg

Cost Effective
Layout and design

High Efficiency
2 Stage Gasification with Heat Recovery

Water Friendly
Low Consumption
And
Wastewater generation

*Available late 2006

E-Gas Technology for Gasification

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