

The background of the slide is a photograph of a large industrial gasification plant at dusk. The scene is filled with complex piping, scaffolding, and large cylindrical vessels. Warm lights from the facility illuminate the structures against a darkening sky. A semi-transparent dark grey banner is overlaid across the middle of the image, containing the title text.

Substitute Natural Gas (SNG) Scrubbing the Carbon in Coal and Petcoke

*Gasification Technologies Conference
October 2, 2006
Washington D.C.*

Cliff Keeler
Senior Project Director, Gasification
clifton.g.keeler@conocophillips.com

Outline

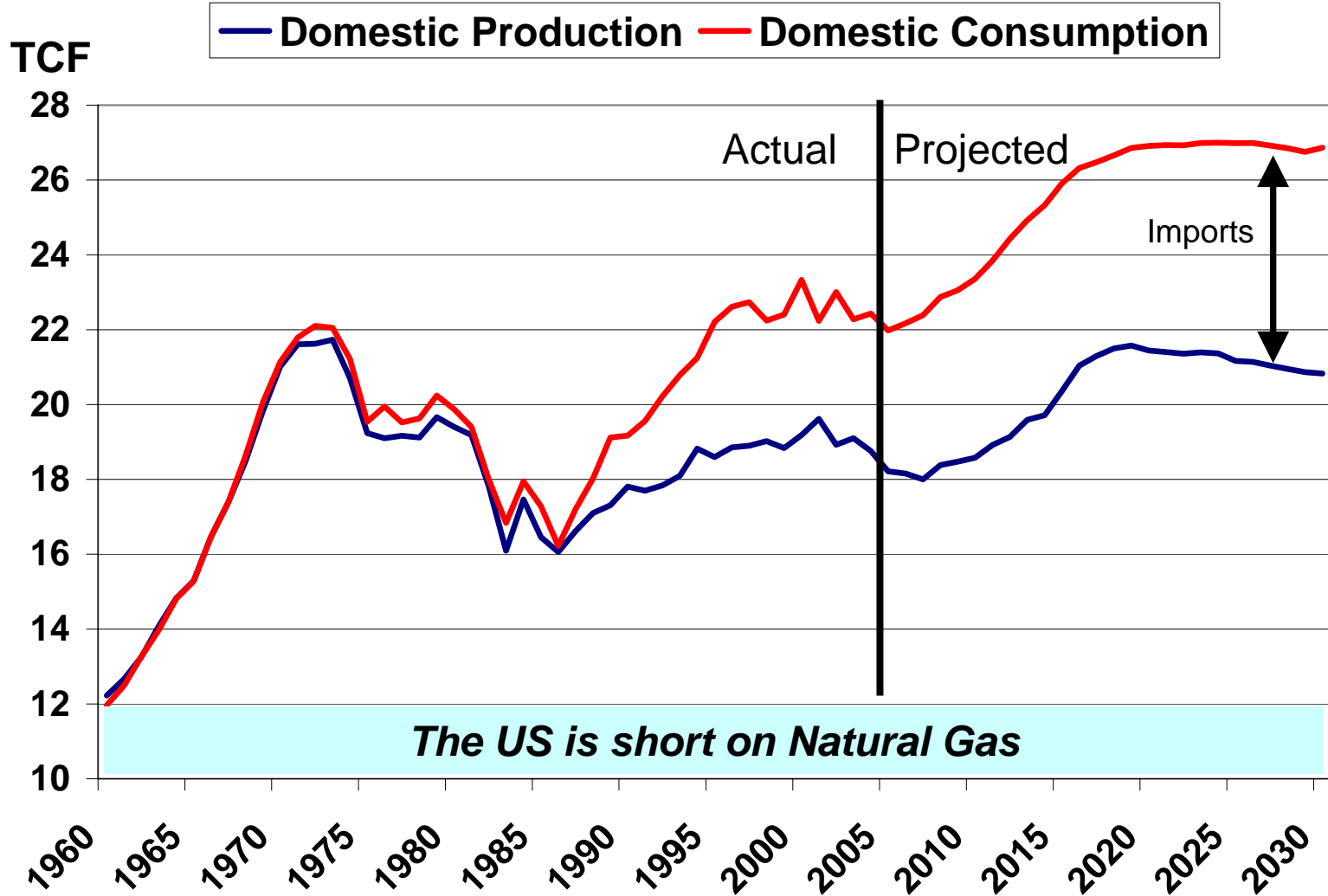
Performing today. Preparing for tomorrow.



1. SNG Drivers
2. Plant Design and Study Basis
3. Results

Domestic Natural Gas Production Falling Short of Demand

Performing today. Preparing for tomorrow.

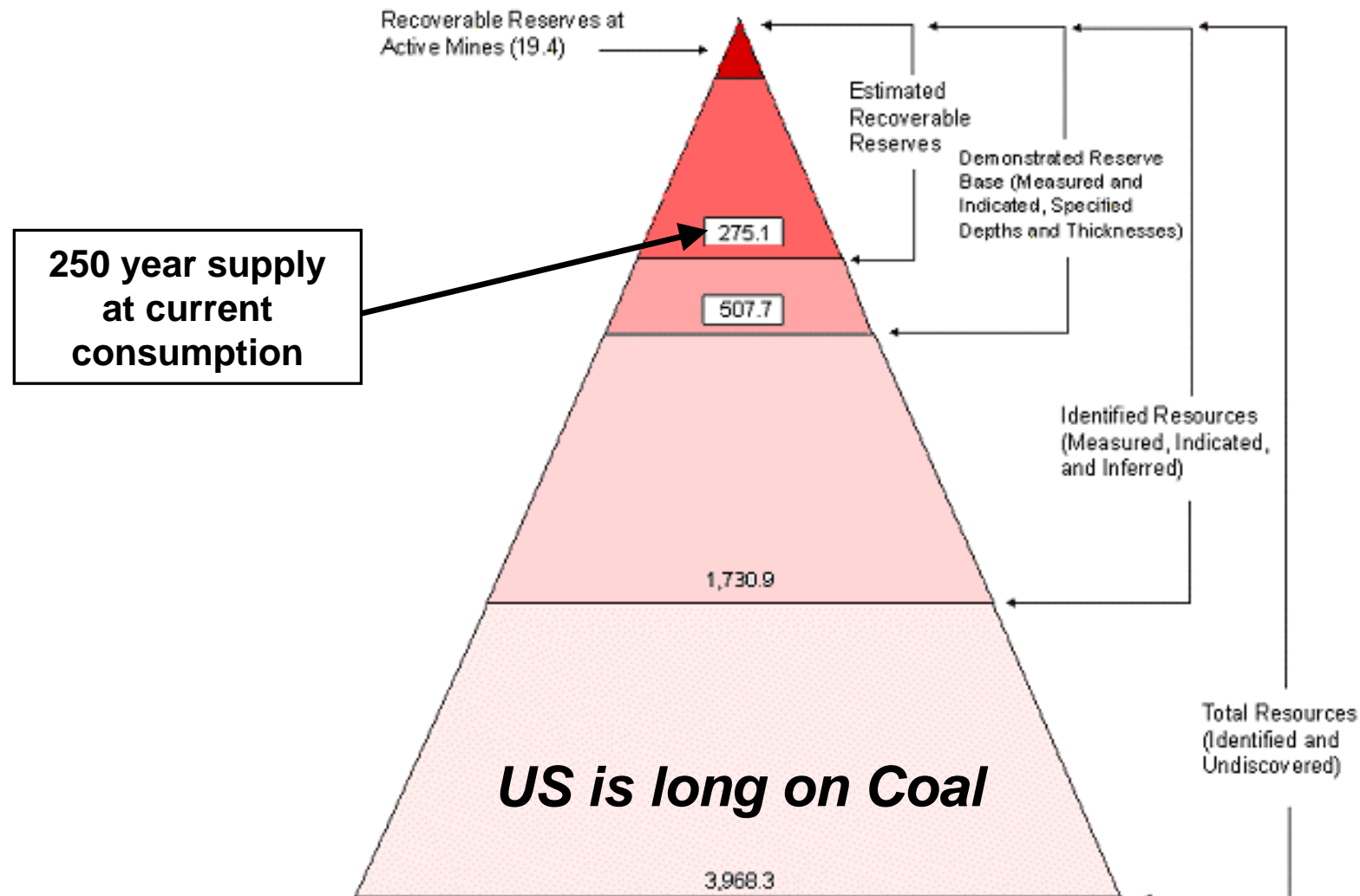


Source: DOE/EIA-Report#0383 (2006) & EIA Annual Energy Review (2005) Table 6.1

Delineation of U.S. Coal Resources and Reserves

(In Billions of Tons)

Performing today. Preparing for tomorrow.



Source: EIA Coal Reserves Data, 1997

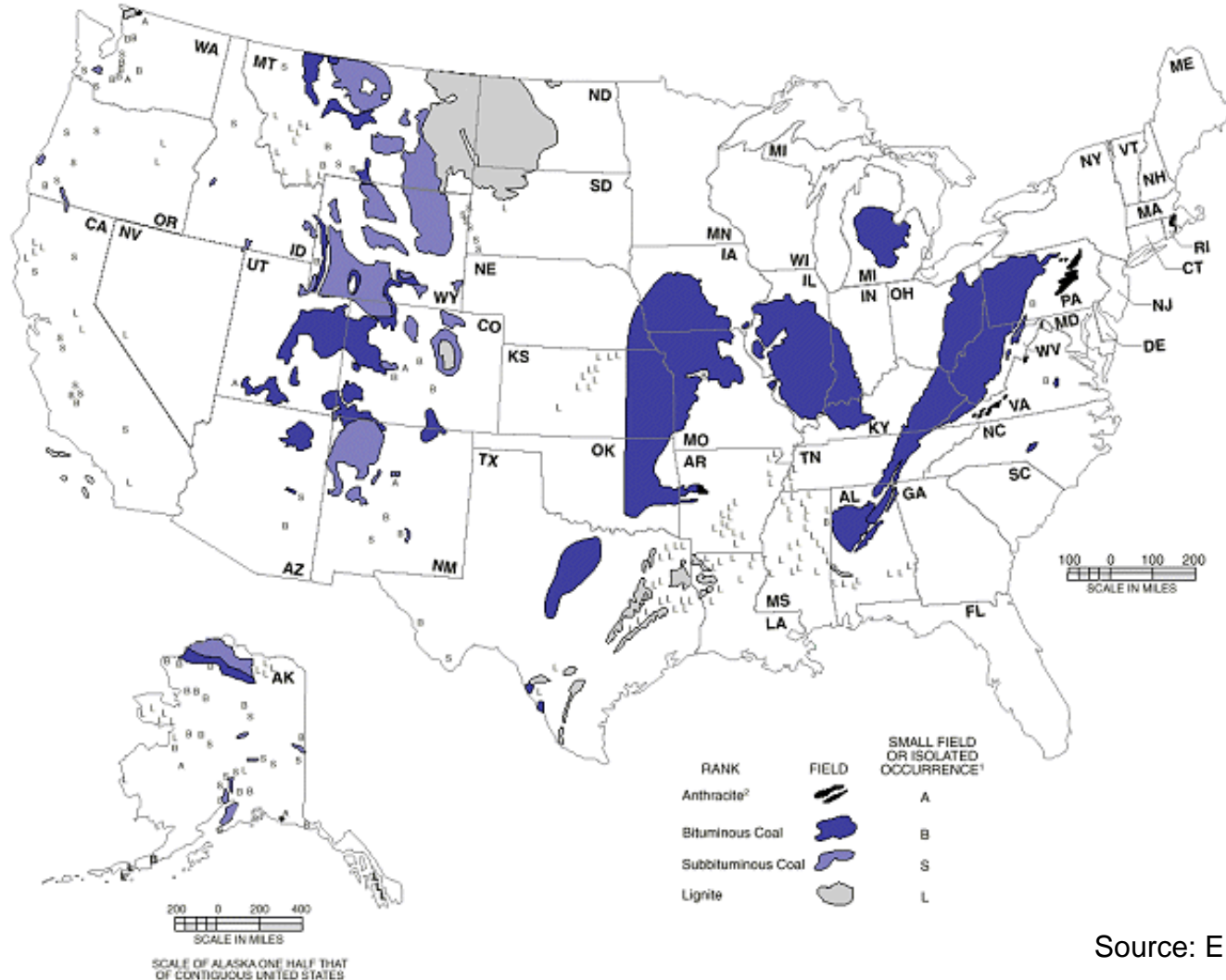
ConocoPhillips

E-Gas™

Technology for Gasification

Coal Bearing Areas of the US

Performing today. Preparing for tomorrow.



Source: EIA

“Illinois coal resources hold more BTUs than all of Saudi Arabia's and Kuwait's oil reserves combined.” - ISGS

US Drivers for Substitute Natural Gas

Performing today. Preparing for tomorrow.

- ✓ USA is short on natural gas and very long on coal
- ✓ Gasification technology can augment North American natural gas supplies and LNG imports
- ✓ Adds value to US coal reserves
- ✓ Increased energy diversity
- ✓ National energy security implications
- ✓ Method to reduce carbon penalty associated with coal

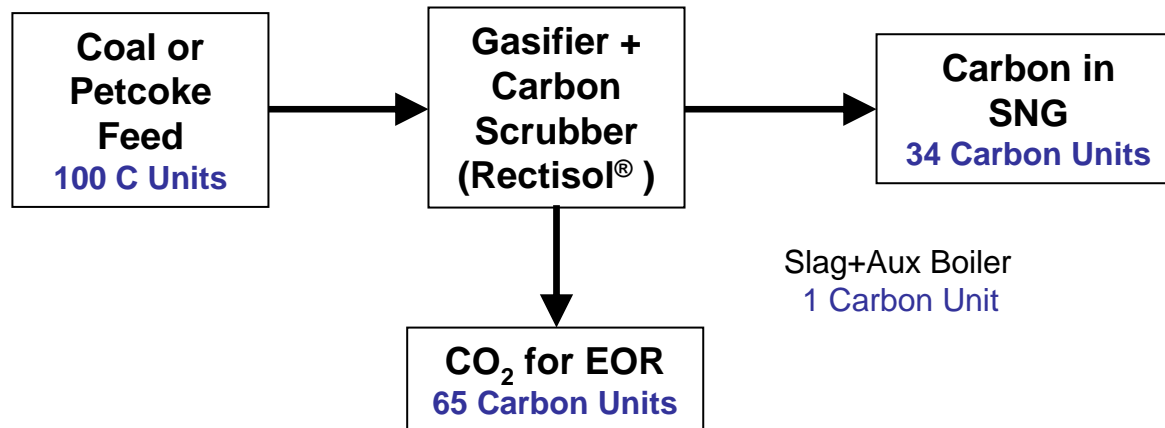
SNG Process Scrubs Carbon from Coal

Performing today. Preparing for tomorrow.

Carbon capture for enhanced oil recovery

- Reasonable proximity to oil fields required
- Improves project economics
- Increases life of existing oil fields
- Scrubs approximately 65% of the carbon from the feedstock
- Increases environmental attractiveness

Carbon Balance

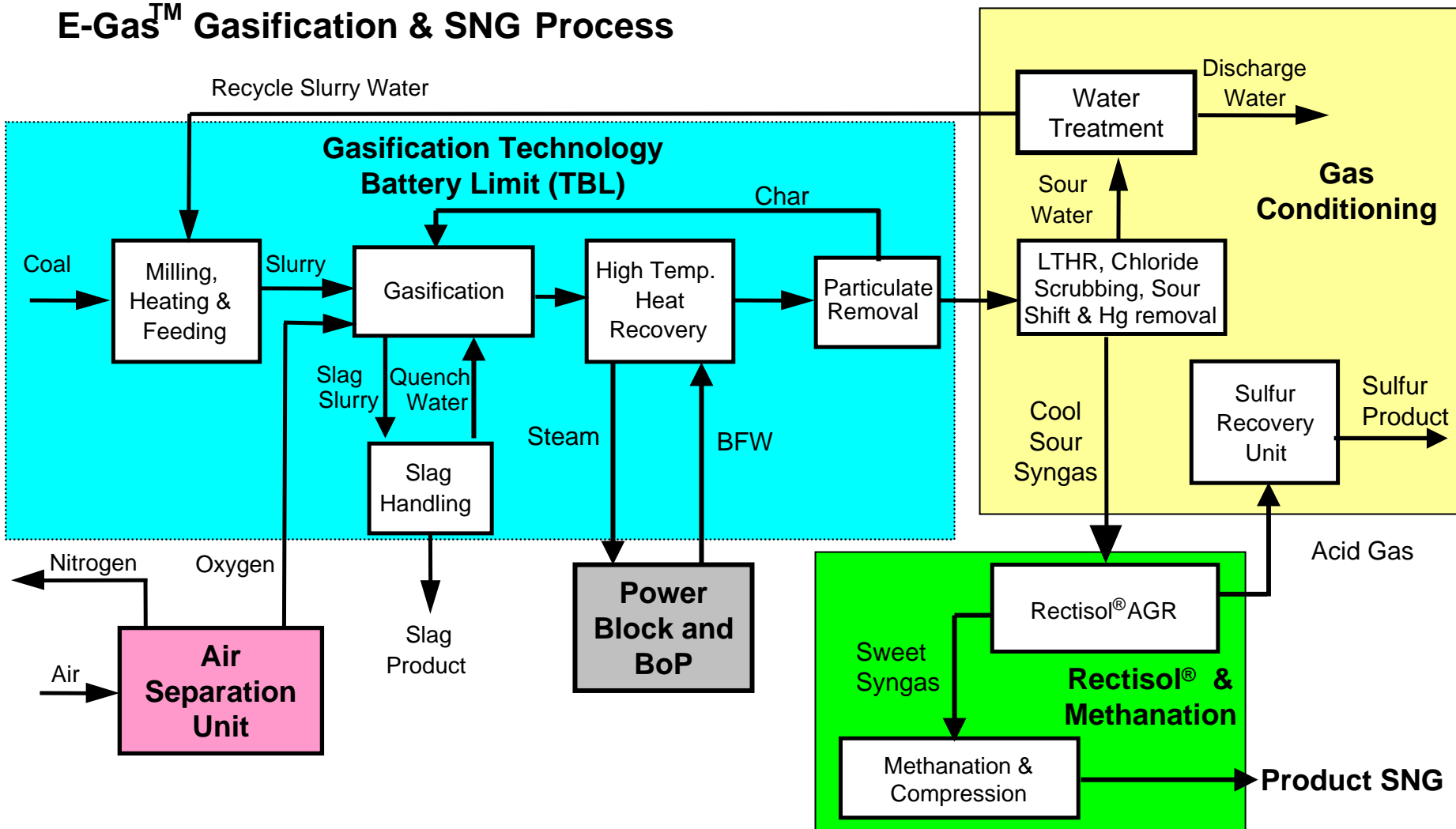


65% of carbon in feedstock can be captured with SNG

Simplified Block Flow Diagram

Performing today. Preparing for tomorrow.

E-Gas™ Gasification & SNG Process



SNG Design Basis

Fixed gasifier size for all cases

3 x 50% gasification train plant

12 hours of LOX storage

High reliability

High purity oxygen (99.5%)

CO shift

Hg removal

Rectisol[®] acid gas recovery

Claus sulfur recovery unit

Commercial methanation

SNG delivery pressure 900 psi

CO₂ compression to 2000 psi

Case	Feedstock	Location
1	Petcoke	Gulf Coast
2	IL#6 Coal	Midwest
3	PRB	Wyoming
CO ₂ capture option evaluated		

Feedstock Parameters

Performing today. Preparing for tomorrow.

Feedstock	Petcoke	IL #6	PRB
Location	Gulf Coast	Midwest Minemouth	Wyoming Minemouth
HHV, Btu/lb (As Rec'd)	13,699	11,053	8,800
Composition:			
Carbon (dry basis), wt%	87.3	70.1	70.2
Hydrogen (dry basis), wt%	3.7	4.7	5.3
Sulfur (dry basis), wt%	6.3	2.7	1.2
Nitrogen (dry basis), wt%	1.3	0.3	1.1
Ash (As Rec'd), wt%	0.63	11.08	6.8
Moisture (As Rec'd), wt%	9.9	13.7	26.9

Expected Performance Results

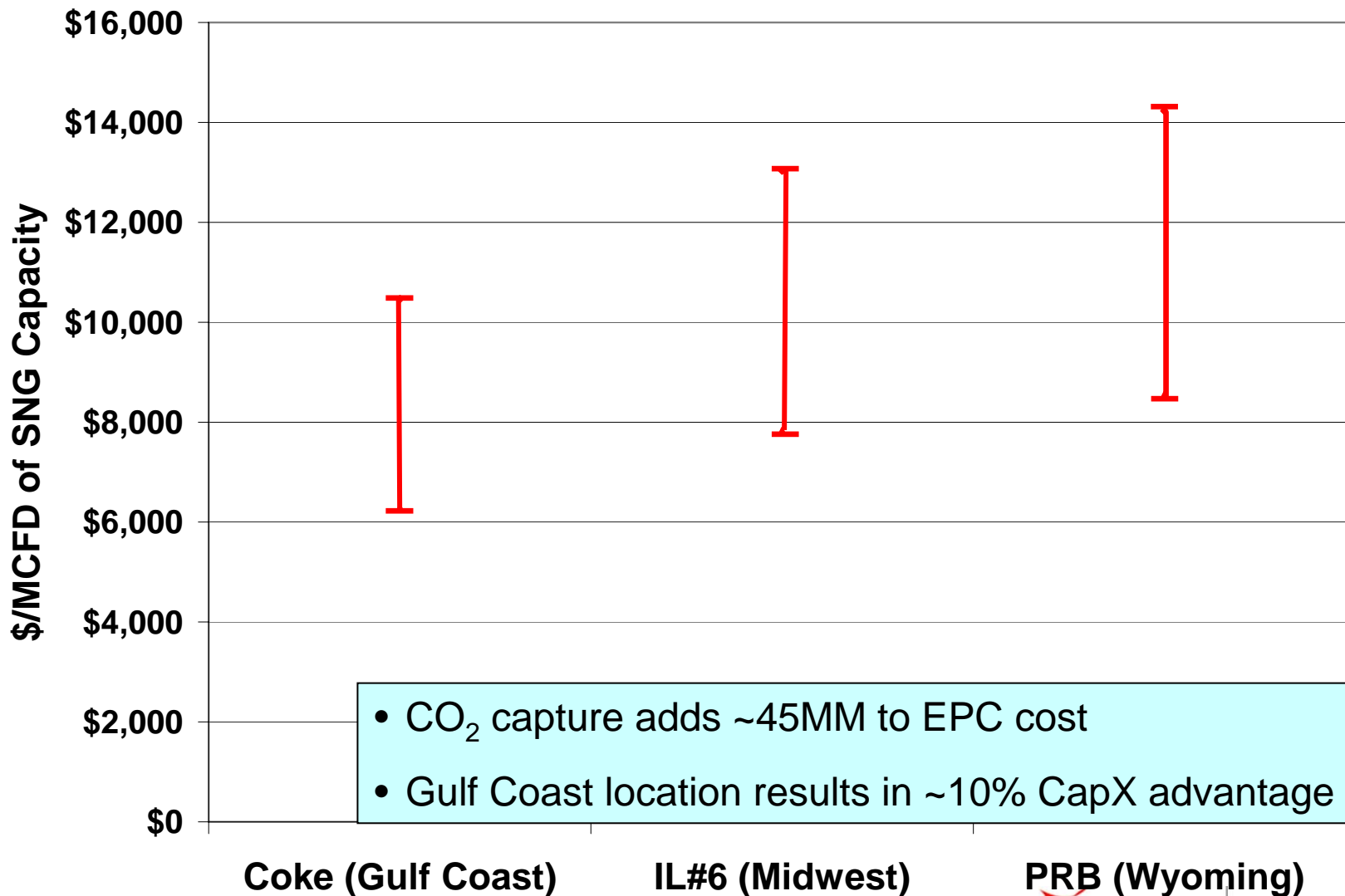
Performing today. Preparing for tomorrow.

	Petcoke	IL#6	PRB
Feedrate (TPD)	6,300	7,000	8,300
Gross Power	160	155	165
Net Power* (MW)	20	35	30
SNG Product (MMSCFD)	115	100	90
Product Yield (MCF/ton)	18	14	11
CO ₂ product (MMSCFD)	190	160	170

* Net power reduced by approximately 15MW in CO₂ capture case

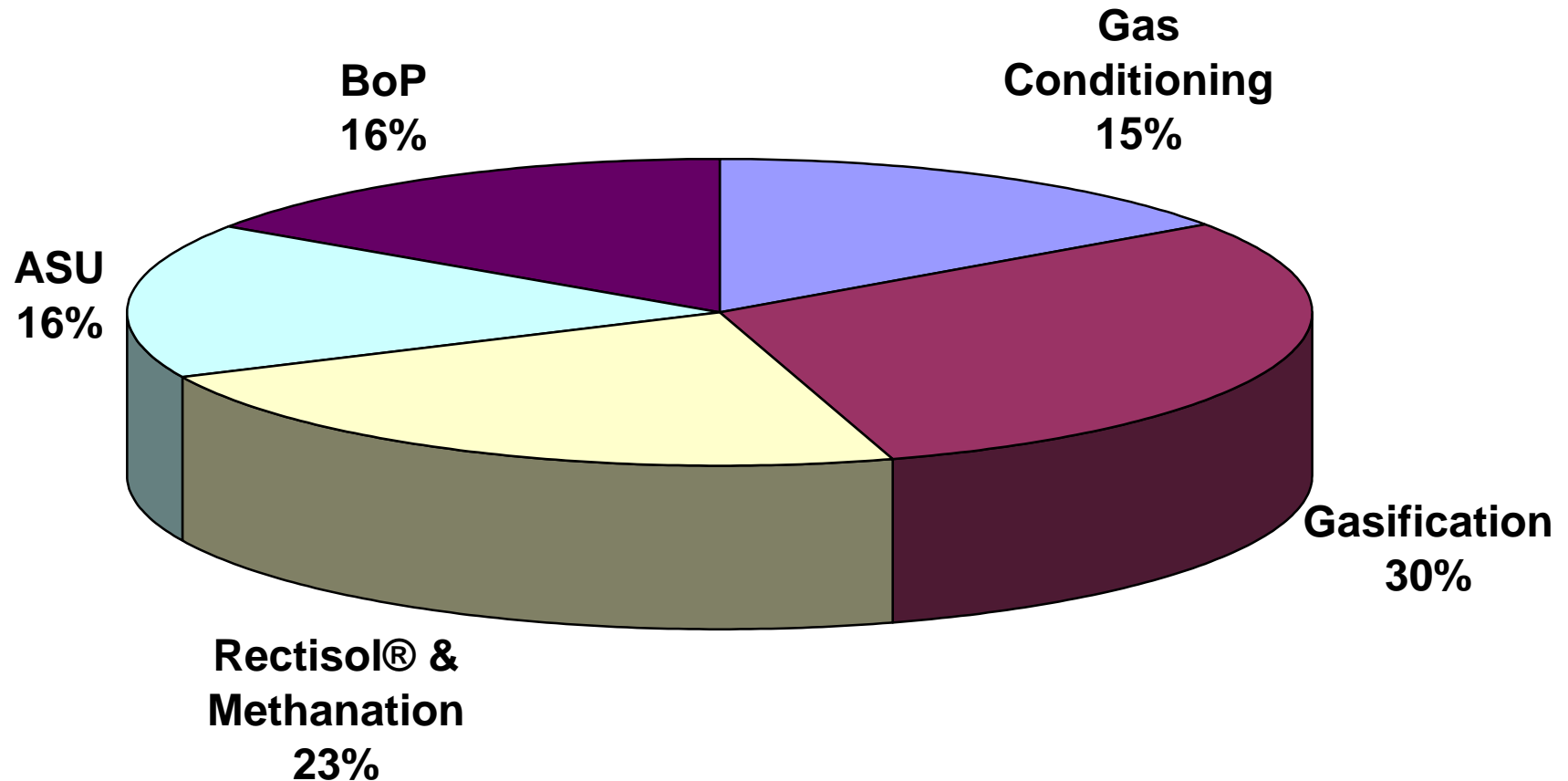
Capital Cost Comparison

Performing today. Preparing for tomorrow.



Capital Cost Breakdown by Major Process Area

Performing today. Preparing for tomorrow.



Gasification is less than 1/3rd of total capital cost

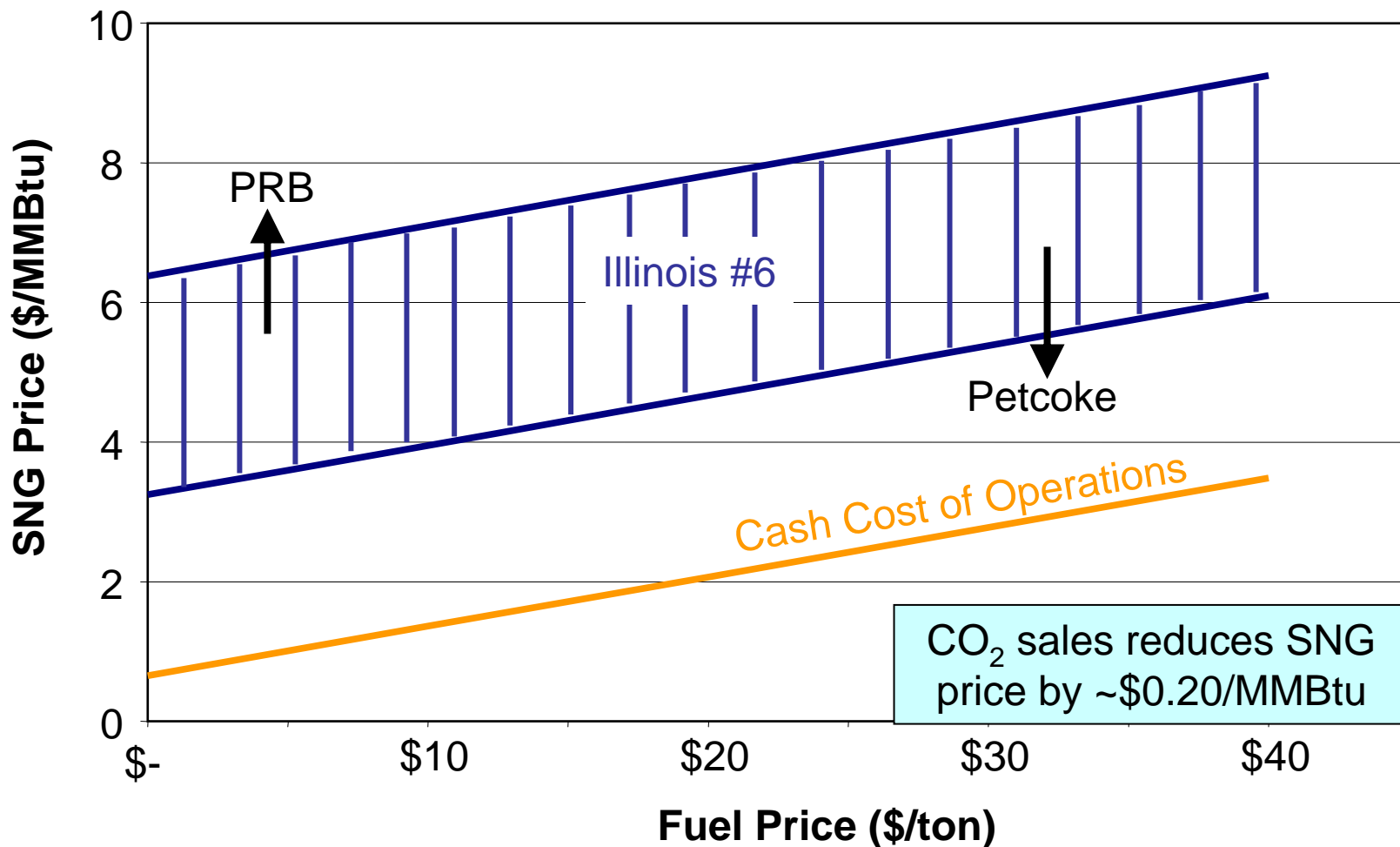
Financial and Economic Assumptions in Base Case

Performing today. Preparing for tomorrow.

Key Assumptions	Value	Other Factors Included
SNG base price (\$/mmbtu)	\$6.00	<ul style="list-style-type: none">• O&M• Owners Cost• Financing Fees• Working Capital• Capital Spares• Escalation• Insurance• Taxes
Interest on debt	6.0%	
Debt/Equity	70/30	
Feedstock (\$/ton)	\$28	
CO ₂ Product Price (\$/ton)	\$20	
Project Life	20 years	

Cost of Gas

Performing today. Preparing for tomorrow.

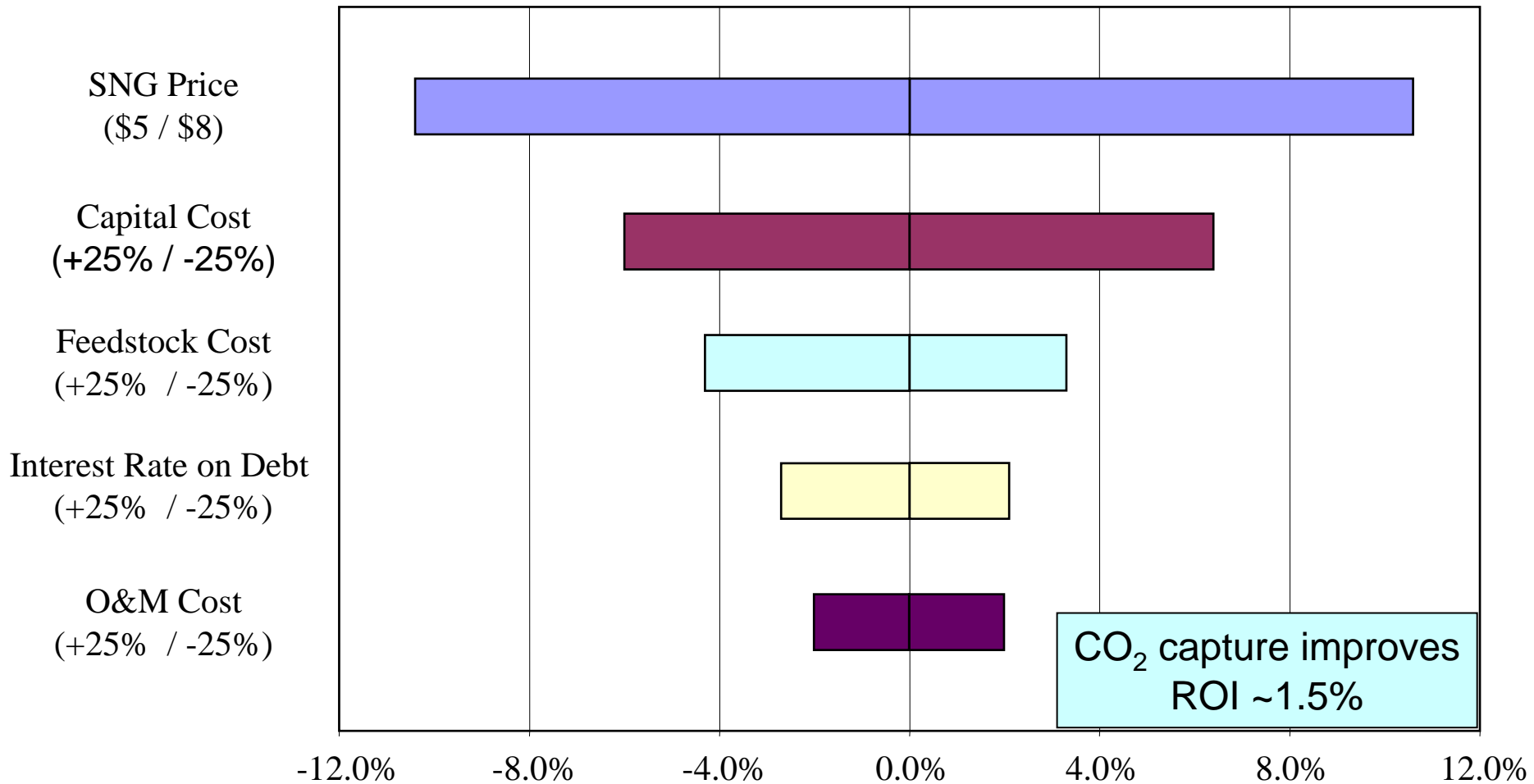


Analysis based on 15% leveraged ROI

Sensitivity Analysis – Impact to ROI

Performing today. Preparing for tomorrow.

Basis: Ill#6 without CO₂ Capture



Enablers for Successful Projects

Performing today. Preparing for tomorrow.

- Favorable forward gas price
- Location, location, location
 - Construction cost (labor, rail and deep water access)
 - Feedstock pricing
 - Market for CO₂
 - Other product markets (Liquid air products, sulfuric acid, etc.)
- Innovative financing to minimize interest payments
- Governmental supports (both state and federal)
- Reduction in capital cost – all technologies
 - ASU, Rectisol[®], methanation and gasification

Summary

Performing today. Preparing for tomorrow.

- SNG integrates proven technologies
- SNG has favorable economics in certain applications
- Scrubbing carbon from coal – puts coal on an comparable footing with natural gas
- Deployment of SNG augments North American supplies
 - Broadens energy diversity
 - Reduces foreign dependence on natural gas
 - Significant deployment requires governmental supports

E-Gas Technology for Gasification

Performing today. Preparing for tomorrow.



**“Common Sense
For Energy And The
Environment”**