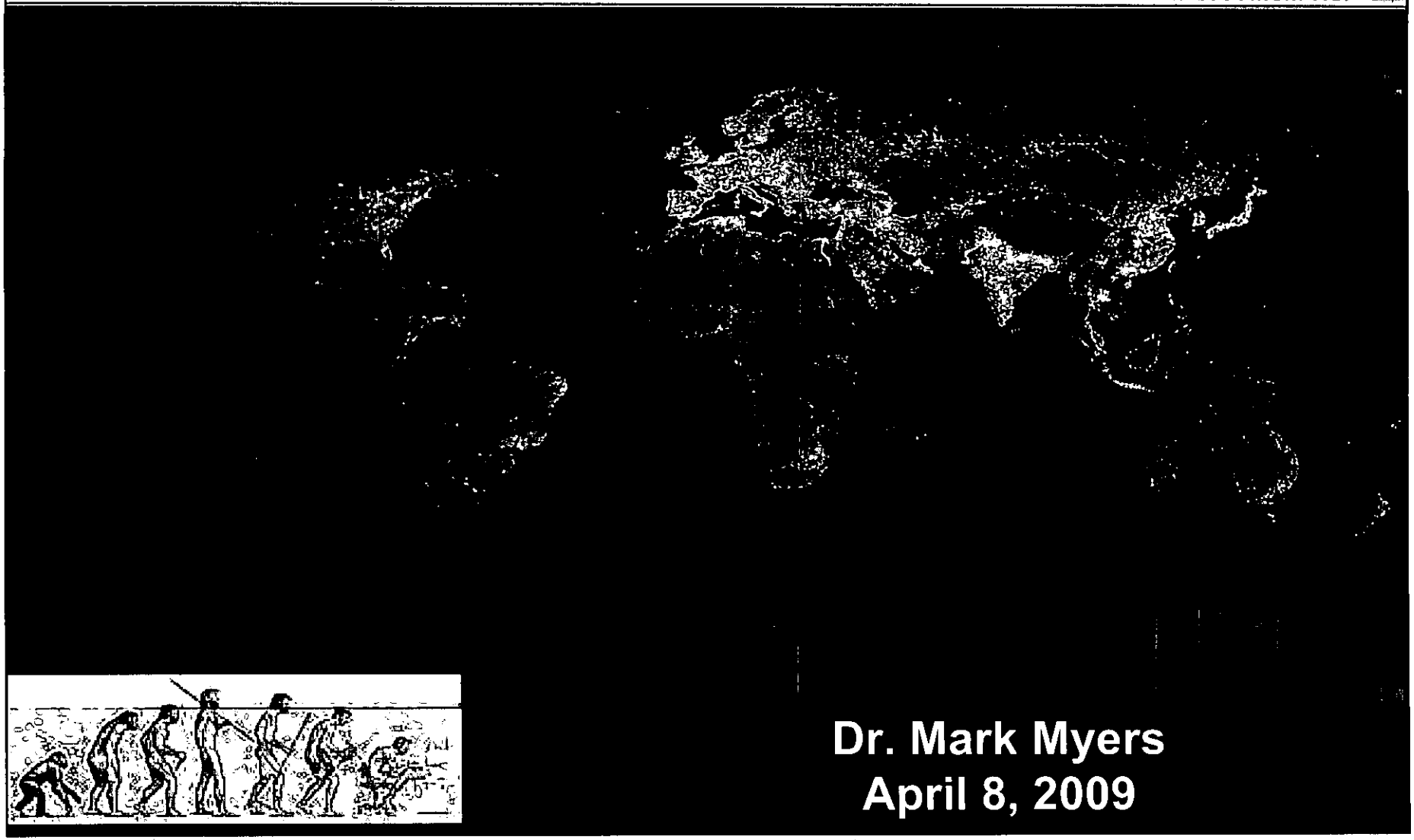
4/8/09 PRESENTATION: SHALE GAS DEVELOPMENT IN THE U.S.

2429

Alaska's Natural Gas – Needed or Not? What About Shale Gas and Carbon Regulation?

AGIA

The Alaska Gasline Inducement Act



Dr. Mark Myers

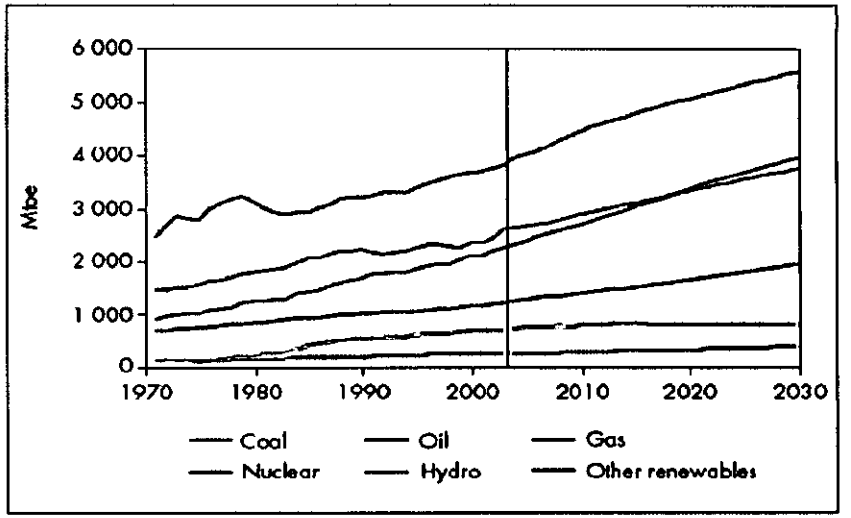
April 8, 2009

Alaska's Natural Gas is America's Resource For Enhancing Economic, Environmental and National Security

AGIA
The Alaska Gasline Inducement Act

- Global competition for imported energy
- Growing population, long term economic growth heighten worldwide demand
- Environmental consequences of development, extraction, and use of other resources

World Energy Consumption by Source



IEA

The Energy Mix for the United States

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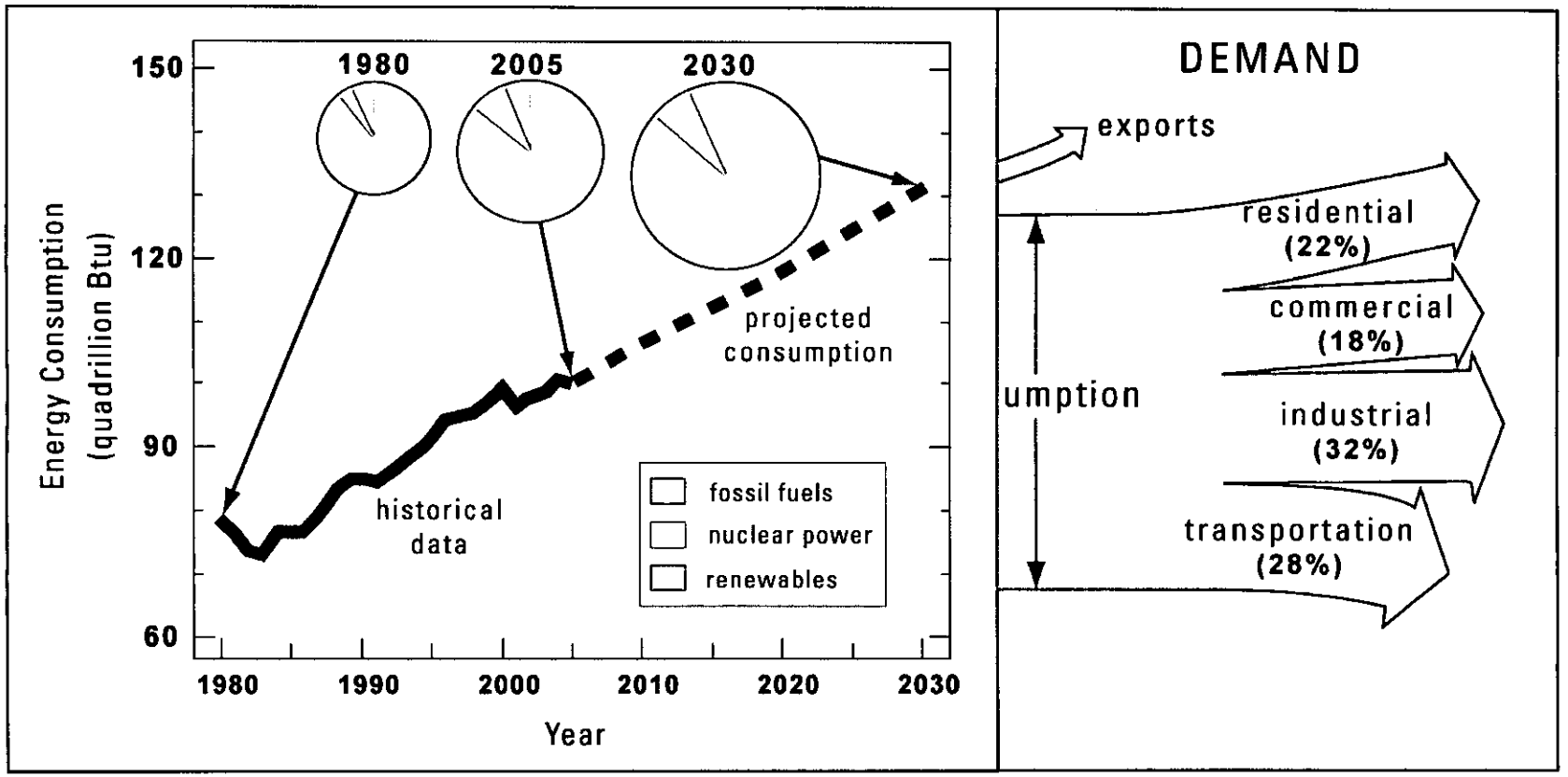

EIA

Large Changes Have Occurred In Fuel Sources

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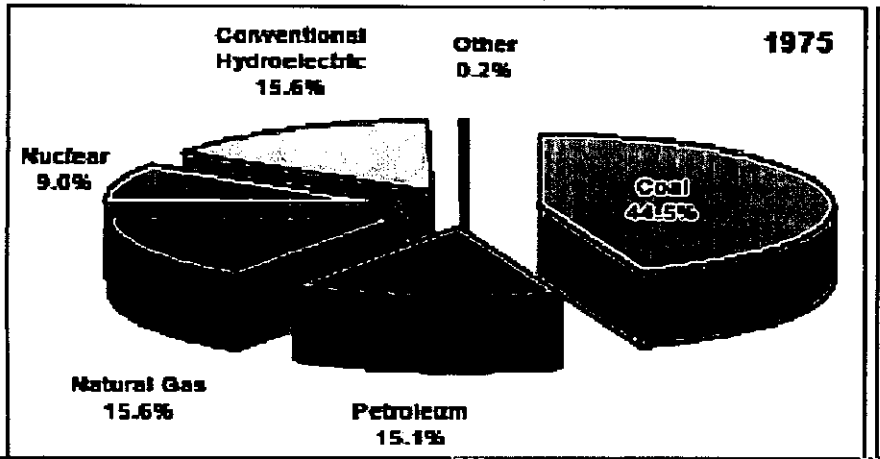
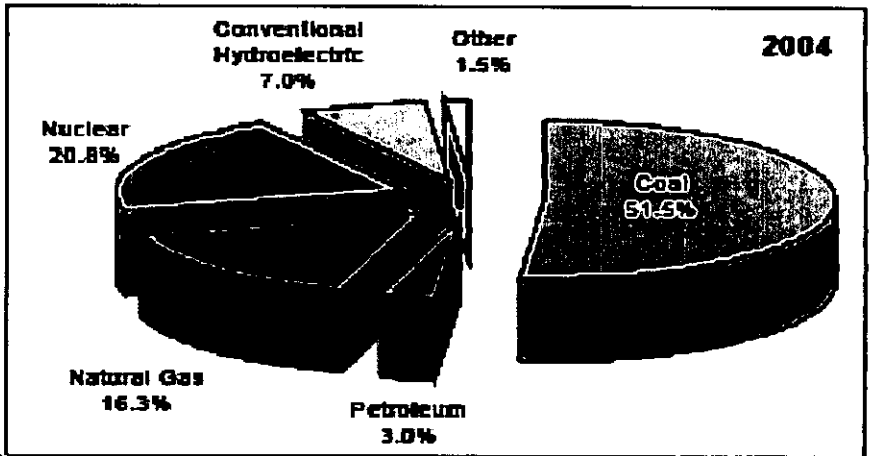
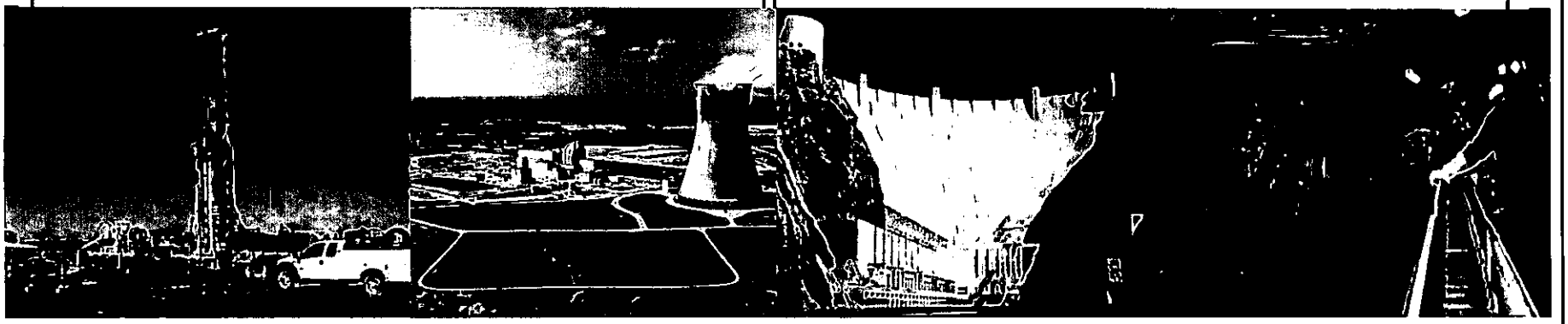
U.S. Electric Power Generation by Fuel Type - Years 1975 and 2004







USGS/EIA

Change in Fuel Type for Electrical Generation Over Three Decades

No Free Lunch: All New Sources of Energy Have Their Own Unique Environmental Challenges: Biomass/Water

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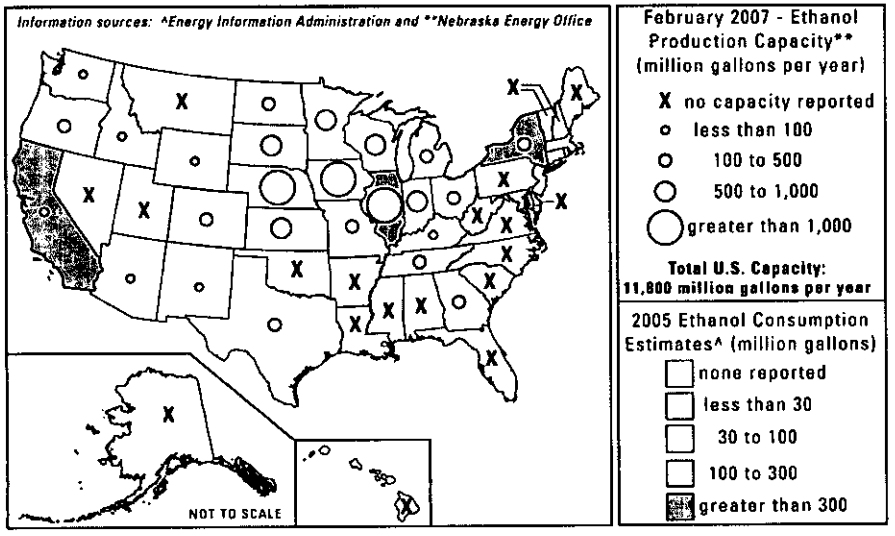
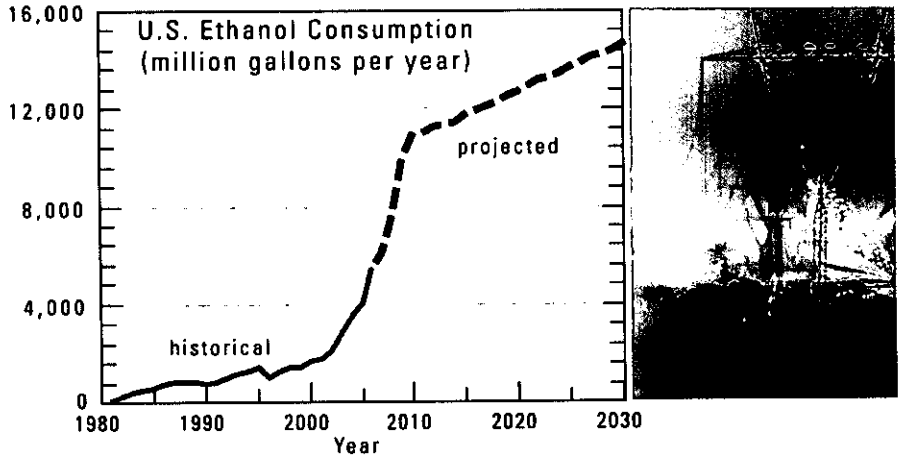
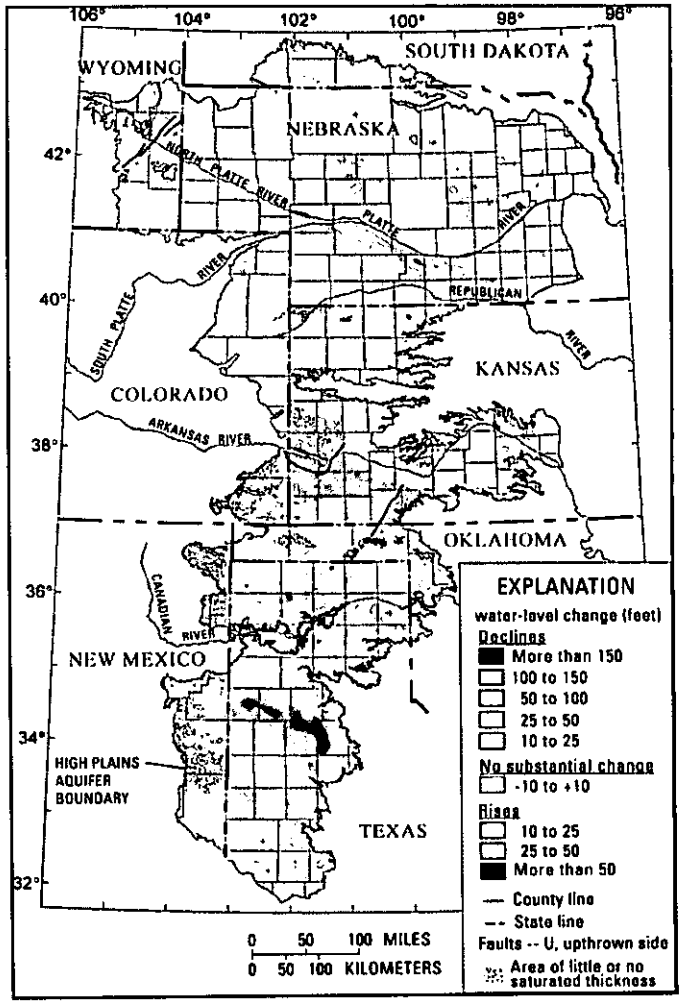
USGS/EIA







The USA Today

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- How have things changed since the legislature approved the AGIA license?
  - Global economic downturn with associated rapid decline in oil and gas prices
  - Rapid expansion of unconventional (shale) gas supplies in USA
  - Policy shift limiting access to lower 48 federal lands for non-renewable energy production?
  - First authoritative Arctic oil and gas assessment
  - Increased likelihood of carbon regulation

U.S. Gas Well Drilling down 45% in Last Year

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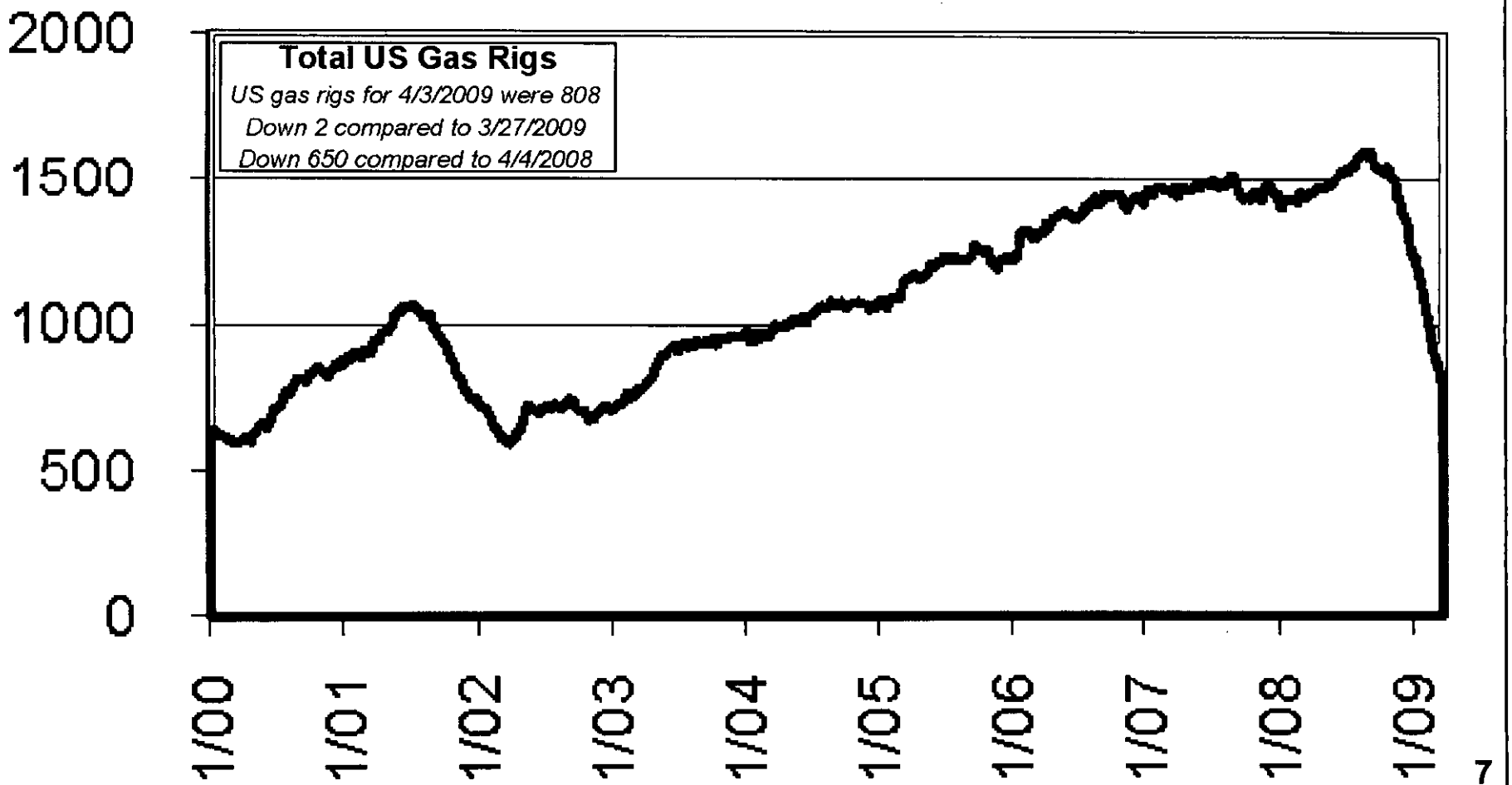

Source: Baker Hughes

Economic 'Recession' AGIA

The Alaska Gasline Inducement Act

Jim Mulva, Chairman and CEO ConocoPhillips,
March 13, 2009 - *Petroleumworld.com*

"Costs are coming down pretty dramatically," (Mulva) said. "When we say defer, we're not talking years, we're talking months, quarters, maybe up to a year."

Speaking about the Denali Alaska gas pipeline project, proposed last June by ConocoPhillips and BP, Mulva said President Barack Obama has identified the 4 Bcf/d project as a means of reducing US dependence on foreign oil.

The pipeline would bring North Slope gas down to a pipeline in Alberta for transport to the Lower 48 states. "We know it's going to get far more federal attention," he said. "Obviously, Alaska would like to see it go."

Mulva repeated the partners plan a 2010 open season for gas deliveries; first gas deliveries are eyed for 2019.

While current gas prices have led ConocoPhillips to cut back on its Canadian operations, Mulva discounted the low prices as a roadblock to the pipeline project's development.

"You can't look at gas prices today," he said. "You have to look at prices 10 years from now."

Both Lower 48 Unconventional and Alaska North Slope Gas are Needed for America's Future

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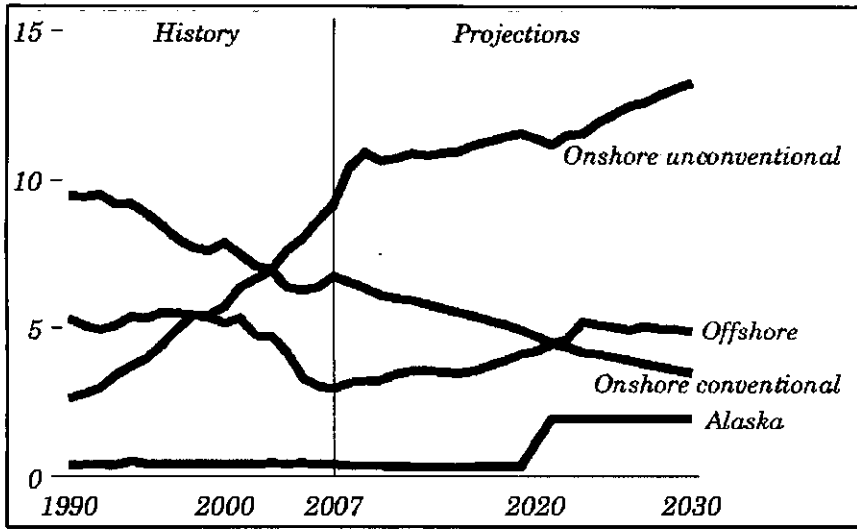
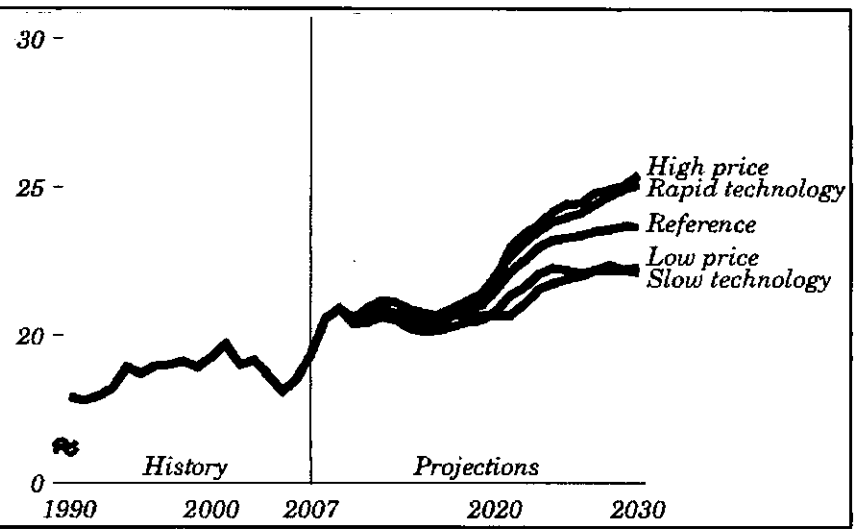


Natural gas production by source, (1990-2030 9trillion cubic feet)



Total U.S. natural gas production in five cases, 1990-2030 (trillion cubic feet)

Source: EIA Annual Energy Outlook 2009

2009 EIA Forecasts for Natural Gas Prices Accounts for Growth of Unconventional Gas Resources

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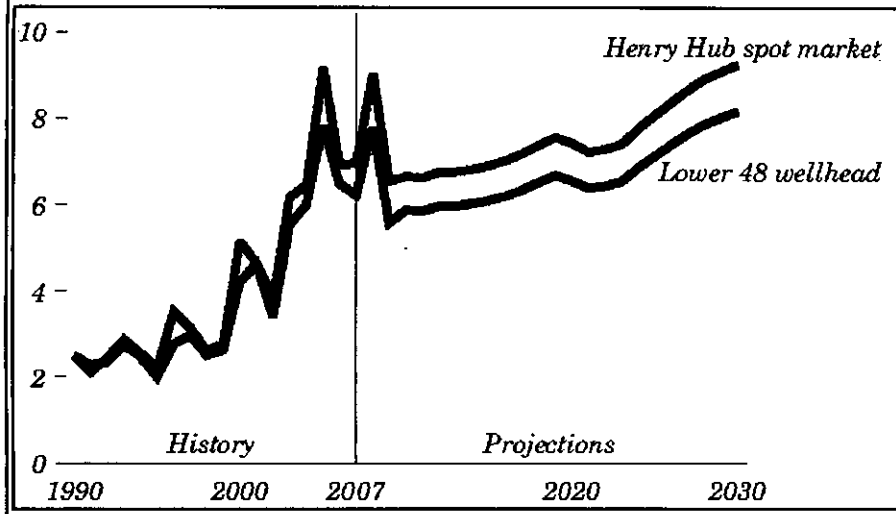
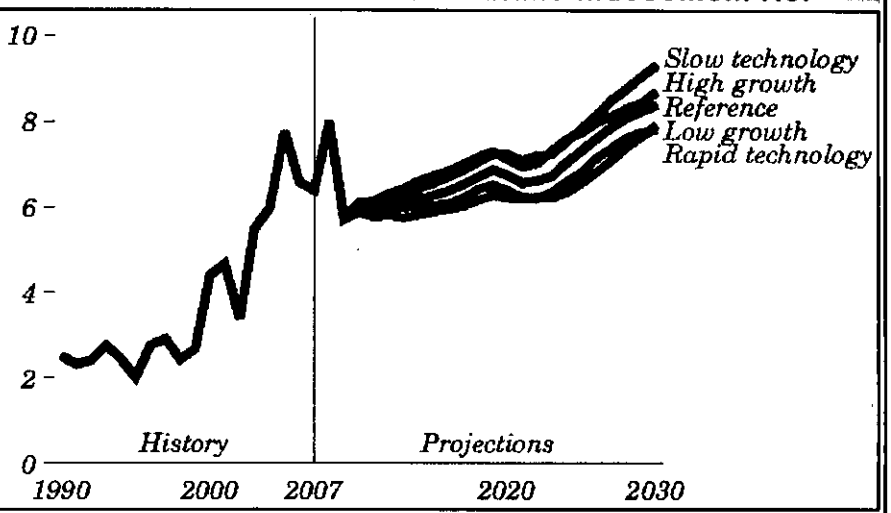


Lower 48 wellhead and Henry Hub Spot market prices for natural gas, 1990-2030 (2007 dollars per million Btu)



Lower 48 wellhead natural gas prices in five cases, 1990-2030 (2007 dollars per thousand cubic feet)

Source: EIA Annual Energy Outlook 2009

Development of New Unconventional Gas Resources

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"Declines [in North America] are expected to accelerate after 2030 coinciding with the increase in LNG import volumes. Black & Veatch expects near-term production growth in the Rockies and shale plays to offset declines in the Gulf Coast and other Lower 48 production basins."

- AGIA Findings and Determination; Appendix G1 – *AGIA NPV Report*

Shale Gas Provides About 5% of Domestic Production

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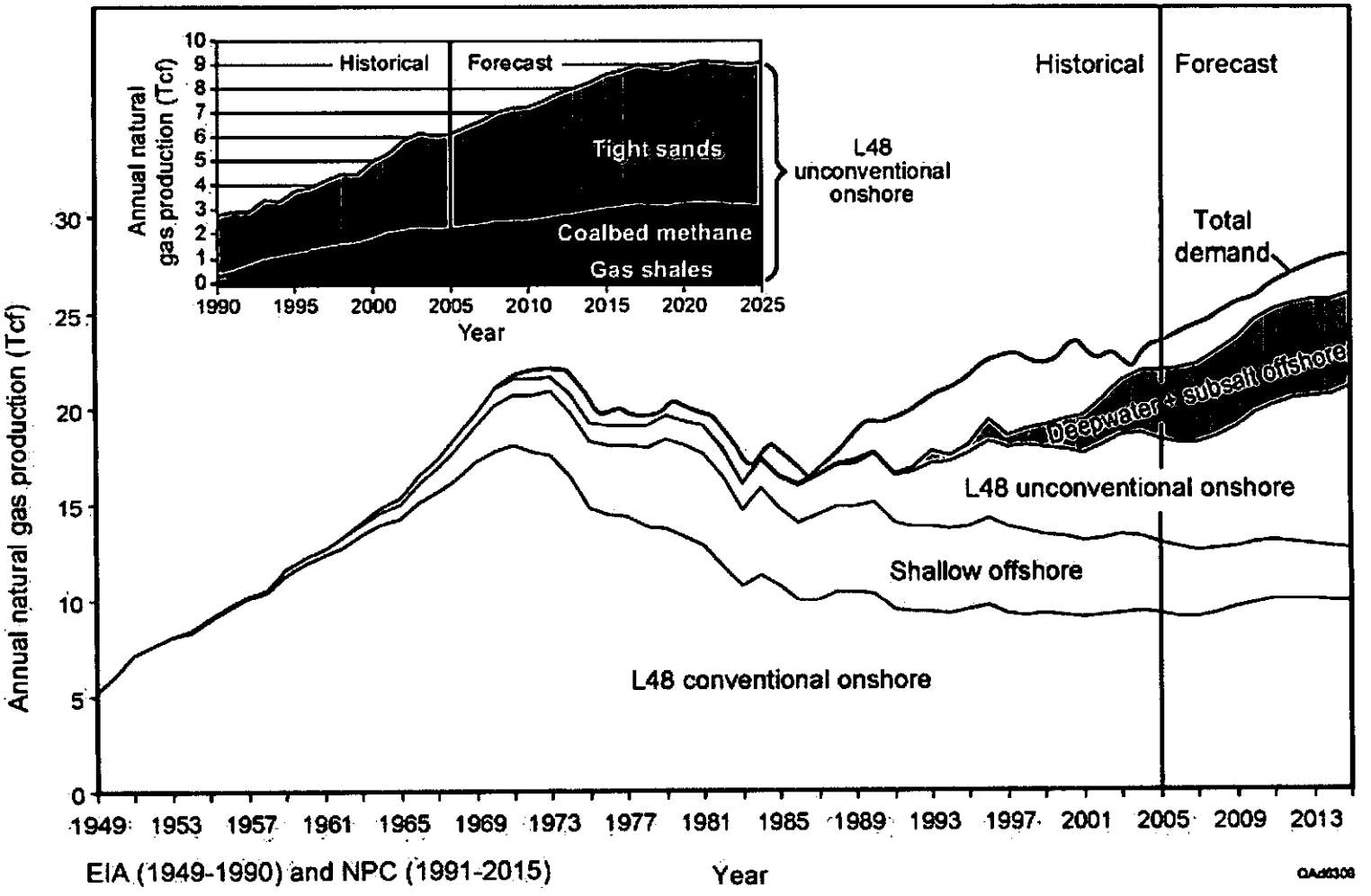

Wyoming Gas Reserves & Production History

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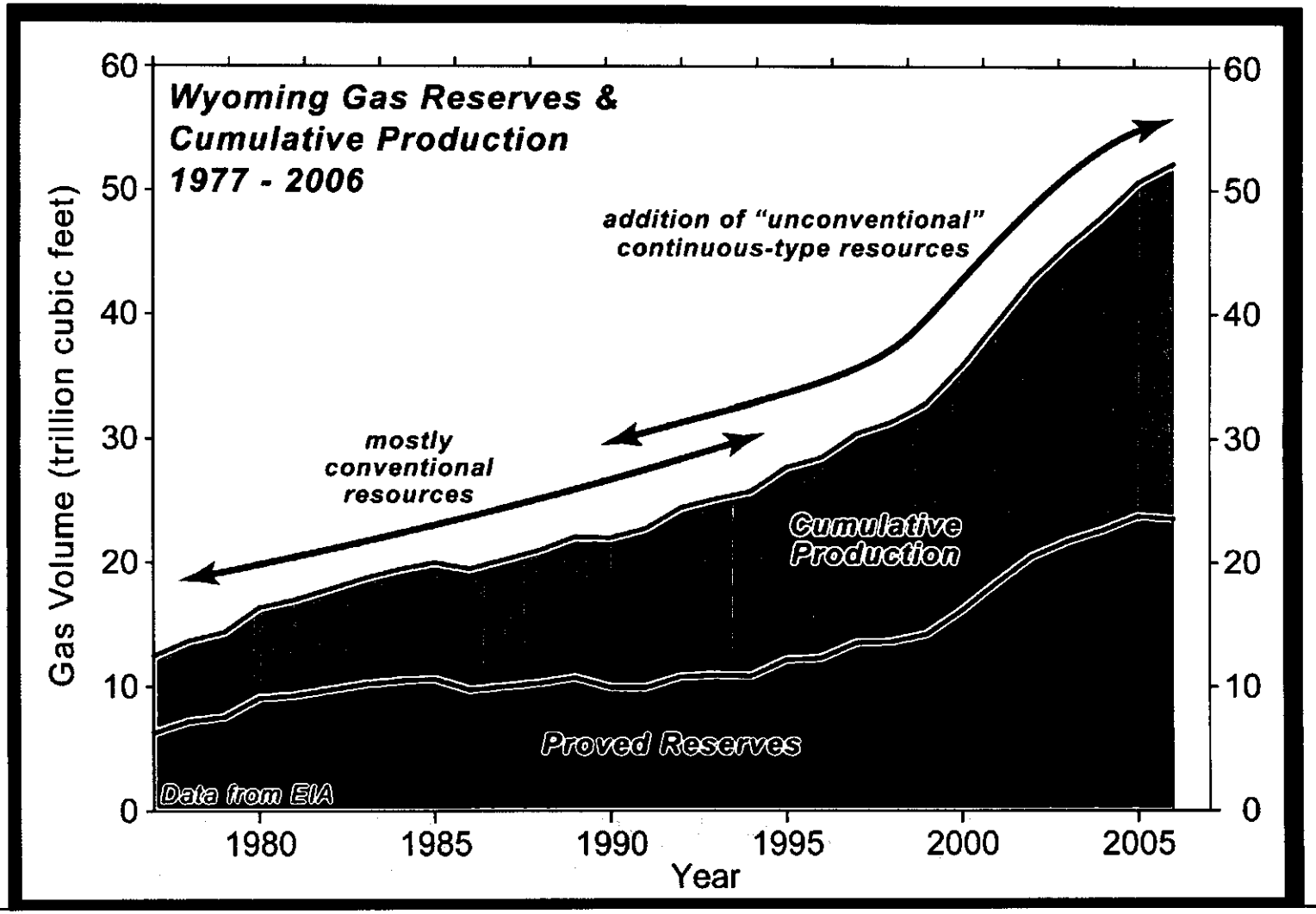
Courtesy of USGS



Lower 48 Shale Gas Plays

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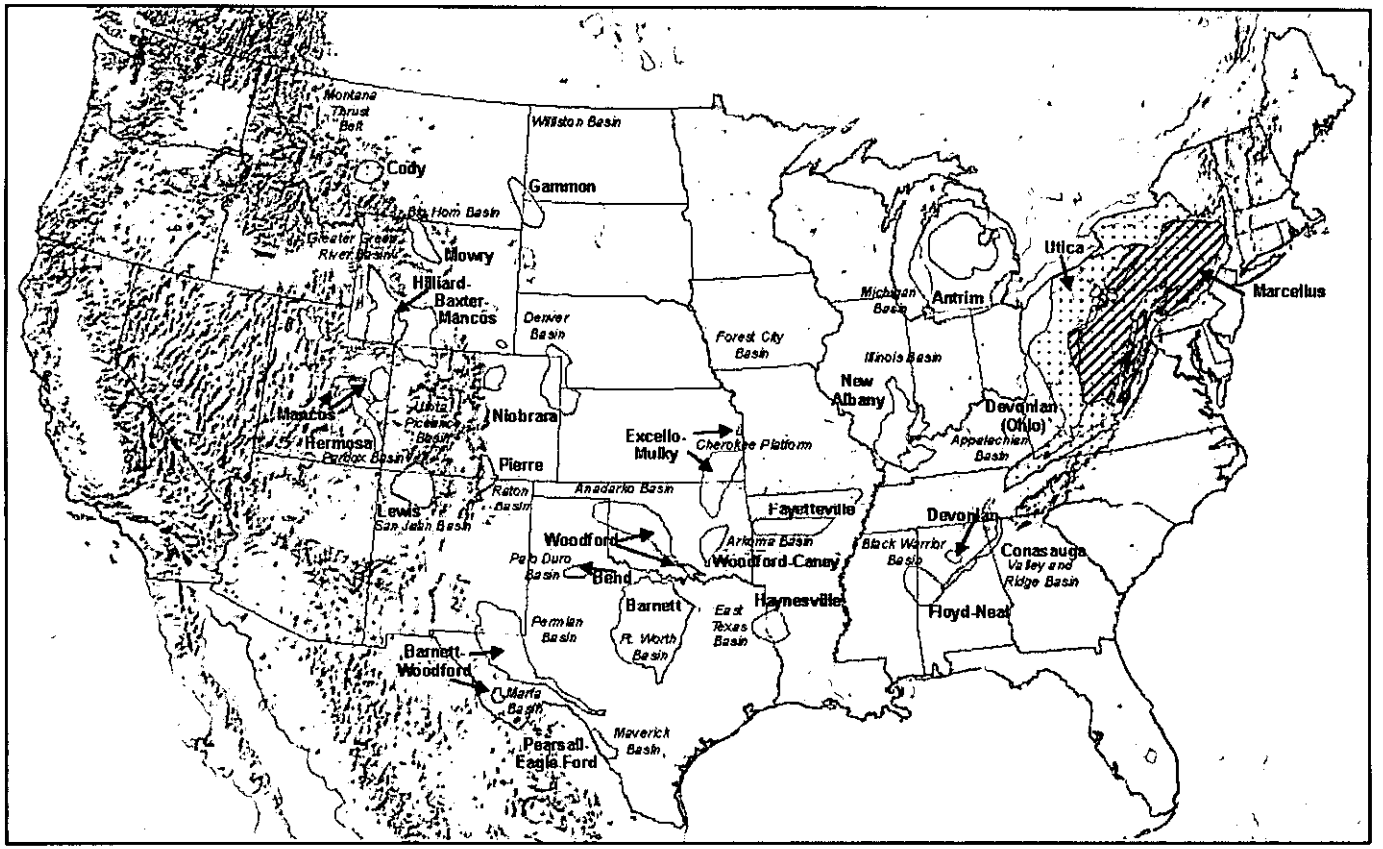

United States Shale Gas Plays

www.eia.doe.gov
Energy Information Administration
Office of Oil and Gas

Shale Gas Plays
Basins

Stacked Appalachian Plays
Marcellus
Utica
Devonian (OH shale)

November 2008
Miles
0 150 300 600

N

Estimated Break-Even Costs for Lower 48 Shale Gas and Alaska North Slope Onshore Gas

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- Onshore North Slope Gas (at AECO Hub)
  - $3.00 - $4.25
  - (USGS, AGIA Finding)
- Lower 48 Shale Gas (NYMEX)
  - Lowest - $4.20
  - Medium - $6.64
  - Highest - $11.50
  - (Bank of America)
- Today's lower drilling and steel costs and future technological development enhance economics of BOTH

Source: Bank of America, USGS and AGIA Finding

Arctic Alaska and Russia at the Top

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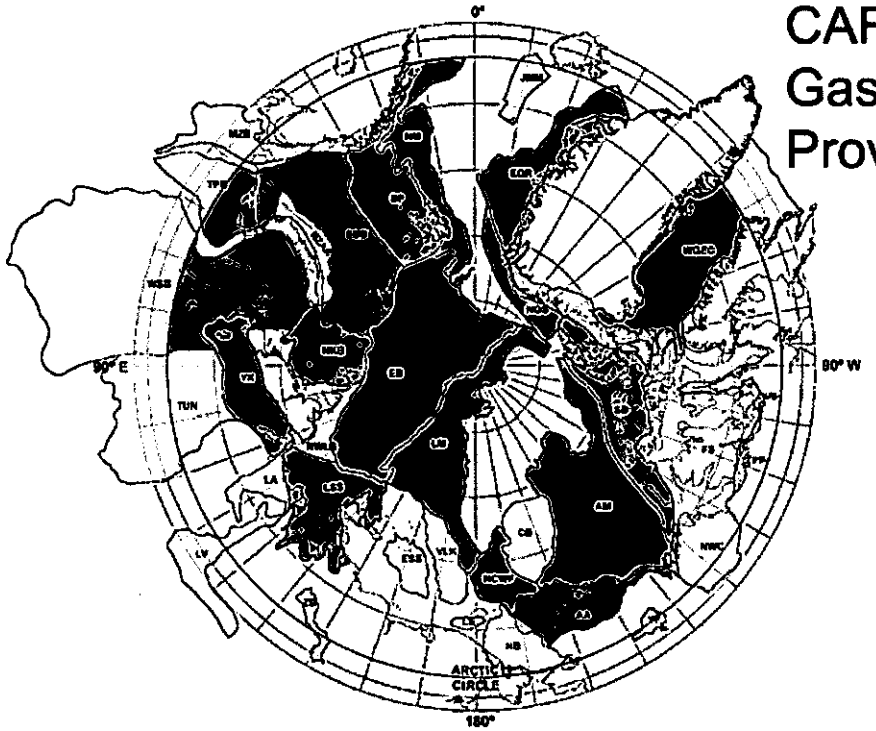
UNDISCOVERED GAS
(trillion cubic feet)

- >100
- 6–100
- <6
- Area not quantitatively assessed
- Area of low petroleum potential



CARA Gas Provinces

Province Code	Province	Oil (MMBO)	Total Gas (BCFG)	NGL (MMBNGL)	BOE (MMBOE)
WSB	West Siberian Basin	[illegible]	[illegible]	[illegible]	132,571.66
AA	Arctic Alaska	29,960.94	221,397.60	5,904.97	72,765.52
EBB	East Barents Basin	7,406.49	317,557.97	1,488.58	61,755.10
EGR	East Greenland Rift Basins	8,902.13	86,180.06	8,121.57	31,387.04
YK	Yenisey-Khatanga Basin	5,583.74	99,964.26	2,675.15	24,919.61
AM	Amerasia Basin	9,723.58	56,891.21	541.69	19,747.14
WGEC	West Greenland-East Canada	7,274.40	51,818.16	1,152.59	17,063.35
	a Shelf	3,115.57	32,562.84	867.16	9,409.87
	n Margin	1,437.29	32,281.01	504.73	7,322.19
	latform	2,055.51	26,218.67	278.71	6,704.00
	asin	1,342.15	19,475.43	520.26	5,108.31
	Basins and Platforms	1,807.26	14,973.58	390.22	4,693.07
	chora Basin	1,667.21	9,062.59	202.80	3,380.44
	enland Sheared Margin	1,349.80	10,207.24	273.09	3,324.09
	v-Makarov	1,106.78	7,156.25	191.55	2,491.04
	Basin	851.11	8,596.36	191.20	2,475.04
	bar Basin	1,912.89	2,106.75	56.41	2,320.43
	ikchi-Wrangel Foreland	85.99	6,065.76	106.57	1,203.52
	lasin	98.03	5,741.87	101.63	1,156.63
	t Laptev Sea Shelf	172.24	4,488.12	119.63	1,039.90
	i Basin	376.86	1,335.20	35.66	635.06
	Basin	47.82	1,505.99	40.14	338.95
	ian Sea Basin	19.73	618.83	10.91	133.78
	in	2.47	648.17	11.37	121.87
	t Canada Interior Basins	23.34	305.34	15.24	89.47
	asin	NQA	NQA	NQA	NQA
	mlya Basins and Admiralty	NQA	NQA	NQA	NQA
	Basin	NQA	NQA	NQA	NQA
	orderland	NQA	NQA	NQA	NQA
	ts (part of Central Alaska ce)	NQA	NQA	NQA	NQA
	it	NQA	NQA	NQA	NQA
	n Microcontinent	NQA	NQA	NQA	NQA
	n Shelf	NQA	NQA	NQA	NQA
		89,983.21	1,668,657.84	44,064.24	412,157.09

Source: USGS Fact Sheet 2008-3049

Undiscovered, Conventional Gas Resources of the U.S.

Alaska resources = 36% of national total

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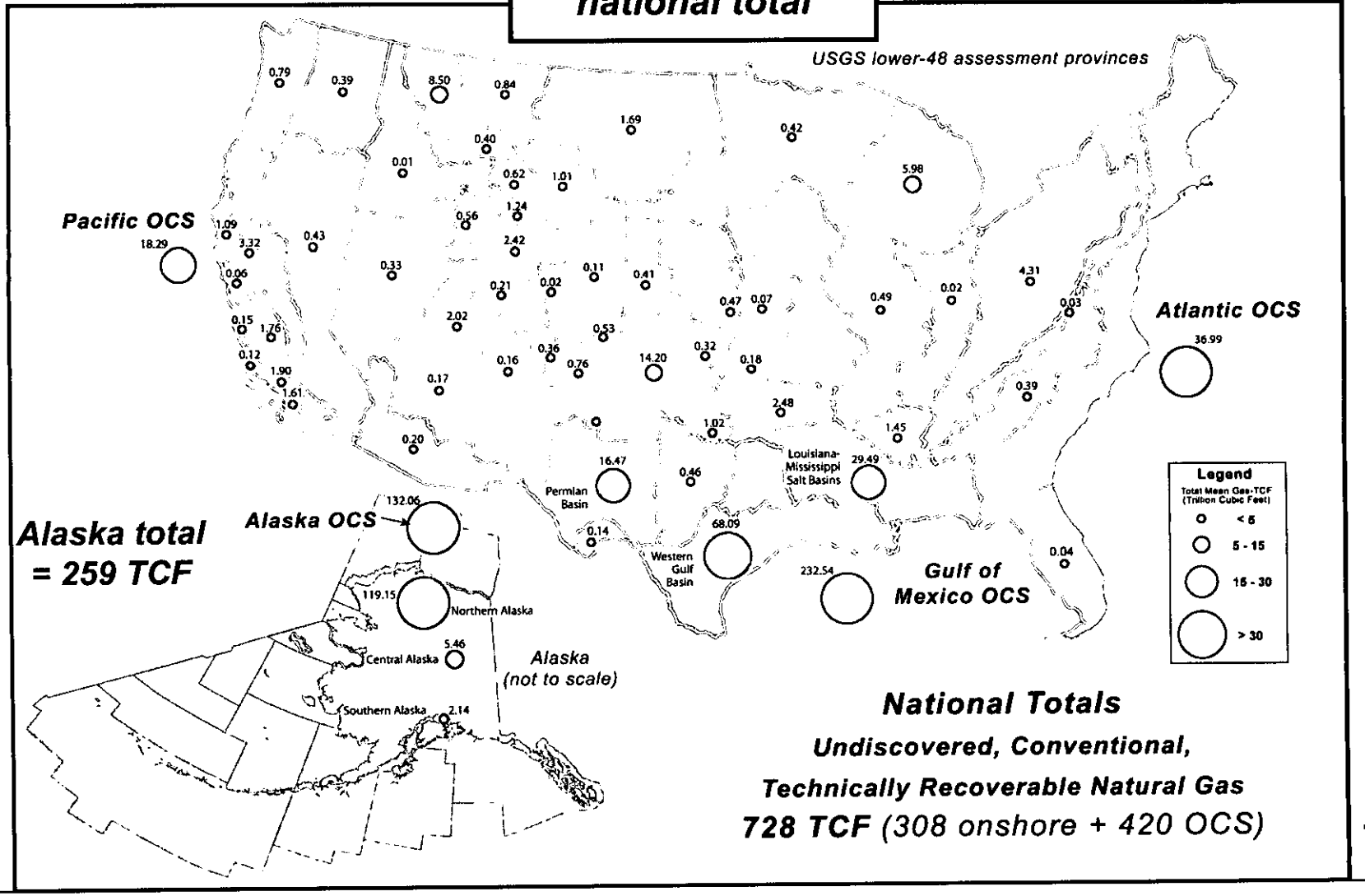
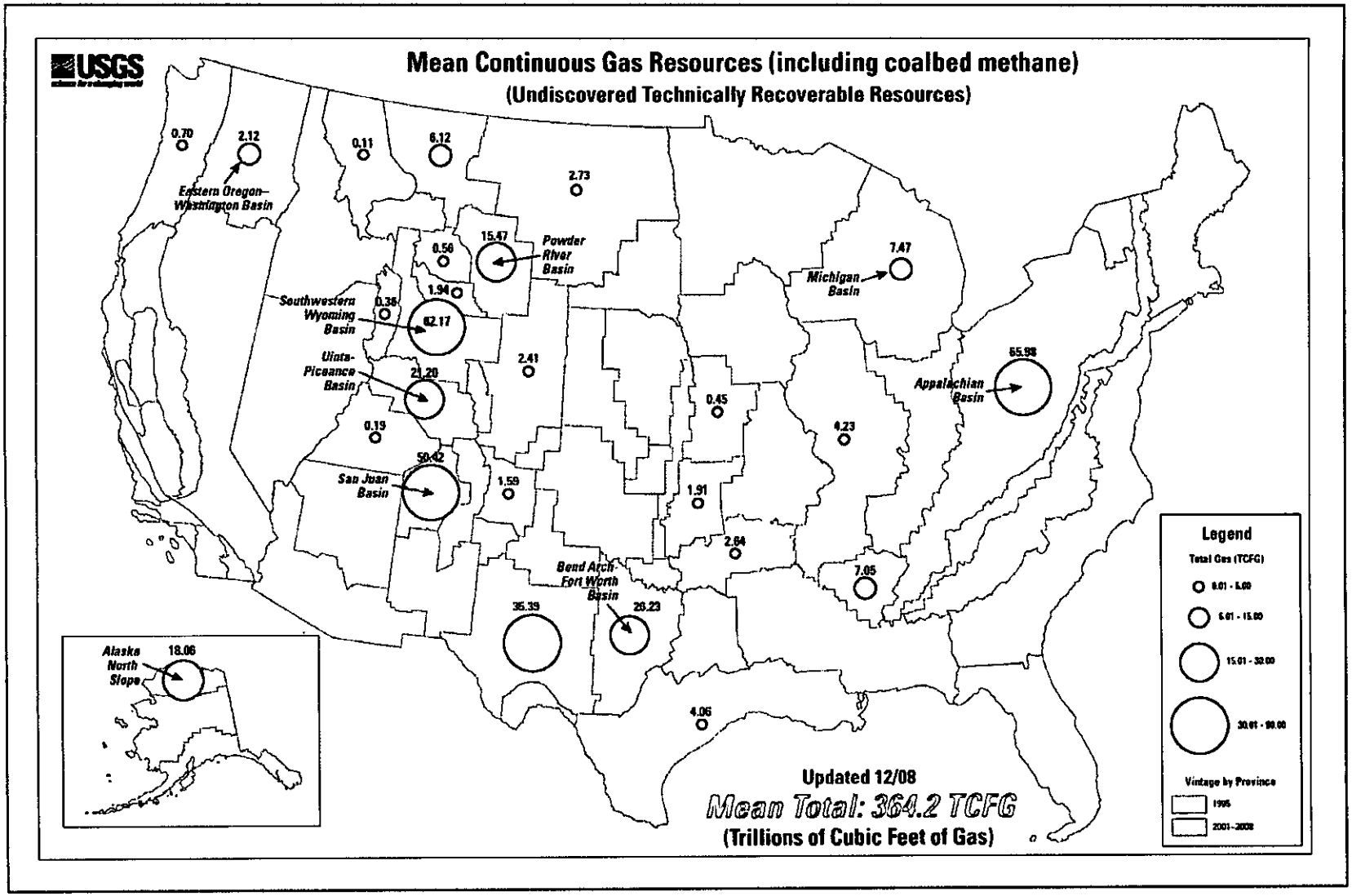
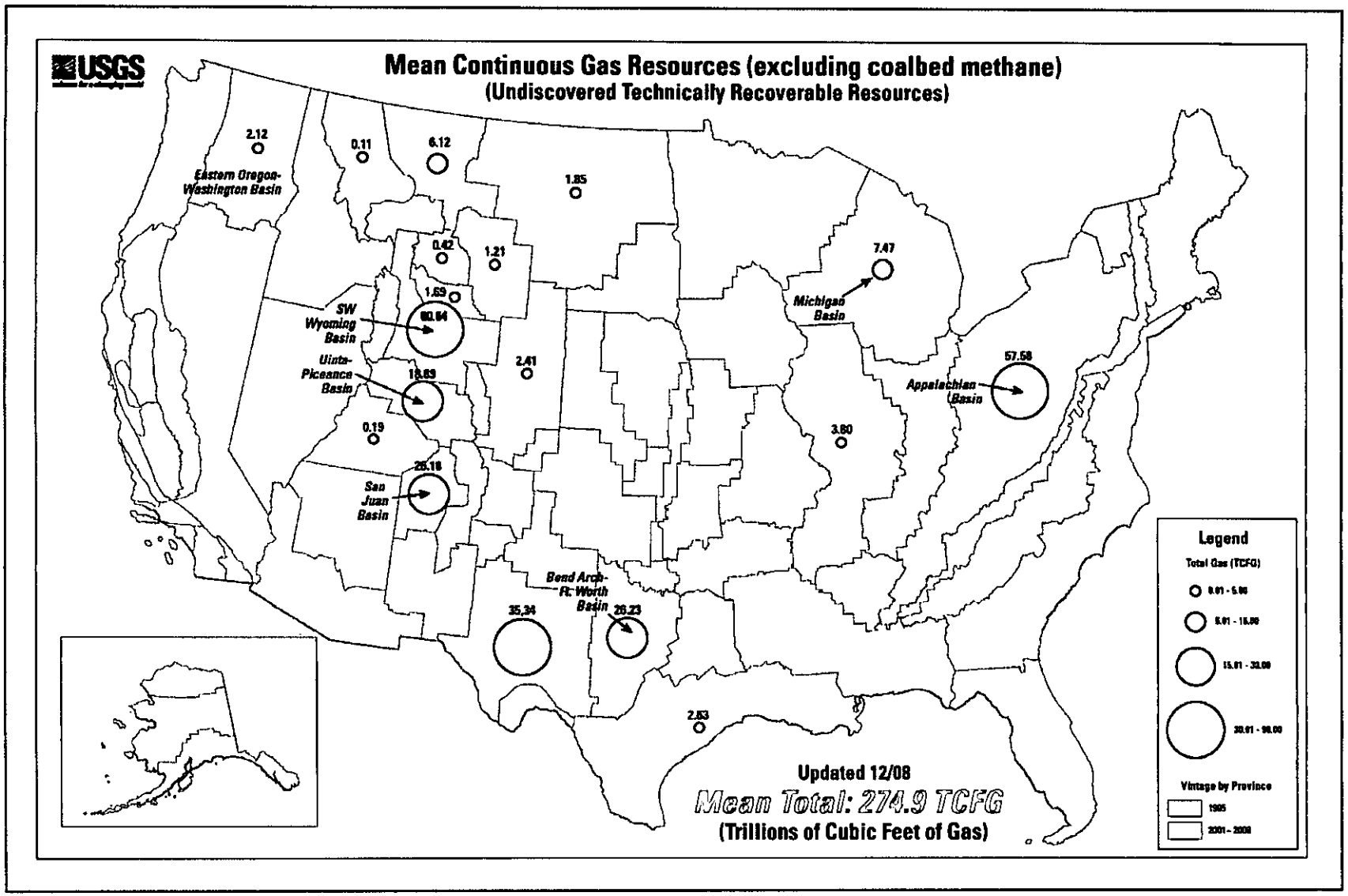


National Totals

Undiscovered, Conventional, Technically Recoverable Natural Gas

728 TCF *(308 onshore + 420 OCS)*


USGS
Mean Continuous Gas Resources (including coalbed methane)
(Undiscovered Technically Recoverable Resources)
0.70
2.12
Eastern Oregon–Washington Basin
0.11
6.12
2.73
15.47
Powder River Basin
0.58
7.47
Michigan Basin
1.94
0.36
Southwestern Wyoming Basin
62.17
Uinta-Piceance Basin
21.20
2.41
65.98
Appalachian Basin
0.45
4.23
0.19
50.42
San Juan Basin
1.59
1.91
2.64
7.05
Bend Arch-Fort Worth Basin
35.39
26.23
4.06
Alaska North Slope
18.06
Updated 12/08
Mean Total: 364.2 TCFG
(Trillions of Cubic Feet of Gas)
Legend
Total Gas (TCFG)
0.01 - 5.00
5.01 - 15.00
15.01 - 30.00
30.01 - 99.00
Vintage by Province
1995
2001–2002


USGS
Mean Continuous Gas Resources (excluding coalbed methane)
(Undiscovered Technically Recoverable Resources)
2.12
Eastern Oregon-Washington Basin
0.11
6.12
1.85
0.42
1.21
1.69
SW Wyoming Basin
50.64
Uinta-Piceance Basin
19.89
2.41
0.19
26.18
San Juan Basin
Bend Arch-Ft. Worth Basin
35.34
26.23
2.53
7.47
Michigan Basin
57.58
Appalachian Basin
3.80
Legend
Total Gas (TCFG)
0.01 - 5.00
5.01 - 15.00
15.01 - 30.00
30.01 - 58.00
Vintage by Province
1995
2001 - 2008
Updated 12/08
Mean Total: 274.9 TCFG
(Trillions of Cubic Feet of Gas)

Undiscovered Conventional Gas Potential

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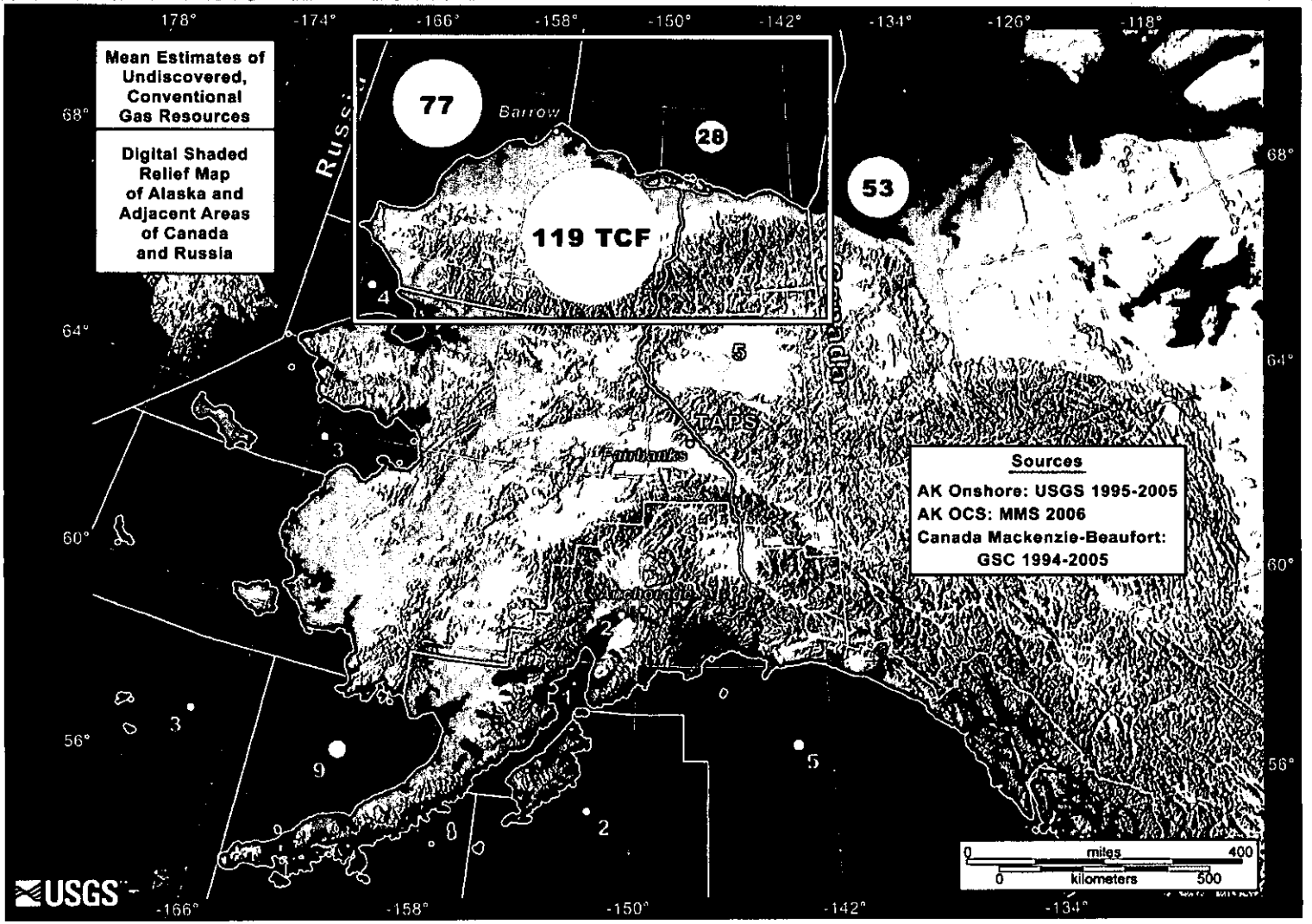

Potential for Undiscovered Petroleum in Arctic Alaska

USGS /MMS

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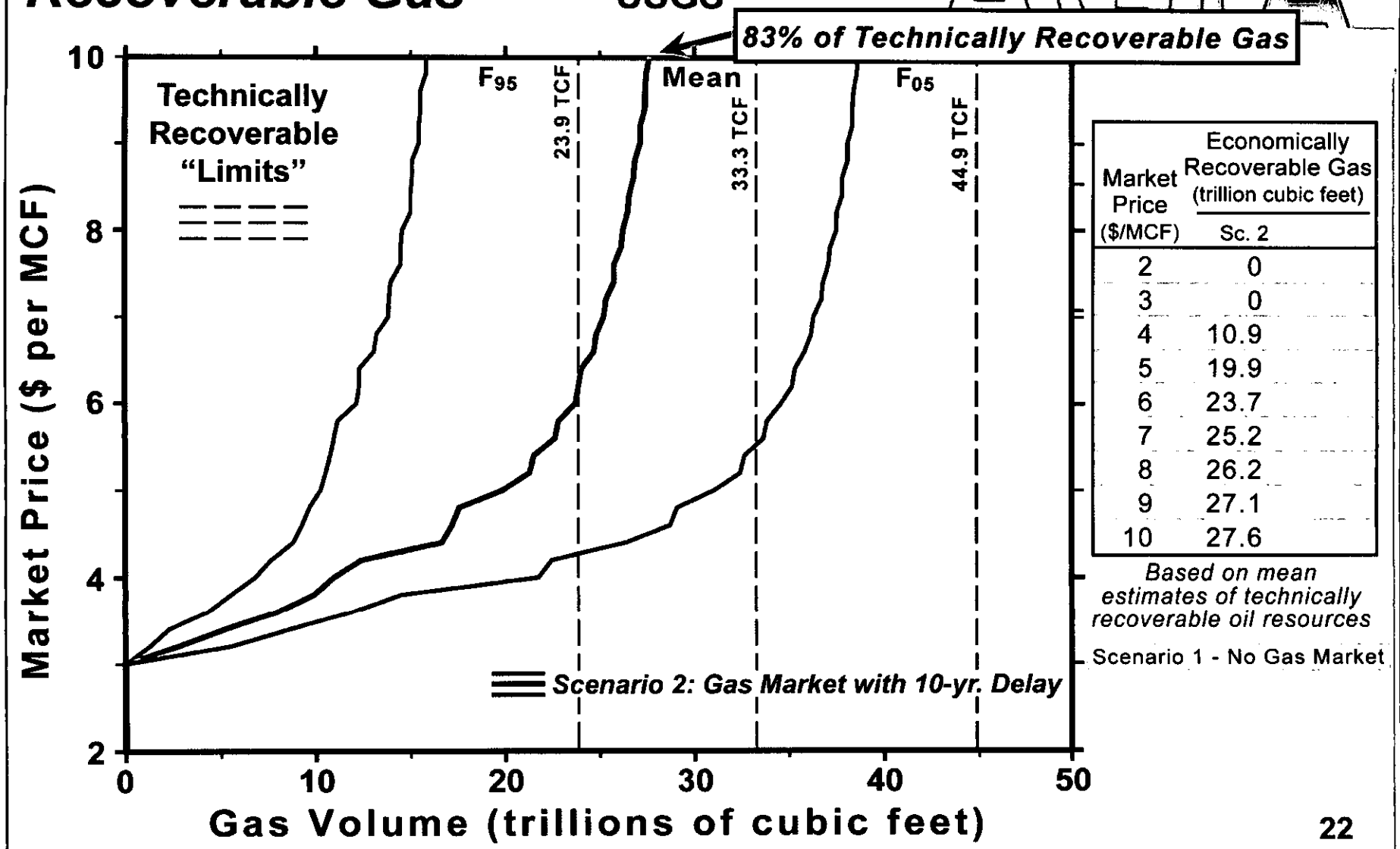
Mean Estimates of Undiscovered, *Conventional* Natural Gas in Arctic Alaska (trillion cubic feet)

	Non-Associated Gas	Associated Gas	Total Gas
Onshore & State Offshore Areas (USGS estimates)			
NPRA	61.35	11.68	73.03
Central North Slope	33.32	4.20	37.52
ANWR, 1002 Area	3.84	4.76	8.60
Subtotal	*98.51*	*20.64*	*119.15*
Federal Offshore Areas (MMS estimates)			
Chukchi Shelf	na	na	76.77
Beaufort Shelf	na	na	27.65
Hope Basin	na	na	3.77
Subtotal	na	na	*108.19*
TOTAL			*227.34*

Central North Slope Economically Recoverable Gas

USGS



Market Price ($/MCF)	Economically Recoverable Gas (trillion cubic feet) Sc. 2
2	0
3	0
4	10.9
5	19.9
6	23.7
7	25.2
8	26.2
9	27.1
10	27.6

Based on mean estimates of technically recoverable oil resources

Scenario 1 - No Gas Market

North Slope Gas Potential

DOE

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Location	Estimate of undiscovered technically recoverable conventional natural gas (Trillion Cubic Feet) Mean	Estimate of economically recoverable* natural gas reserves (Trillion Cubic Feet) Mean
National Petroleum Reserve, Alaska	73.0	31.0
Central North Slope, State Lands	37.5	33.3
ANWR 1002 area	8.6	1.0
TOTAL Onshore Potential	119 TCF	66.3 TCF
Chukchi Sea	76.8	50.0
Beaufort Sea	27.7	21.0
Hope Basin	3.8	
?		
TOTAL Offshore Potential	108 TCF	71.0 TCF
TOTAL	227 TCF	137.3
TCF		

Data Sources: Regional Resource Assessments from the U.S. Geological Survey, http://energy.usgs.gov/alaska/ and Minerals Management Service http://www.mms.gov/alaska/re/reports/2006Asmt/

*NETL This study did not include Hope Basin.

Alaska's North Slope is Very Under-Explored

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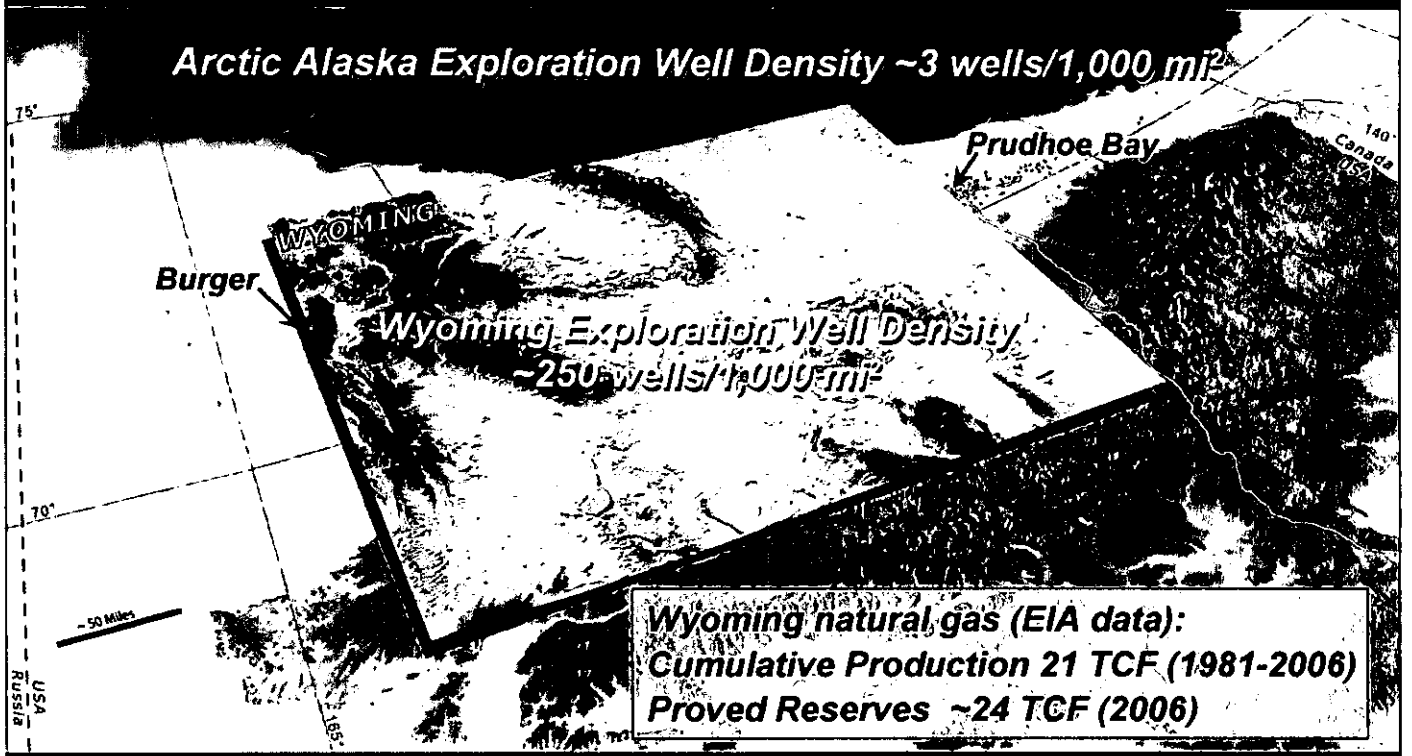
Arctic Alaska Exploration Maturity

- Prospective area onshore & offshore shelves ~ 150,000 mi² (~400,000 km²)
- Fewer than 500 exploration wells (red dots)



- Entire state of Wyoming ~100,000 mi² (~250,000 km²)
- Petroleum-prospective area ~75,000 mi² (~250,000 km²)
- ~19,371 exploration wells

14

Courtesy of USGS

Unconventional Gas Resources (continuous resources)

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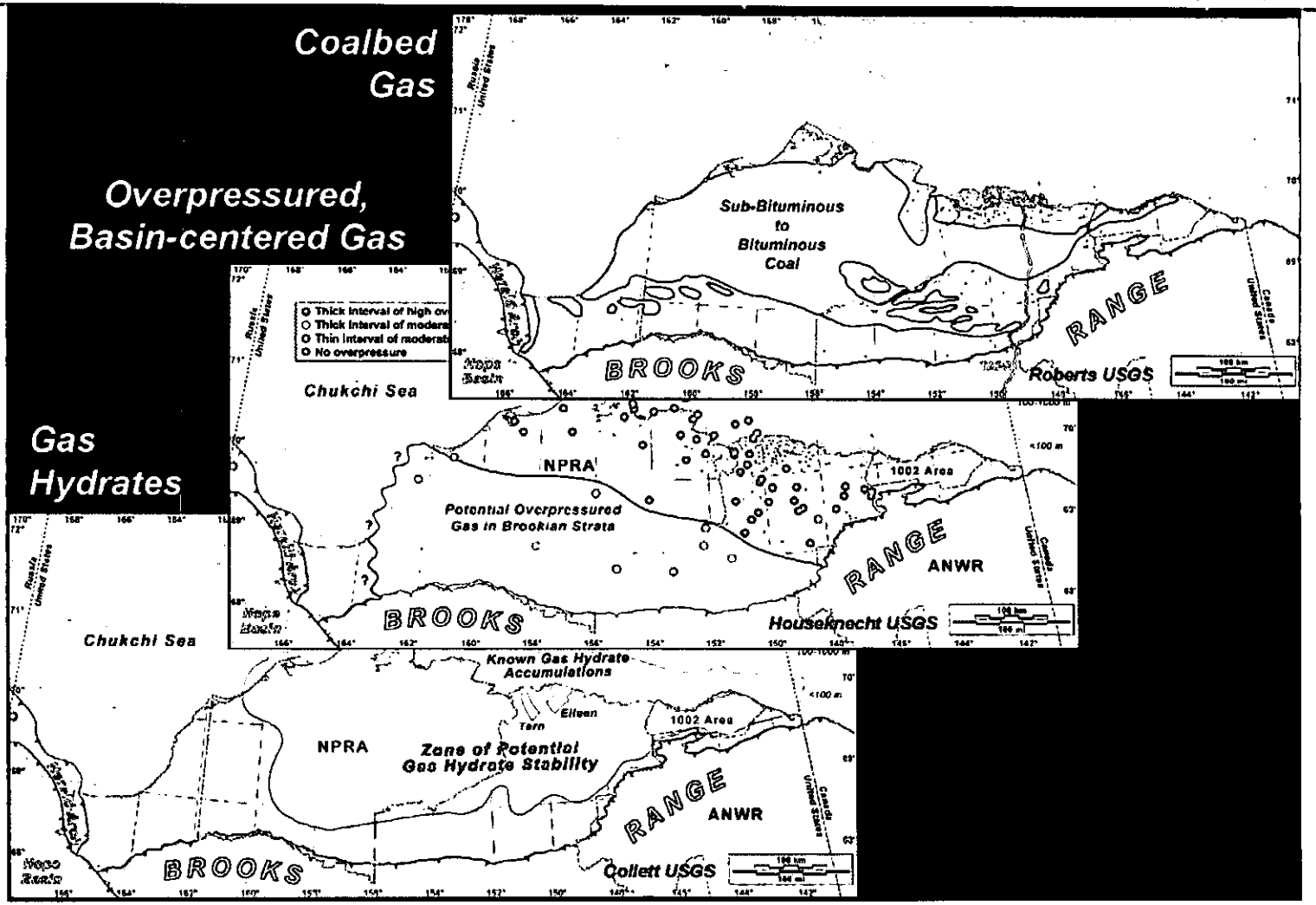

Alaska North Slope Natural Gas Hydrate Assessment Results

AGIA
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[BCFG, billion cubic feet of gas. MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. Fractiles are additive, assuming perfect positive correlations. NGL, natural gas liquids; TPS, total petroleum system; AU, assessment unit.]

Total Petroleum System and Assessment Unit	Field Type	*Total Undiscovered Resources*							
		Gas (BCFG)				*NGL (MMBNGL)*			
		F95	F50	F5	Mean	F95	F50	F5	Mean
Northern Alaska Gas Hydrate TPS									
Sagavanirktok Formation Gas Hydrate AU	*Gas*	6,285	19,490	37,791	20,567	0	0	0	0
Tuluvak-Schrader Bluff-Prince Creek Formations Gas Hydrate AU	*Gas*	8,173	26,532	51,814	28,003	0	0	0	0
Nanushuk Formation Gas Hydrate AU	*Gas*	10,775	35,008	68,226	36,857	0	0	0	0
Total Undiscovered Resources		**25,233**	**81,030**	**157,831**	**85,427**	**0**	**0**	**0**	**0**

Source: USGS Fact Sheet 2008-3073

Alaska's Arctic Natural Gas: Critical Bridge to a Sustainable Future

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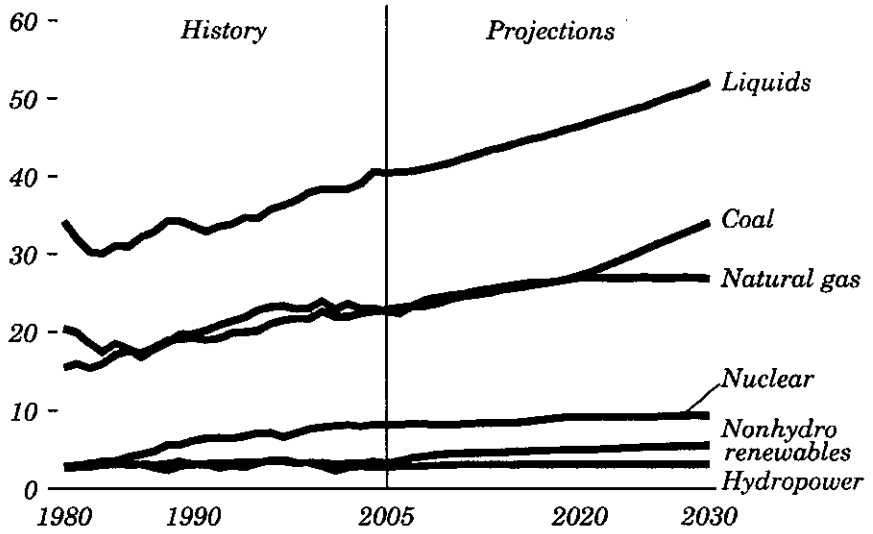
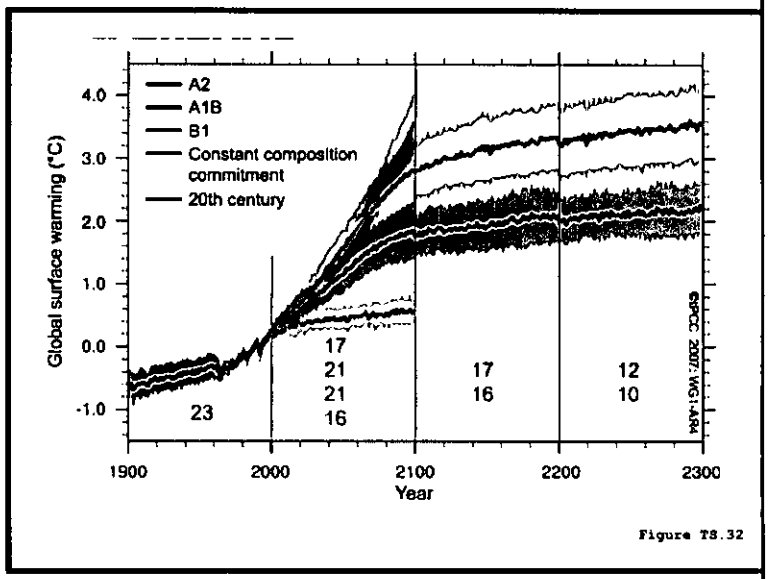
United States Energy Consumption by Fuel



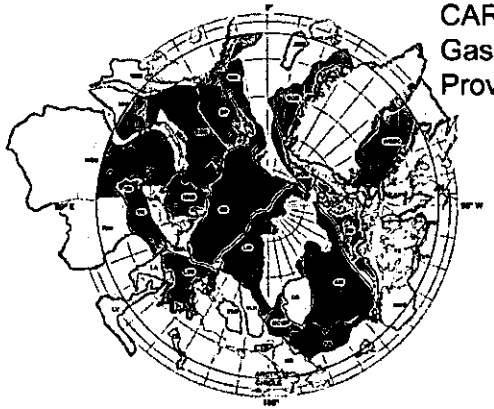
EIA

Carbon Emissions



USGS

IPCC 2007: WG1-AR4



CARA Gas Provinces

Impact of Carbon Regulation on Natural Gas Demand

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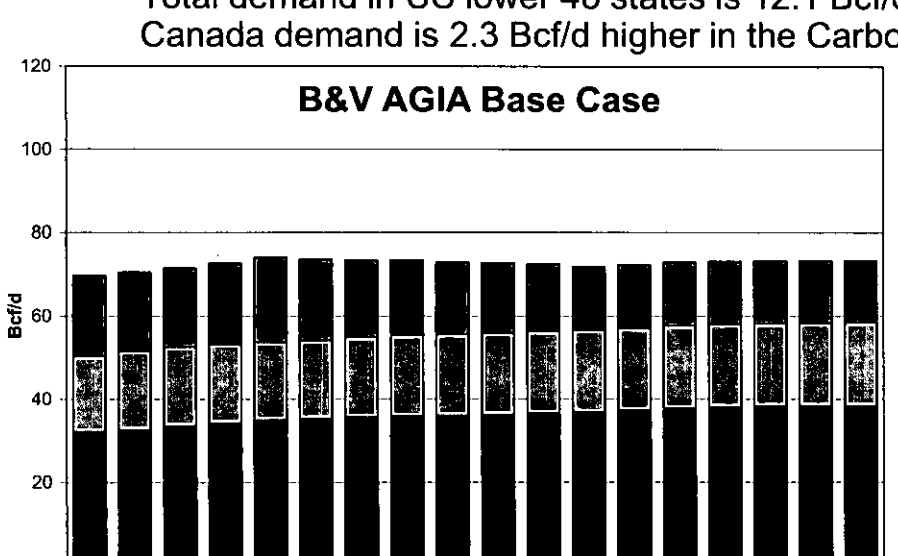
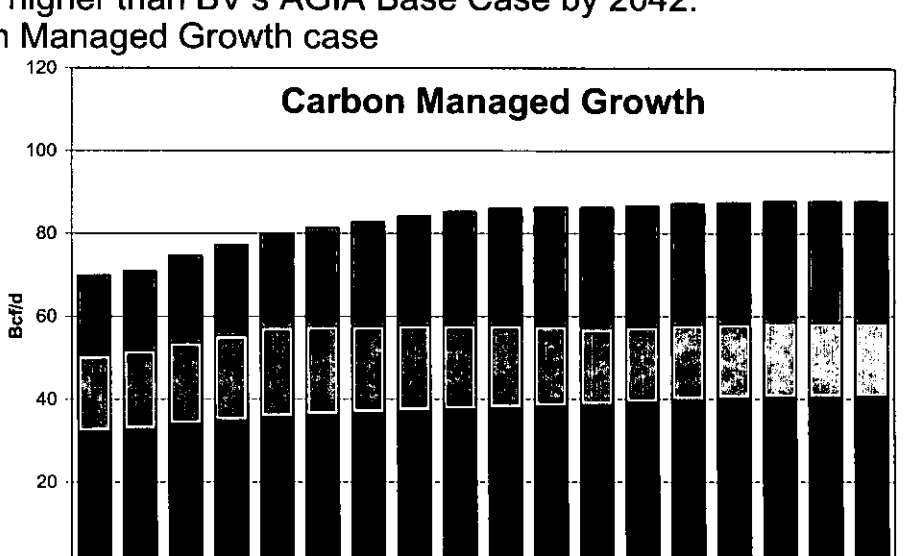
In a Carbon Managed Growth case, demand is 14 Bcf/d more than the B&V AGIA Base Case

- Policies and legislations designed to curb Green House Gas could reduce dispatch and construction of coal-fired generation facilities in favor of natural gas fired facilities, resulting in demand increase from the power sector in the US
- All resources, including renewables, nuclear and IGCC with CCS and gas fired combined cycles are all needed to meet electric demand growth. Gas demand from the power sector will grow from 19 Bcf/d in 2008 to 29 Bcf/d by 2030, with a CAGR of 2%
- Total demand in US lower 48 states is 12.1 Bcf/d higher than BV's AGIA Base Case by 2042. Canada demand is 2.3 Bcf/d higher in the Carbon Managed Growth case





Source: Black & Veatch Analysis

Multiple Different Sources of Natural Gas will be Needed to Meet Lower 48 Demand Growth

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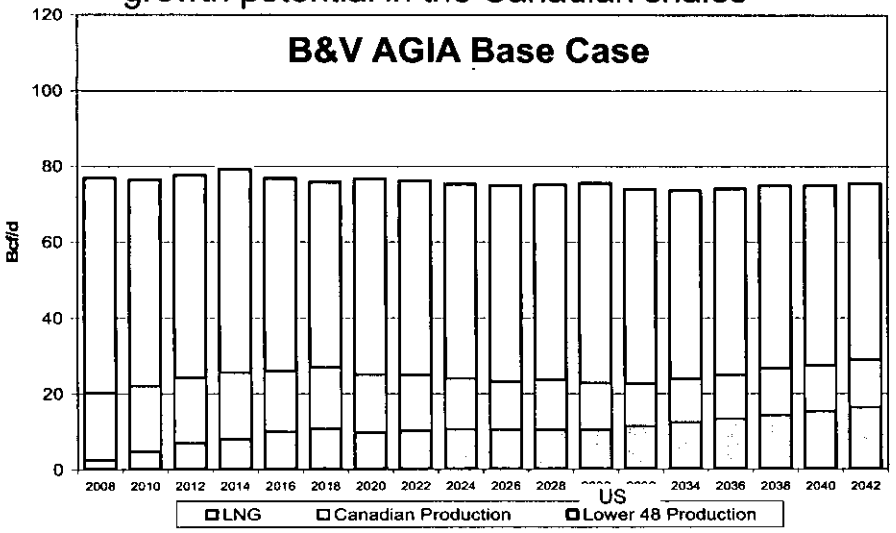
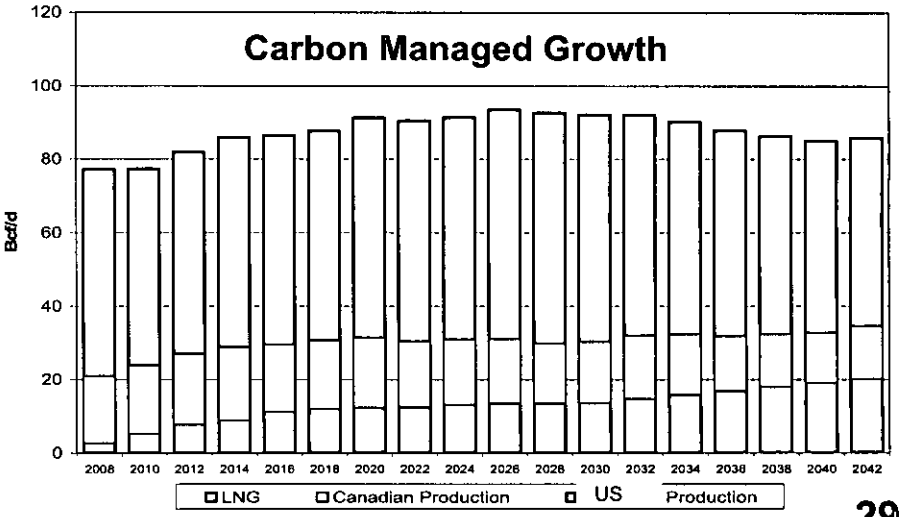
Additional LNG imports and more unconventional productions from the US is necessary in order to meet the lower 48 demand growth

- Additional LNG imports will be needed to meet the demand growth; 6.4 Bcf/d by 2042 in the Carbon Managed Growth scenario
- US Production will average 58.3 Bcf/d from 2022-2042 in the Carbon Managed Growth case, which will be 7.8 Bcf/d higher than the B&V AGIA Base Case. Recent developments in shale discoveries in Haynesville and Marcellus indicate greater production potentials from these unconventional resources. The production growth can be considered as a proxy.
- Canadian production continues to decline in both cases. In the Carbon Managed Growth case, Canadian production is 3.7 Bcf/d higher than in the B&V AGIA Base Case, which may approximately reflect the growth potential in the Canadian shales





Source: Black & Veatch Analysis

Impact of Carbon Regulation on AECO Price Forecasts

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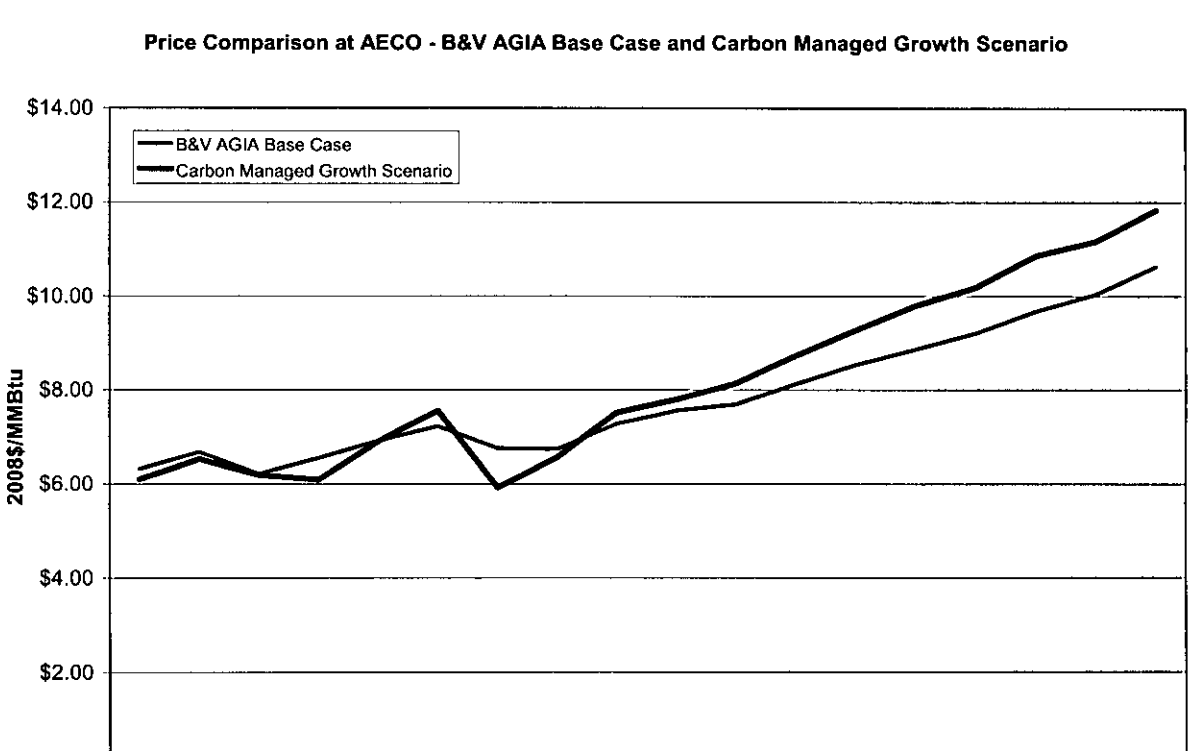
- The Carbon Managed Growth case has sufficient supplies from North America to meet the high demand from both unconventional production and slightly higher additional LNG volumes
- North American gas price is projected to have a higher price path than in the AGIA base case



Source: Black & Veatch Analysis

Liquid Natural Gas (LNG) Imports Current and Forecast Volumes

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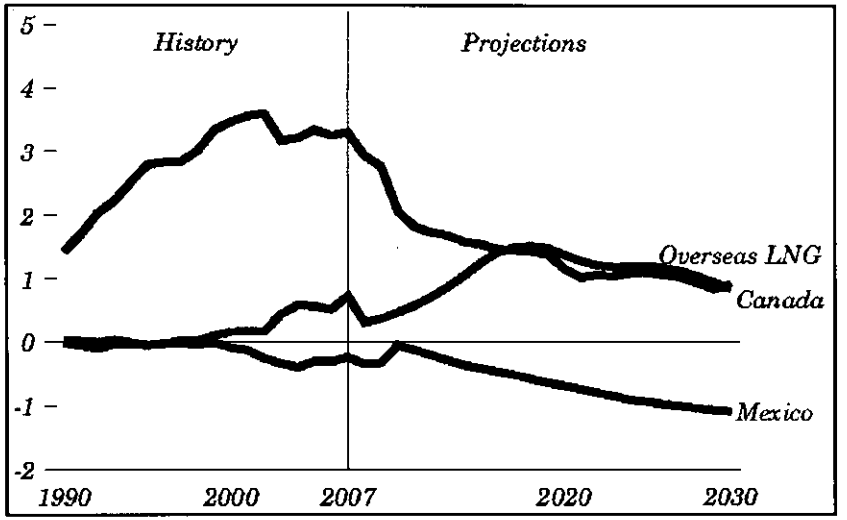
LNG import volumes have experienced little net change since the legislature approved the AGIA license

Total US LNG Import Volumes

July 2008:	31,019 mmcf
December 2008:	30,708 mmcf



Net U.S. imports of natural gas by source, 1990-2030 (trillion cubic feet)

Source: EIA Annual Energy Outlook 2009

*More Recent EIA Price Forecasts for Gas Predict **Higher** Long-term Prices for Natural Gas in the U.S.*

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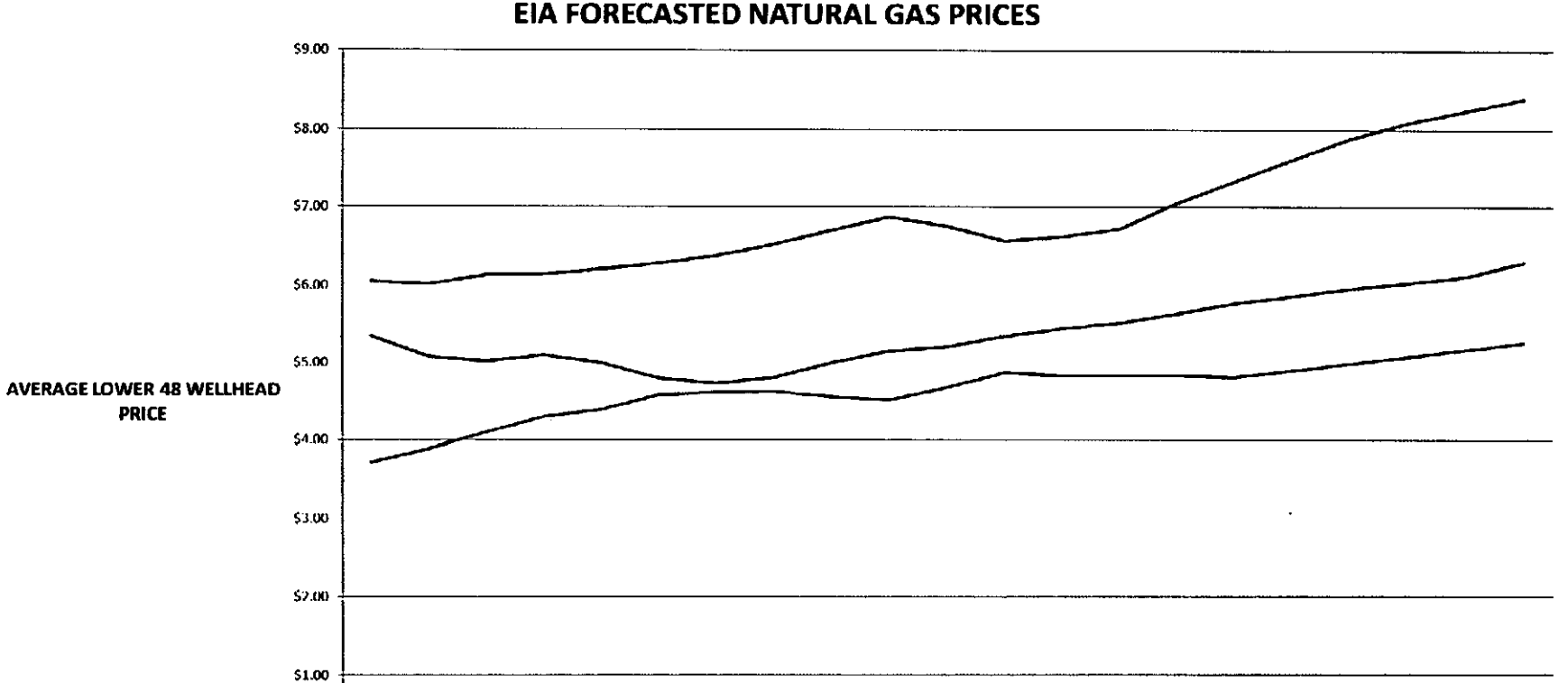
EIA FORECASTED NATURAL GAS PRICES



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
2004 EIA FORECAST (IN 2007 DOLLARS)	$3.72	$3.89	$4.10	$4.30	$4.39	$4.58	$4.62	$4.63	$4.56	$4.52	$4.68	$4.87	$4.84	$4.84	$4.84	$4.81	$4.90	$4.99	$5.08	$5.17	$5.26
2006 EIA FORECAST (IN 2007 DOLLARS)	$5.34	$5.08	$5.01	$5.10	$5.00	$4.80	$4.74	$4.81	$5.00	$5.15	$5.21	$5.34	$5.44	$5.51	$5.63	$5.77	$5.85	$5.96	$6.02	$6.11	$6.29
2009 EIA FORECAST (IN 2007 DOLLARS)	$6.05	$6.01	$6.13	$6.14	$6.20	$6.27	$6.37	$6.52	$6.70	$6.87	$6.75	$6.56	$6.62	$6.72	$7.05	$7.33	$7.61	$7.88	$8.09	$8.25	$8.40

YEAR

—2004 EIA FORECAST (IN 2007 DOLLARS) —2006 EIA FORECAST (IN 2007 DOLLARS) —2009 EIA FORECAST (IN 2007 DOLLARS)

Atigun Gorge North Slope Alaska – Along the Gasline Route

Photo taken by David Houseknecht USGS

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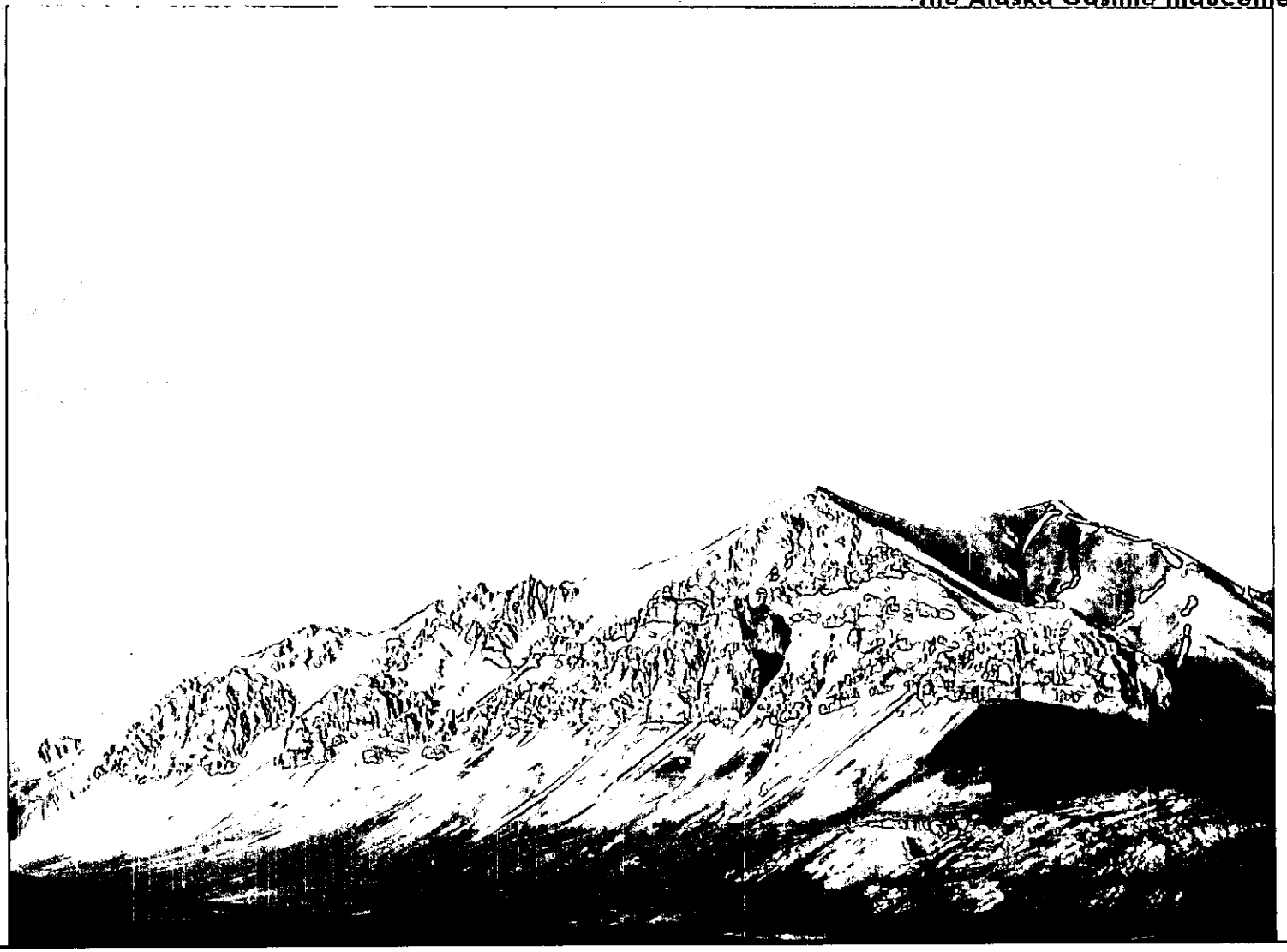

Historic AECO Basis to Henry Hub (Monthly Averages)

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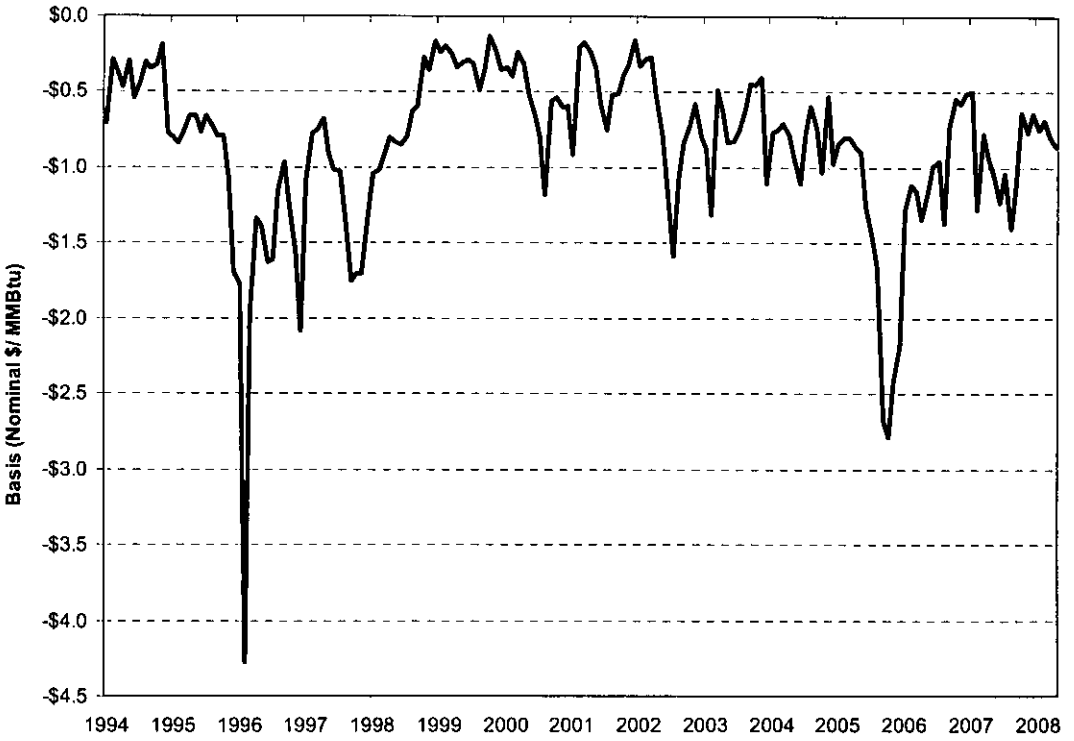

Source: AGIA Finding