

3/25/09

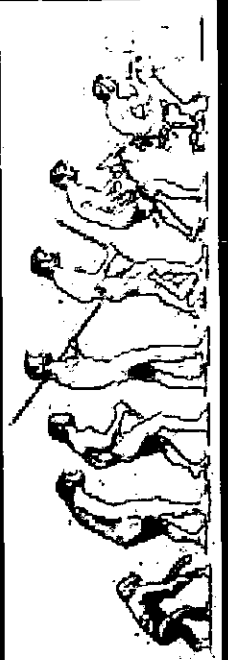
AGIA

UPDATE

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

AGIA

The Alaska Gasline Inducement Act



Dr. Mark Myers
March 25, 2009

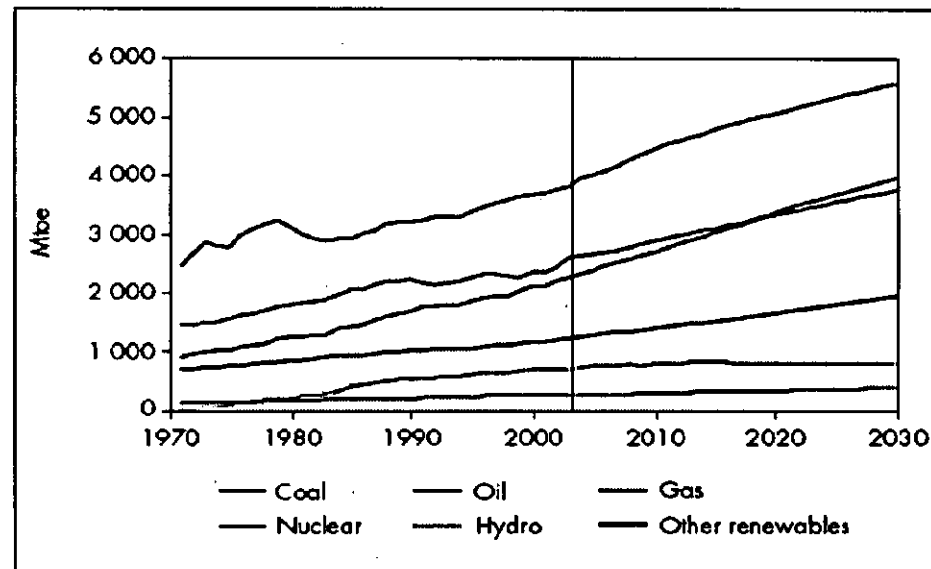
Alaska's Natural Gas is America's Resource For Enhancing Economic, Environmental and National Security

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

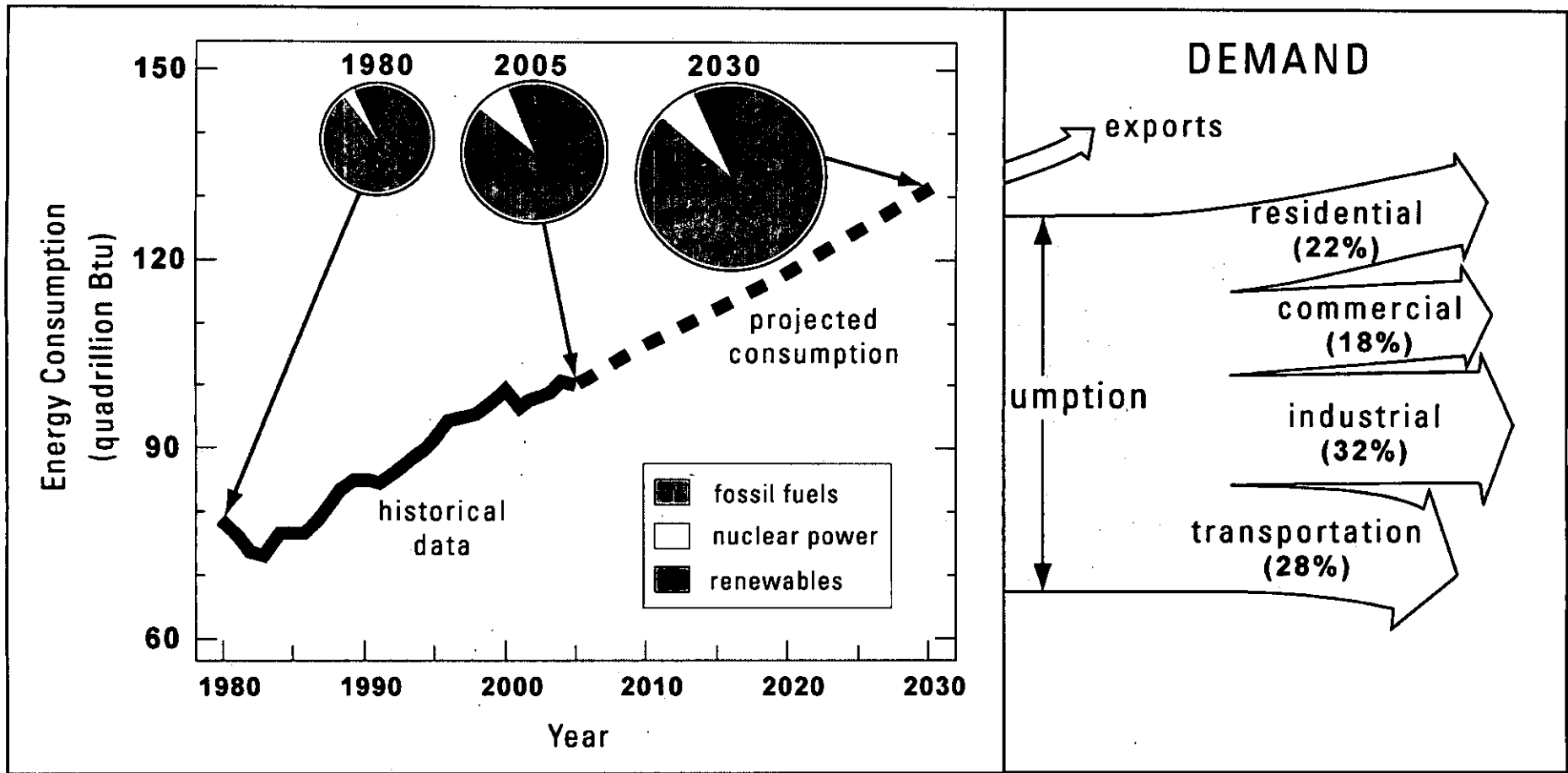
World Energy
Consumption by
Source



The Energy Mix for the United States



The Alaska Gasline Inducement Act

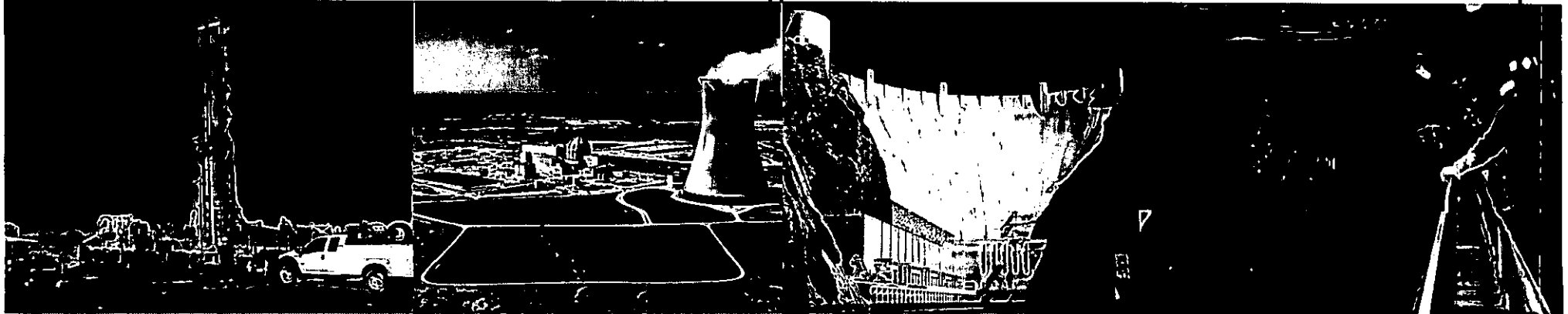
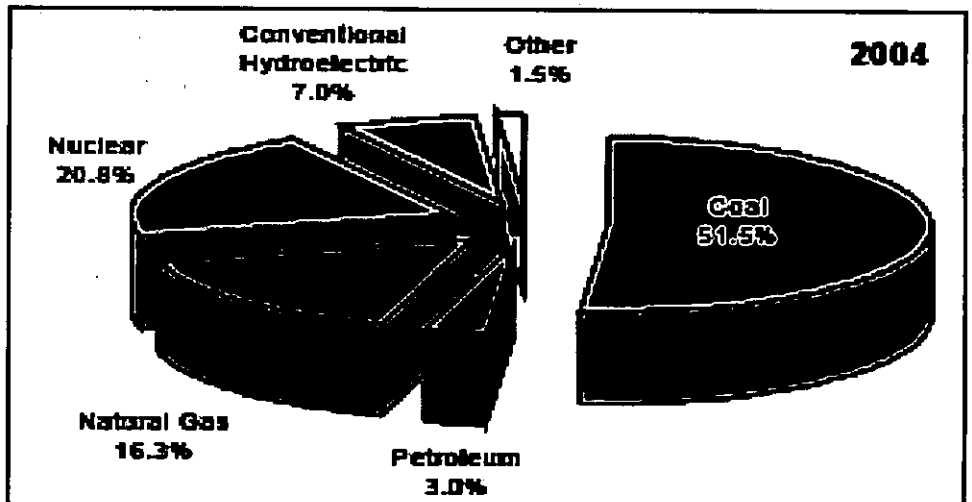
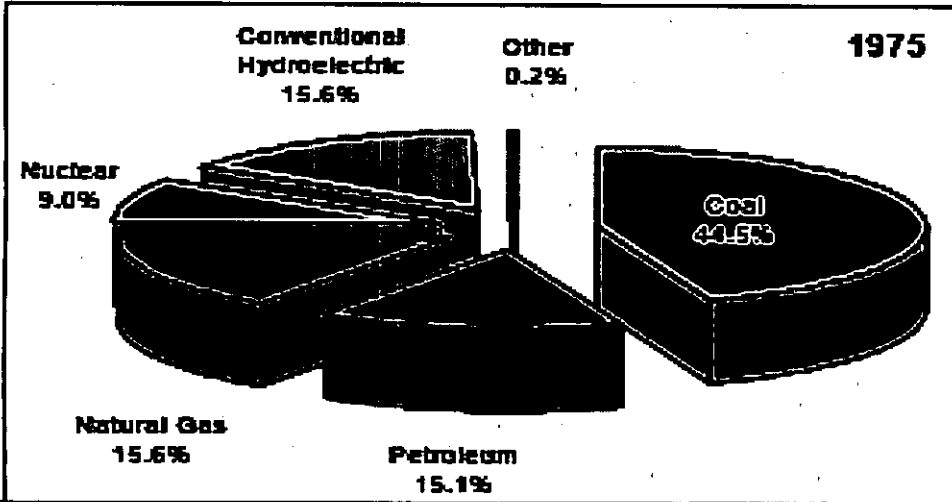


Large Changes Have Occurred In Fuel Sources

AGIA

The Alaska Gasline Inducement Act

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



USGS/EIA

Change in Fuel Type for Electrical Generation Over Three Decades

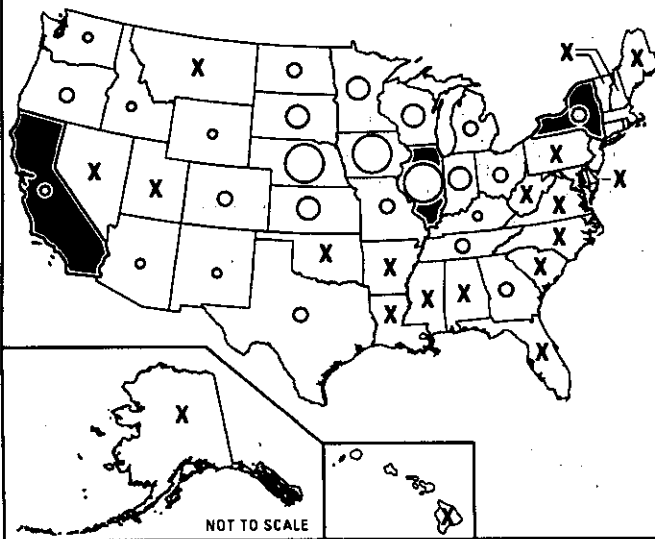
No Free Lunch: All New Sources of Energy Have Their Own Unique Environmental Challenges: Biomass/Water

AGIA

The Alaska Gasline Inducement Act

USGS/EIA

Information sources: ^Energy Information Administration and **Nebraska Energy Office



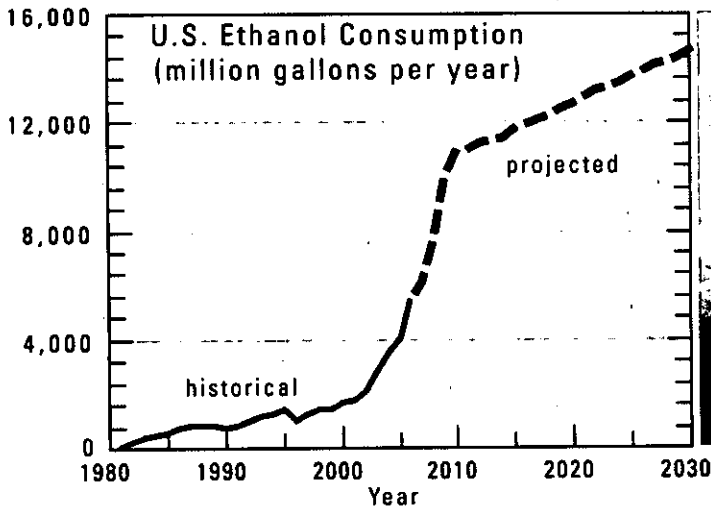
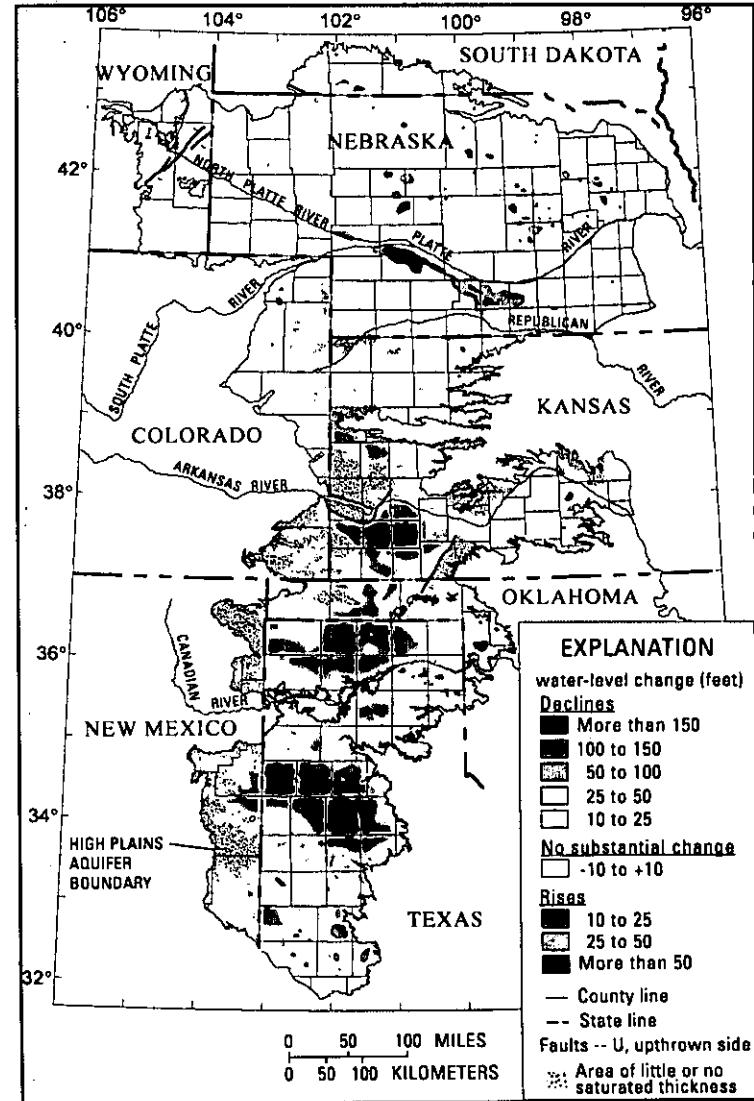
February 2007 - Ethanol Production Capacity** (million gallons per year)

- X no capacity reported
- less than 100
- 100 to 500
- 500 to 1,000
- greater than 1,000

Total U.S. Capacity: 11,800 million gallons per year

2005 Ethanol Consumption Estimates^ (million gallons)

- none reported
- less than 30
- 30 to 100
- 100 to 300
- greater than 300



The USA Today

AGIA

The Alaska Gasline Inducement Act

- 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

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."

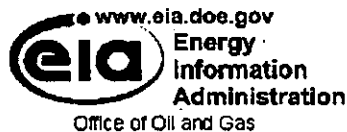
Lower 48 Shale Gas Plays

AGIA

The Alaska Gasline Inducement Act



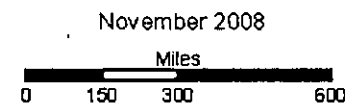
United States Shale Gas Plays



Shale Gas Plays
 Basins

Stacked Appalachian Plays

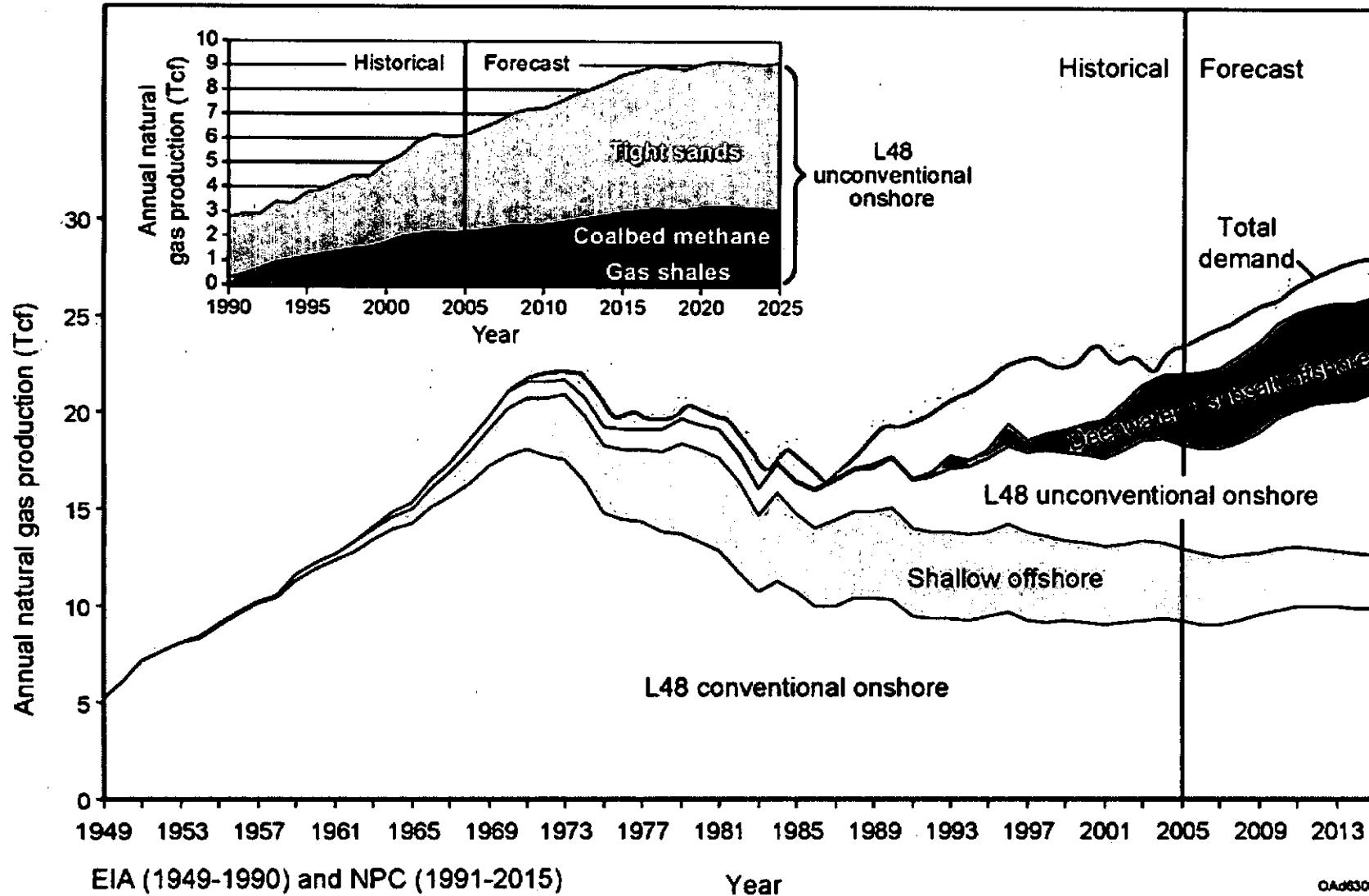
Marcellus
 Utica
 Devonian (OH shale)



Shale Gas Provides About 5% of Domestic Production



The Alaska Gasline Inducement Act



EIA (1949-1990) and NPC (1991-2015)

Year

QA06308

Development of New Unconventional Gas Resources



The Alaska Gasline Inducement Act

“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.”

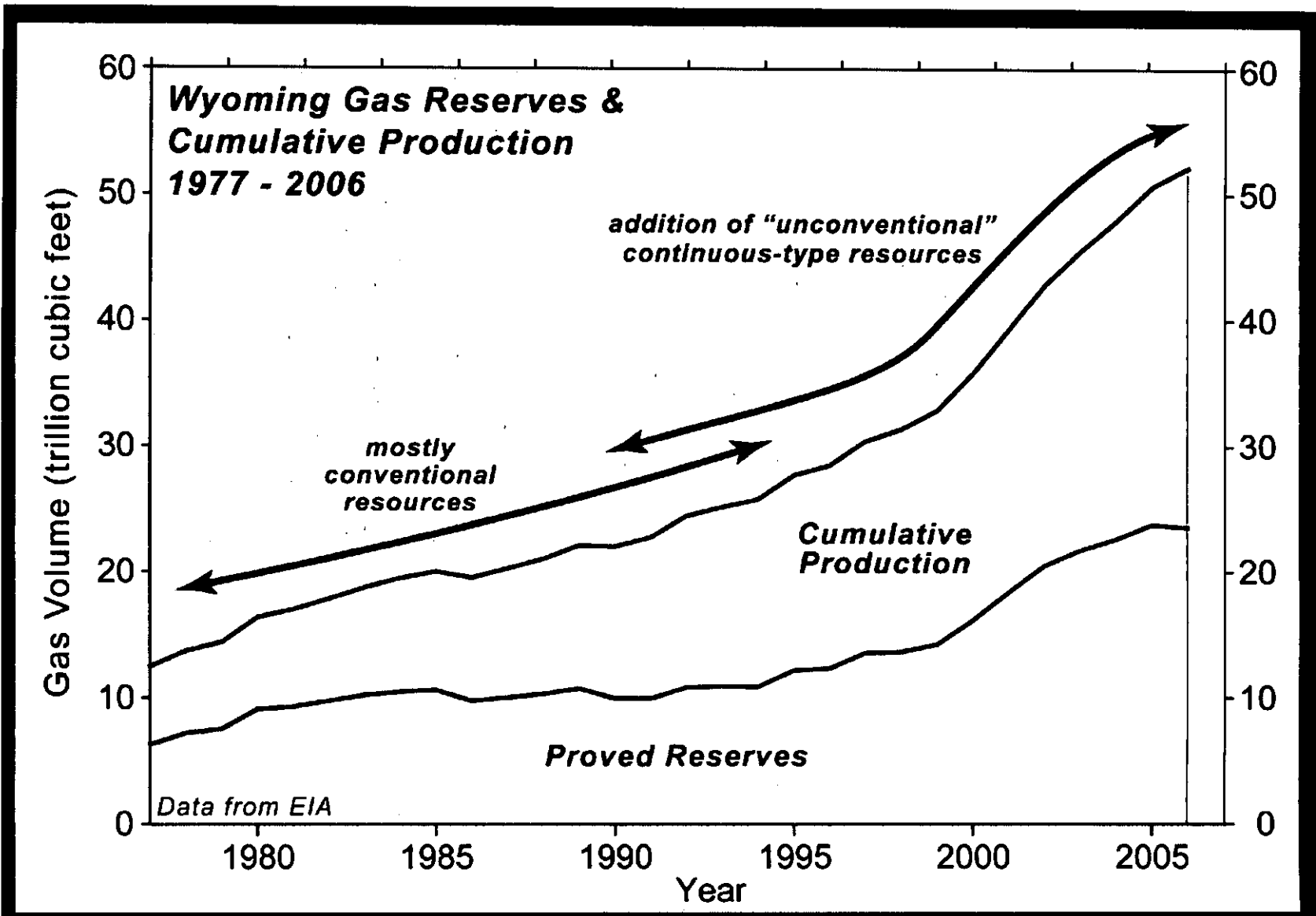
- AGIA Findings and Determination; Appendix G1 – *AGIA NPV Report*

Wyoming Gas Reserves & Production History



The Alaska Gasline Inducement Act

Courtesy of USGS



Arctic Alaska and Russia at the Top

AGIA

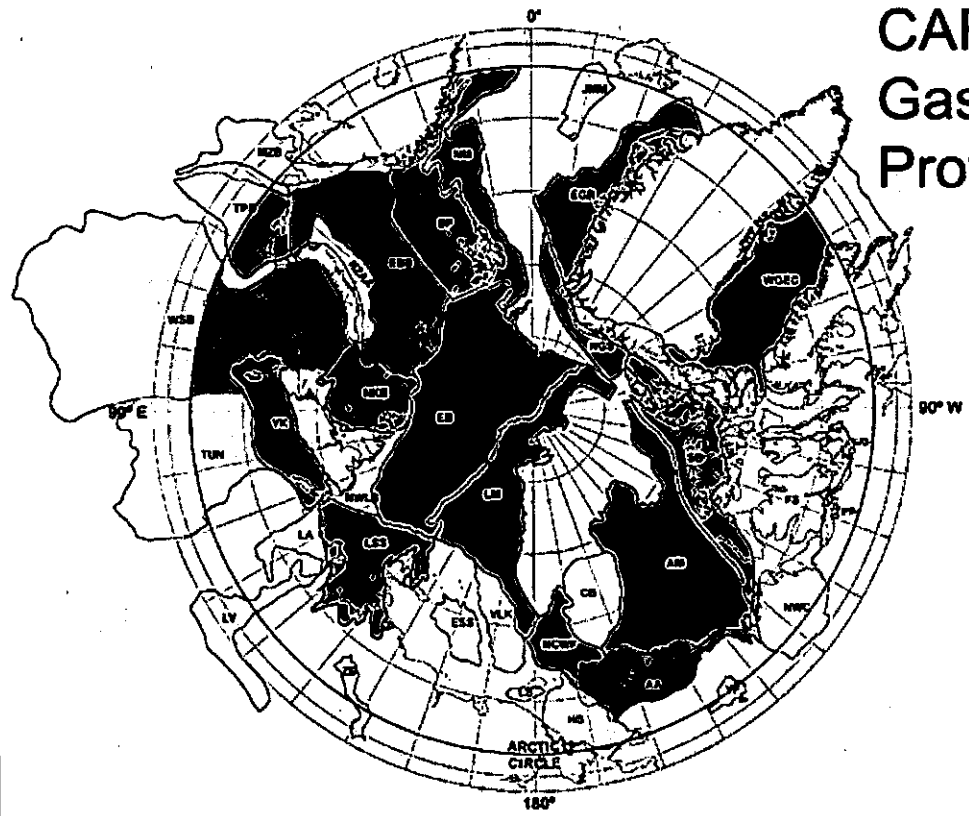
The Alaska Gasline Inducement Act

UNDISCOVERED GAS
(trillion cubic feet)

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

Province Code	Province	Oil (MMBO)	Total Gas (BCFG)	NGL (MMBNGL)	BOE (MMBOE)
WSB	West Siberian Basin	6,559.66	661,406.66	89,228.60	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	317,557.07	1,498.80	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
	Arctic Shelf	3,115.57	32,562.84	887.16	9,409.87
	Arctic Margin	1,437.29	32,281.01	504.73	7,322.19
	Arctic Platform	2,055.51	26,218.67	278.71	6,704.00
	Arctic Basin	1,342.15	19,475.43	520.26	5,108.31
	Arctic Basins and Platforms	1,807.26	14,973.58	390.22	4,693.07
	Arctic Thetys Basin	1,667.21	9,062.59	202.80	3,380.44
	Arctic Greenland Sheared Margin	1,349.80	10,207.24	273.09	3,324.09
	Arctic Makhrov	1,106.78	7,156.25	191.55	2,491.04
	Arctic Basin	851.11	8,596.36	191.20	2,475.04
	Arctic Bar Basin	1,912.89	2,106.75	56.41	2,320.43
	Arctic Ikchi-Wrangell Foreland	85.99	6,065.76	106.57	1,203.52
	Arctic Basin	98.03	5,741.87	101.63	1,156.63
	Arctic Laptev Sea Shelf	172.24	4,488.12	119.63	1,039.90
	Arctic Gji Basin	376.86	1,335.20	35.66	635.06
	Arctic Basin	47.82	1,505.99	40.14	338.95
	Arctic Lian Sea Basin	19.73	618.83	10.91	133.78
	Arctic in	2.47	648.17	11.37	121.87
	Arctic Canada Interior Basins	23.34	305.34	15.24	89.47
	Arctic Basin	NQA	NQA	NQA	NQA
	Arctic Amlyra Basins and Admiralty	NQA	NQA	NQA	NQA
	Arctic Basin	NQA	NQA	NQA	NQA
	Arctic Gorderland	NQA	NQA	NQA	NQA
	Arctic ts (part of Central Alaska)	NQA	NQA	NQA	NQA
	Arctic ce)				
	Arctic it	NQA	NQA	NQA	NQA
	Arctic n Microcontinent	NQA	NQA	NQA	NQA
	Arctic n Shelf	NQA	NQA	NQA	NQA
		89,983.21	1,668,657.84	44,064.24	412,157.09

CARA Gas Provinces



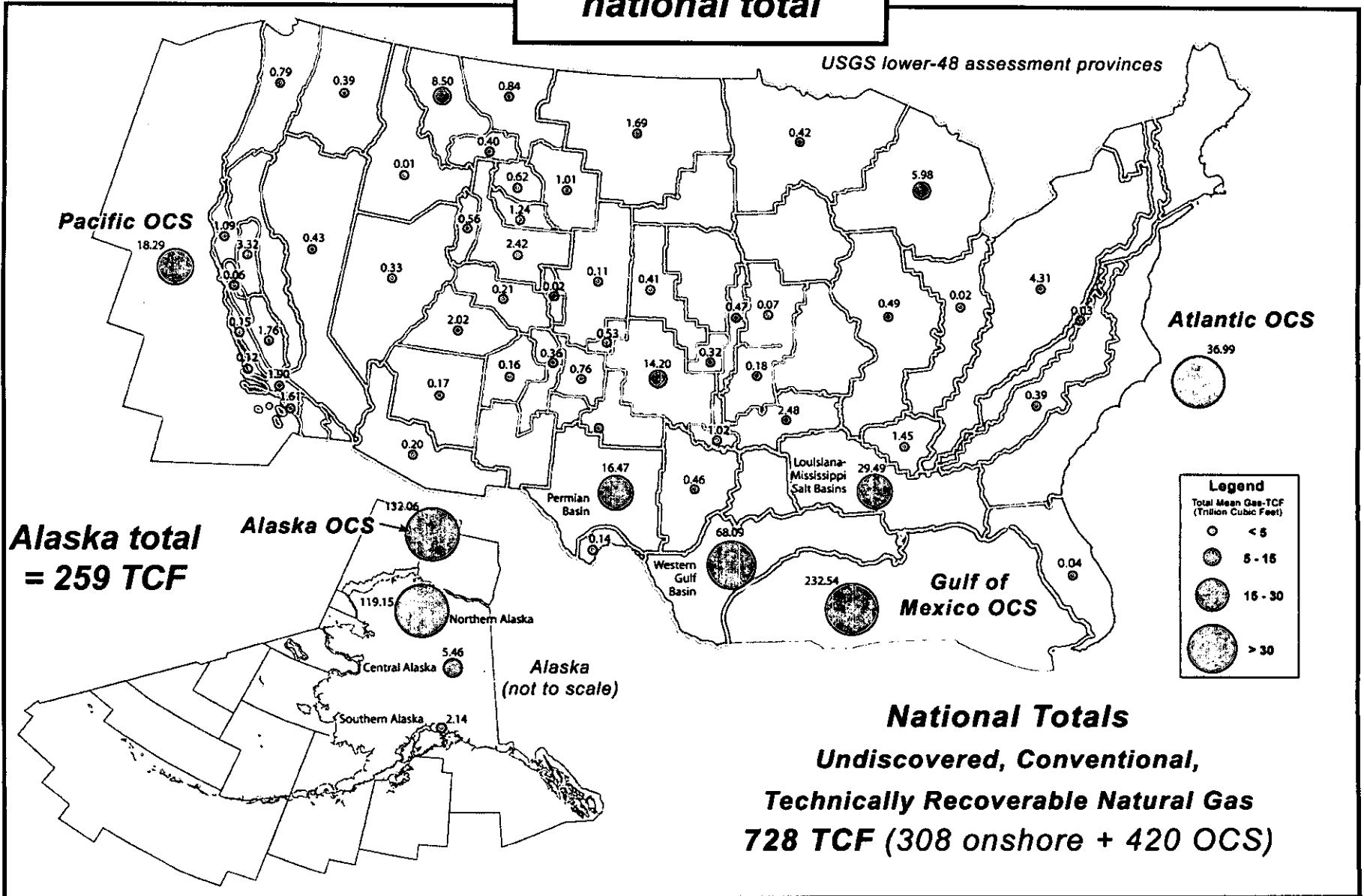
Source: USGS Fact Sheet 2008-3049

Undiscovered, Conventional Gas Resources of the U.S.

Alaska resources = 36% of national total

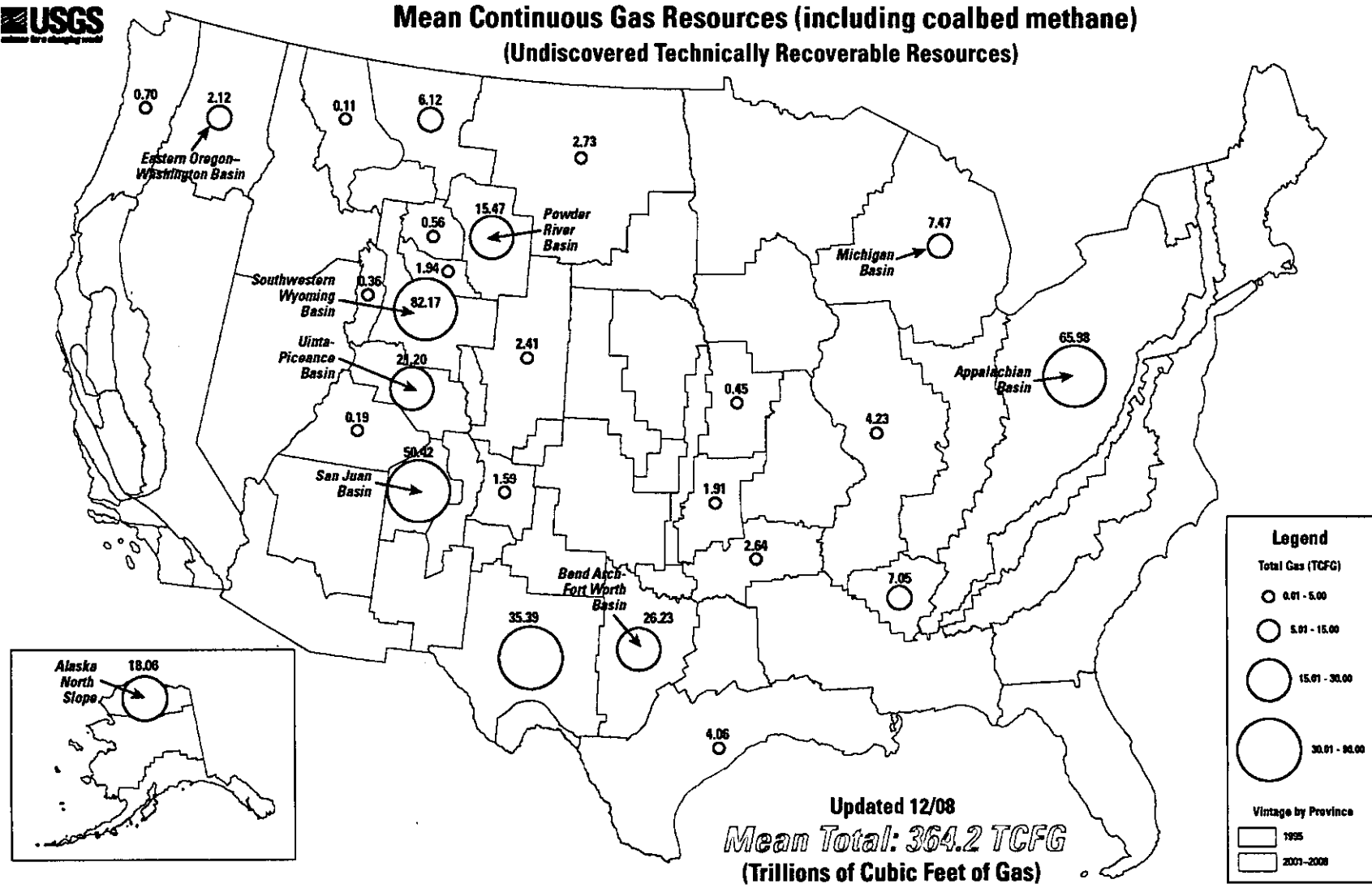
AGIA

The Alaska Gasline Inducement Act





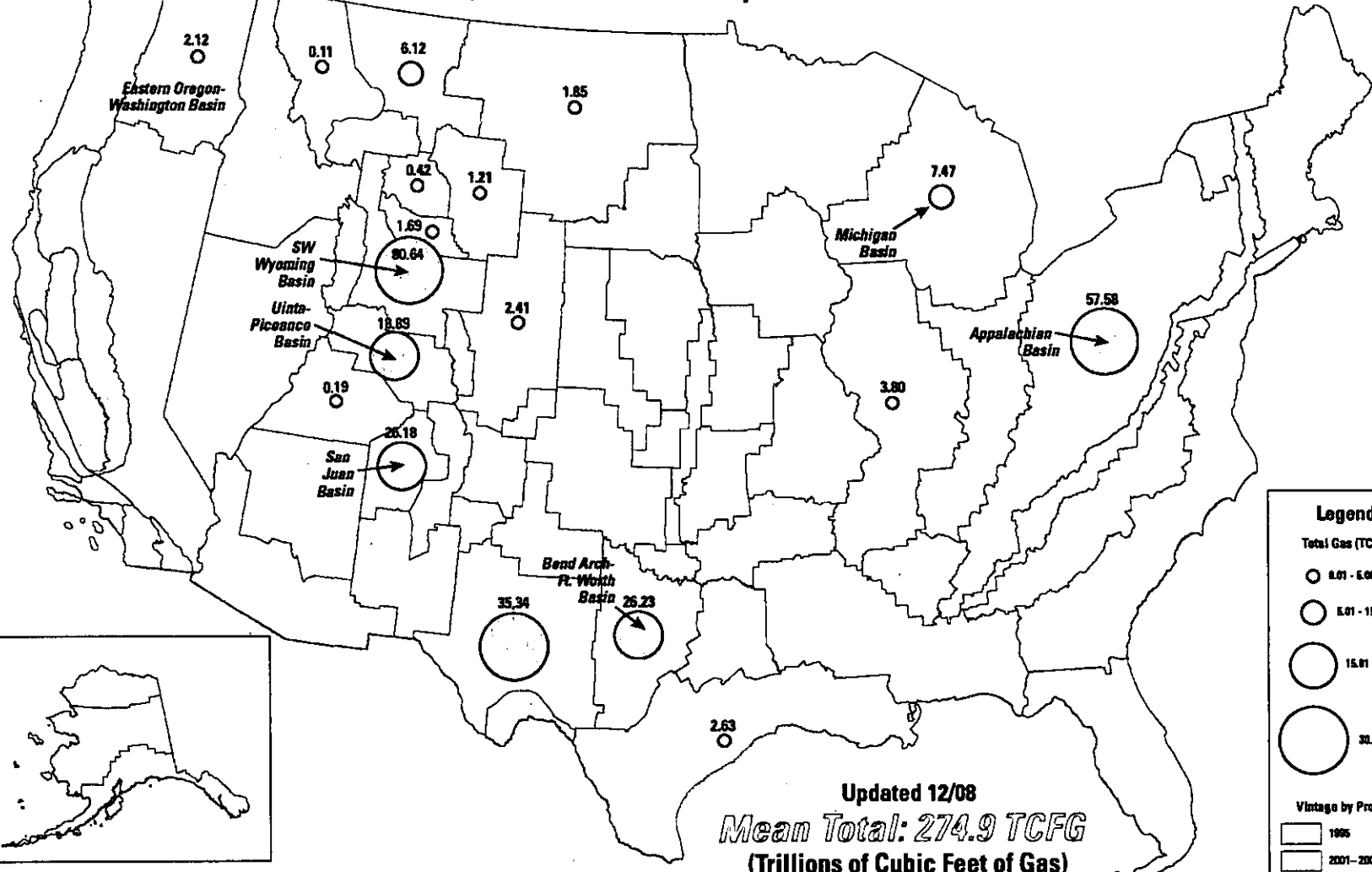
Mean Continuous Gas Resources (including coalbed methane) (Undiscovered Technically Recoverable Resources)



Updated 12/08
Mean Total: 364.2 TCFG
(Trillions of Cubic Feet of Gas)



Mean Continuous Gas Resources (excluding coalbed methane) (Undiscovered Technically Recoverable Resources)



Updated 12/08
Mean Total: 274.9 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 - 90.00

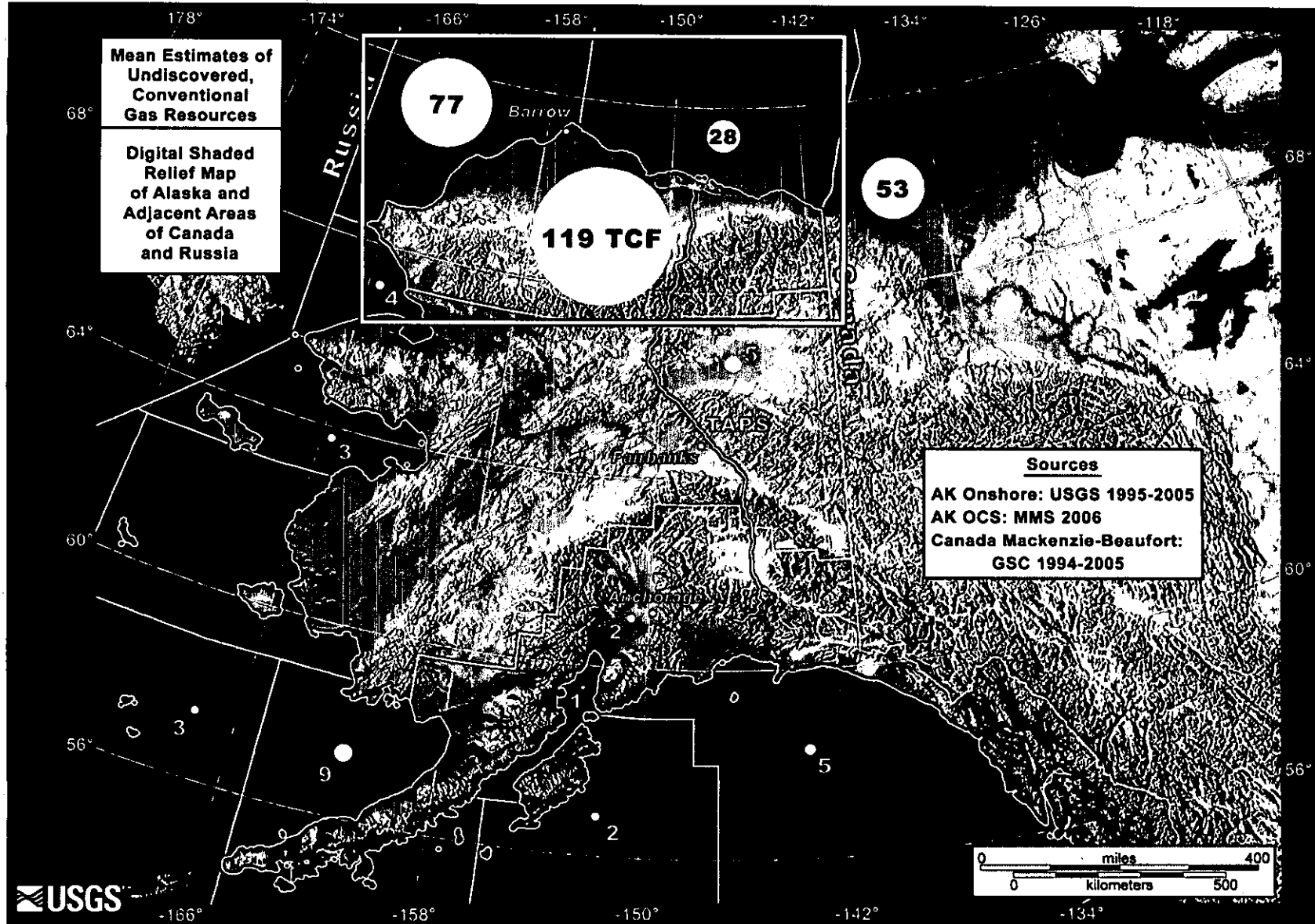
Vintage by Province

- 1995
- 2001-2008

Undiscovered Conventional Gas Potential

AGIA

The Alaska Gasline Inducement Act



Mean Estimates of Undiscovered, Conventional Gas Resources

Digital Shaded Relief Map of Alaska and Adjacent Areas of Canada and Russia

Sources
 AK Onshore: USGS 1995-2005
 AK OCS: MMS 2006
 Canada Mackenzie-Beaufort: GSC 1994-2005

Potential for Undiscovered Petroleum in Arctic Alaska

USGS/MMS

AGIA

The Alaska Gasline Inducement Act

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

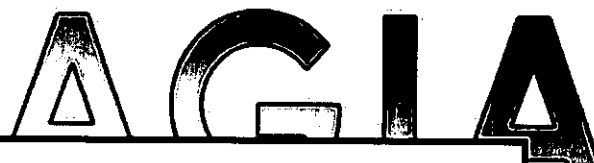
	Non- Associated Gas	Associated Gas	Total Gas
<i>Onshore & State Offshore Areas (USGS estimates)</i>			
NPRA	61.35	11.68	73.03
Central North Slope	33.32	4.20	37.52
ANWR, 1002 Area	3.84	4.76	8.60
Subtotal	98.51	20.64	119.15

Federal Offshore Areas (MMS estimates)

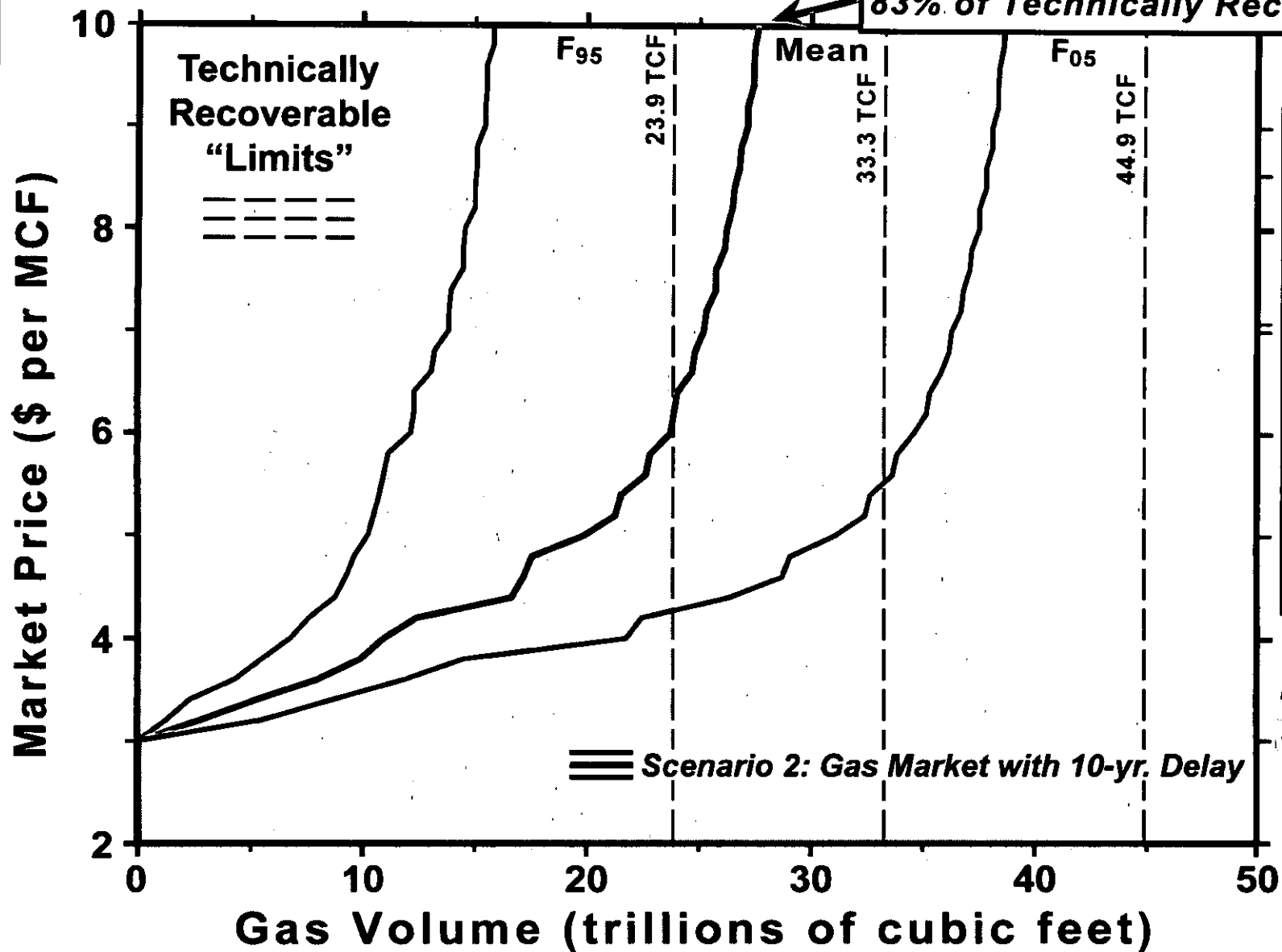
Chukchi Shelf	na	na	76.77
Beaufort Shelf	na	na	27.65
Hope Basin	na	na	3.77
Subtotal	na	na	108.19

Central North Slope Economically Recoverable Gas

USGS



83% of Technically Recoverable Gas



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

AGIA

The Alaska Gasline Inducement Act

Location	Estimate of undiscovered technically recoverable conventional natural gas	Estimate of economically recoverable* natural gas reserves
	(Trillion Cubic Feet) Mean	(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 TCF	227 TCF	137.3

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.

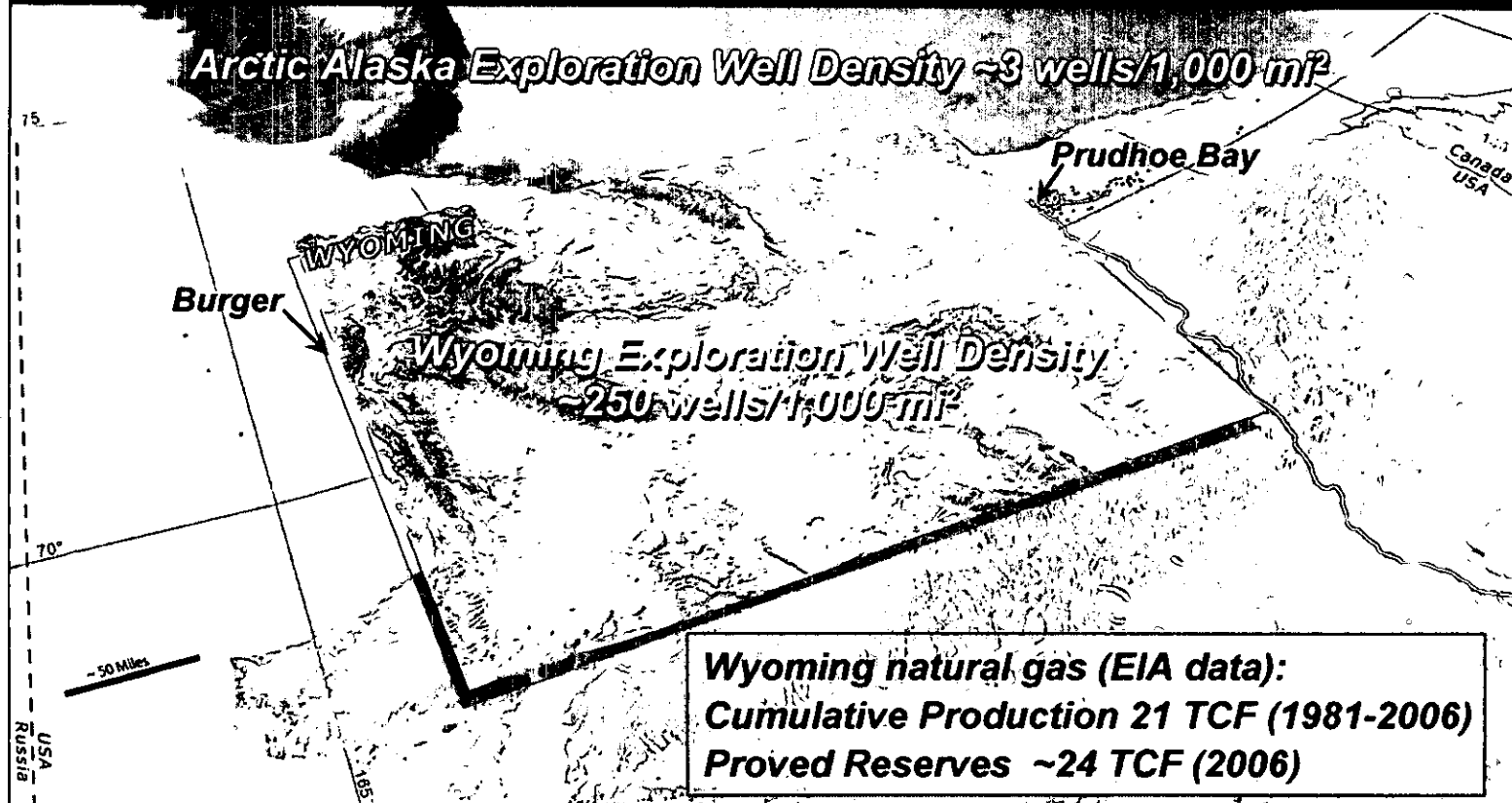
Alaska's North Slope is Very Under-Explored

AGIA

The Alaska Gasline Inducement Act

Arctic Alaska Exploration Maturity

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

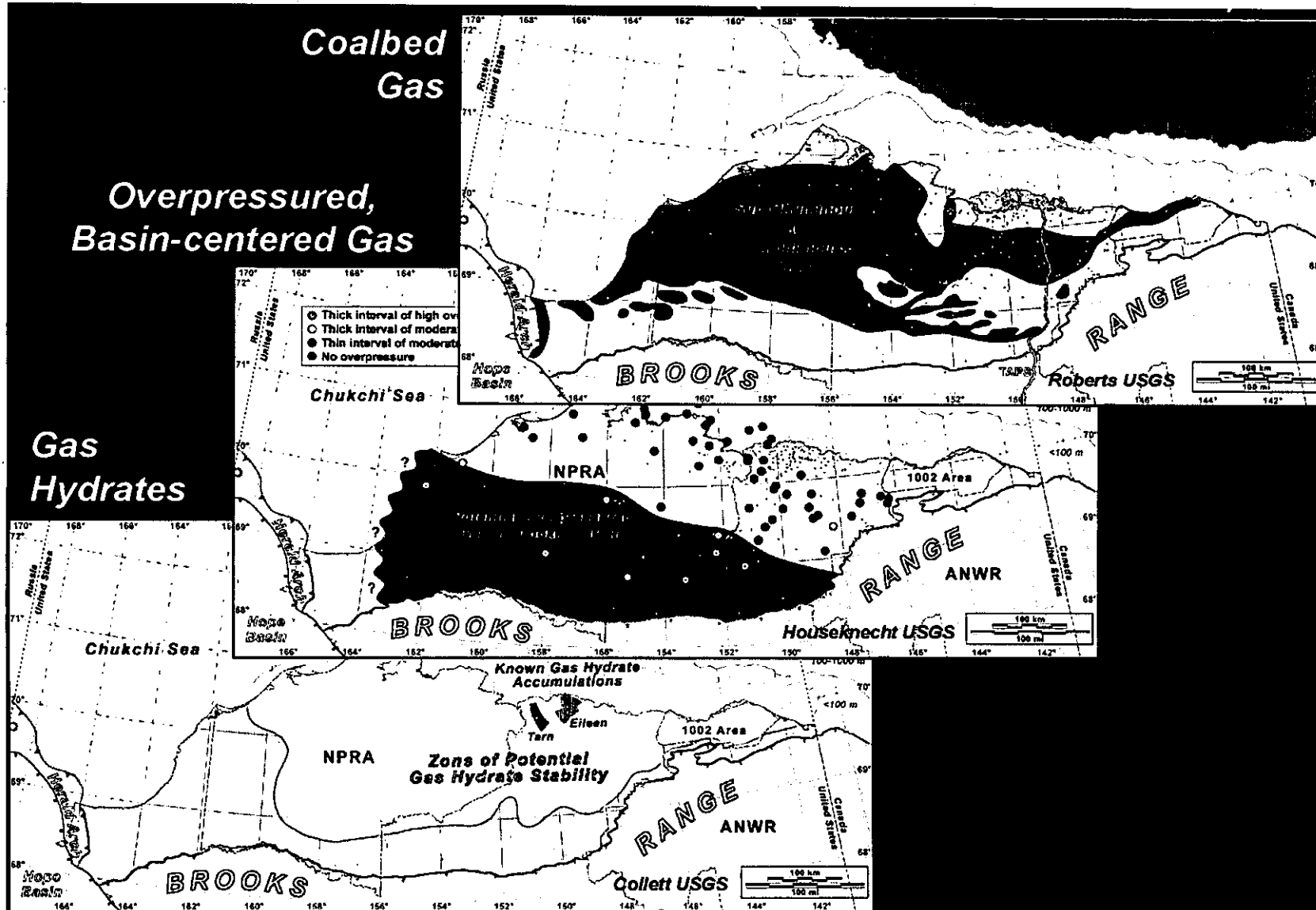


- Entire state of Wyoming ~100,000 mi² (~250,000 km²)
- Petroleum-prospective area ~75,000 mi² (~250,000 km²)
- ~19,371 exploration wells

Unconventional Gas Resources (continuous resources)

AGIA

The Alaska Gasline Inducement Act



Alaska North Slope Natural Gas Hydrate Assessment Results

AGIA

The Alaska Gasline Inducement Act

[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.]

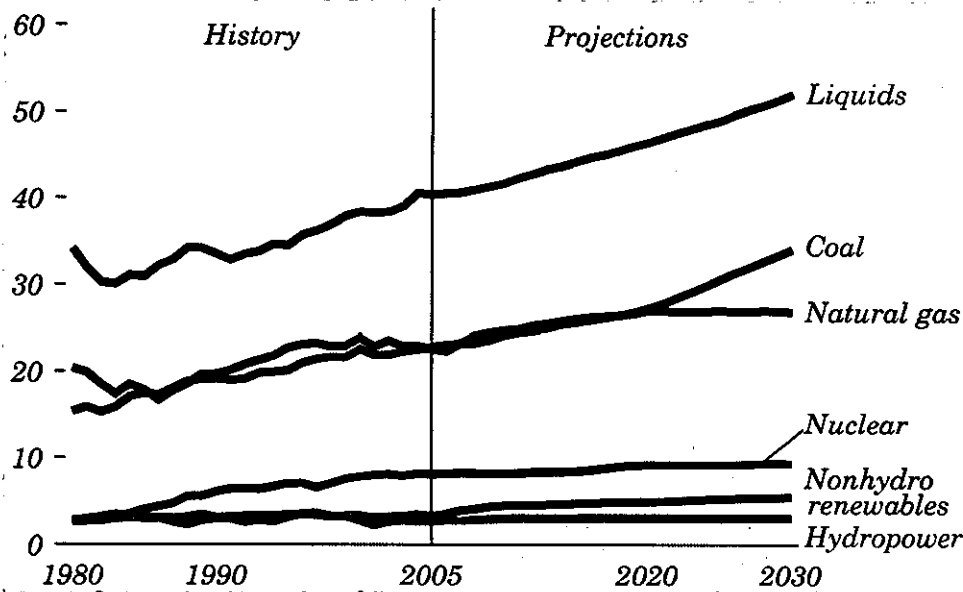
Total Petroleum System and Assessment Unit	Field Type	Total Undiscovered Resources							
		Gas (BCFG)				NGL (MMBNGL)			
		F95	F50	F5	Mean	F95	F50	F5	Mean
Northern Alaska Gas Hydrate TPS									
Sagavanirktok Formation Gas Hydrate AU	Gas	6,285	19,490	37,791	20,567	0	0	0	0
Tuluvak-Schrader Bluff-Prince 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

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



The Alaska Gasline Inducement Act

United States Energy Consumption by Fuel



USGS

EIA

Carbon Emissions

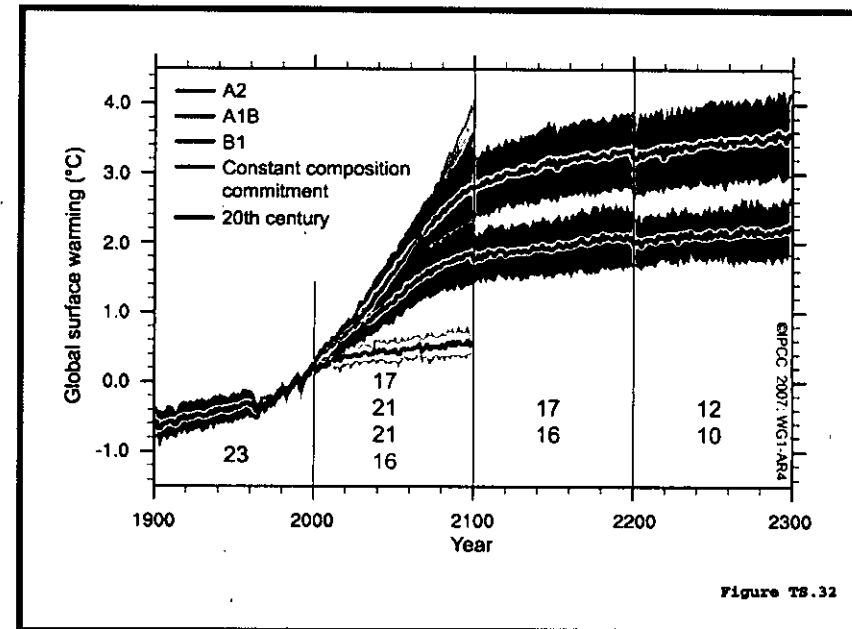
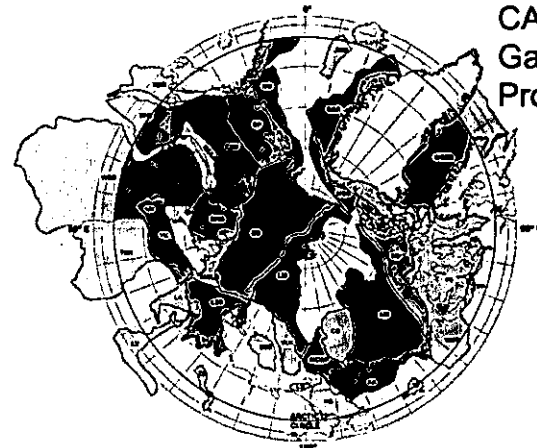


Figure TS.32

CARA Gas Provinces

IPCC 2007: WG1-AR4



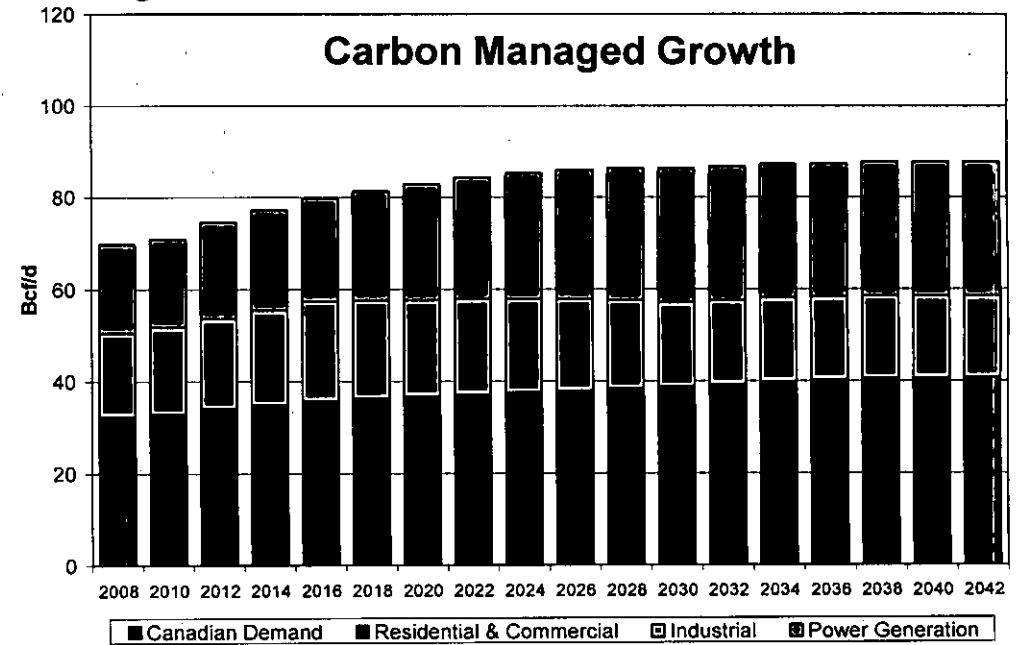
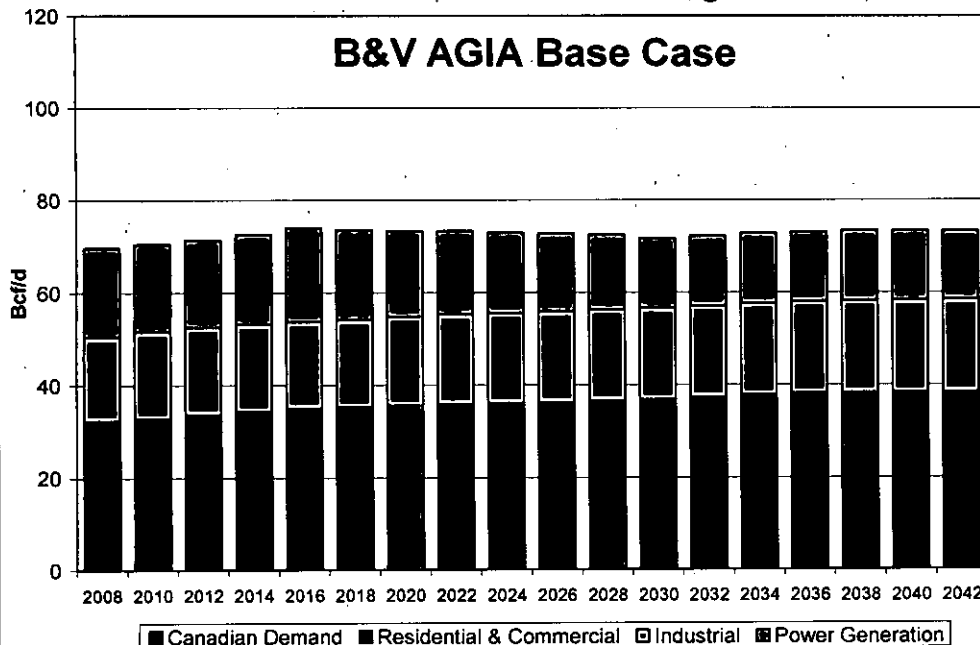
Impact of Carbon Regulation on Natural Gas Demand

AGIA

The Alaska Gasline Inducement Act

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

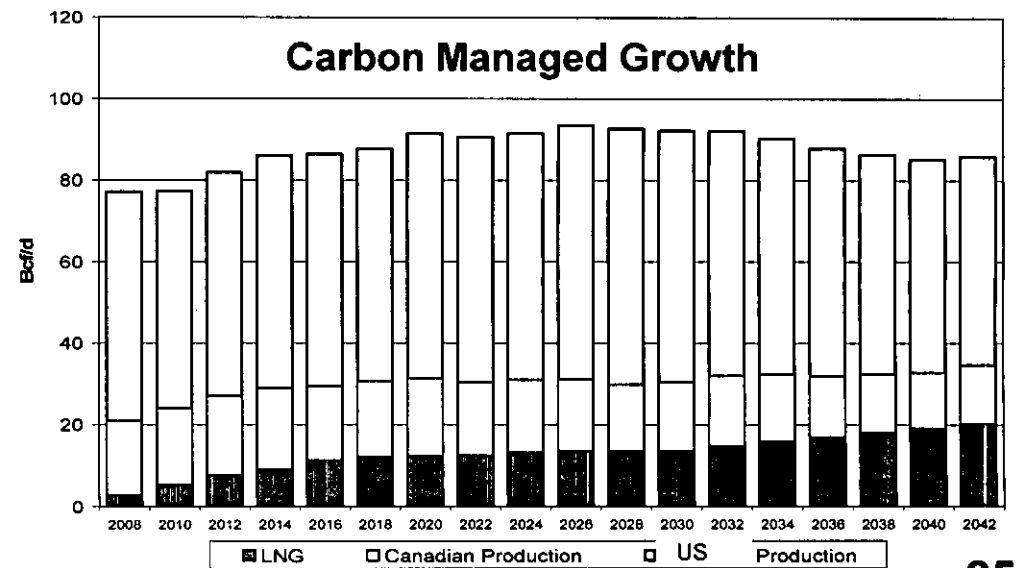
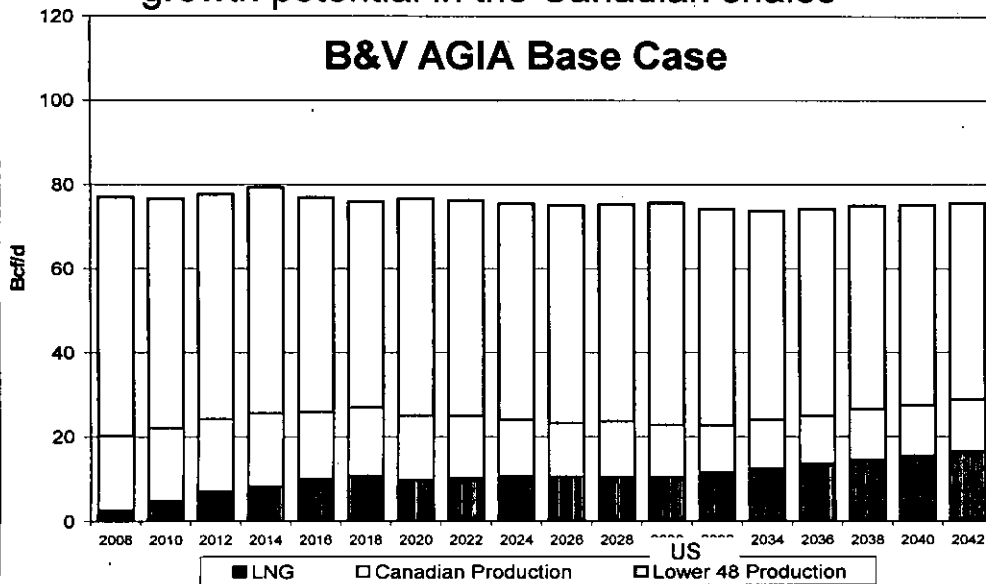
Multiple Different Sources of Natural Gas will be Needed to Meet Lower 48 Demand Growth



The Alaska Gasline Inducement Act

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

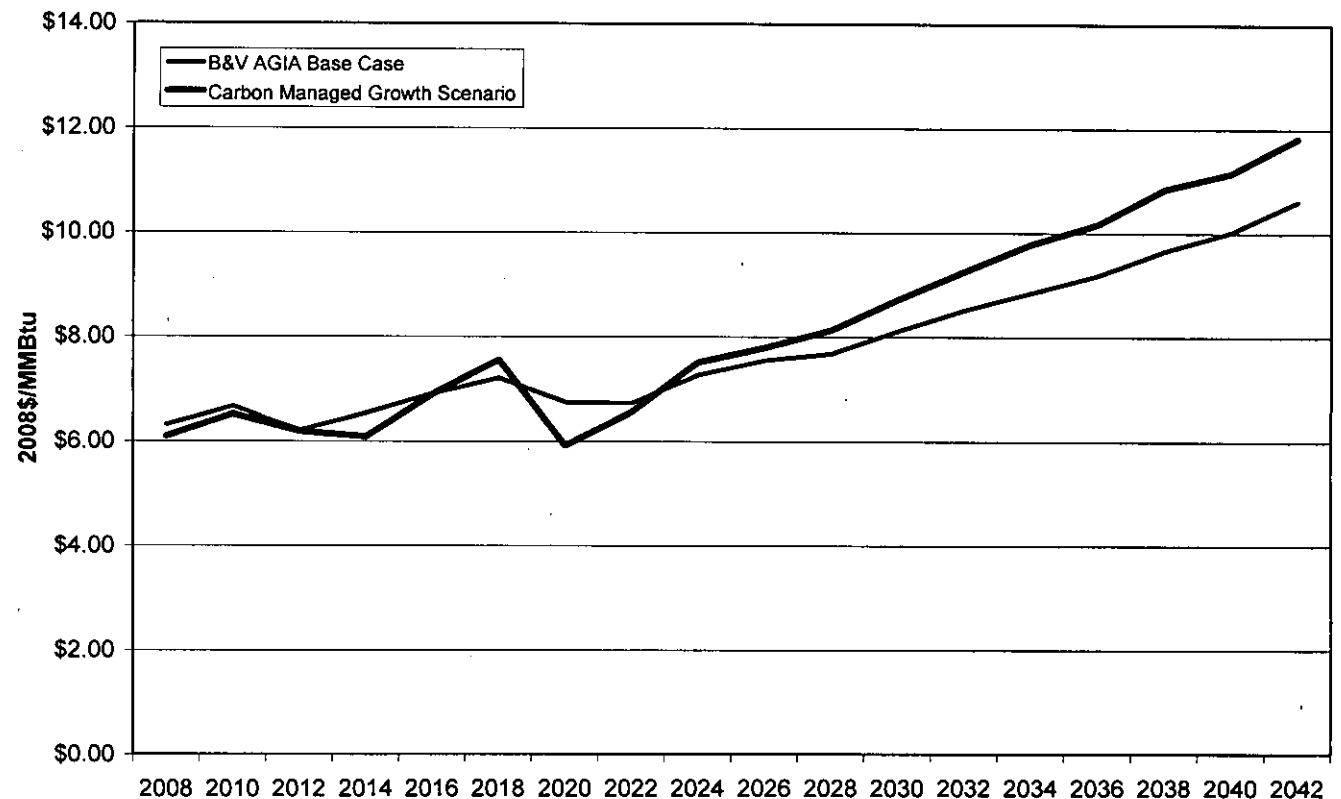
Impact of Carbon Regulation on AECO Price Forecasts

AGIA

The Alaska Gasline Inducement Act

- 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

Price Comparison at AECO - B&V AGIA Base Case and Carbon Managed Growth Scenario



Liquid Natural Gas (LNG) Imports



The Alaska Gasline Inducement Act

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