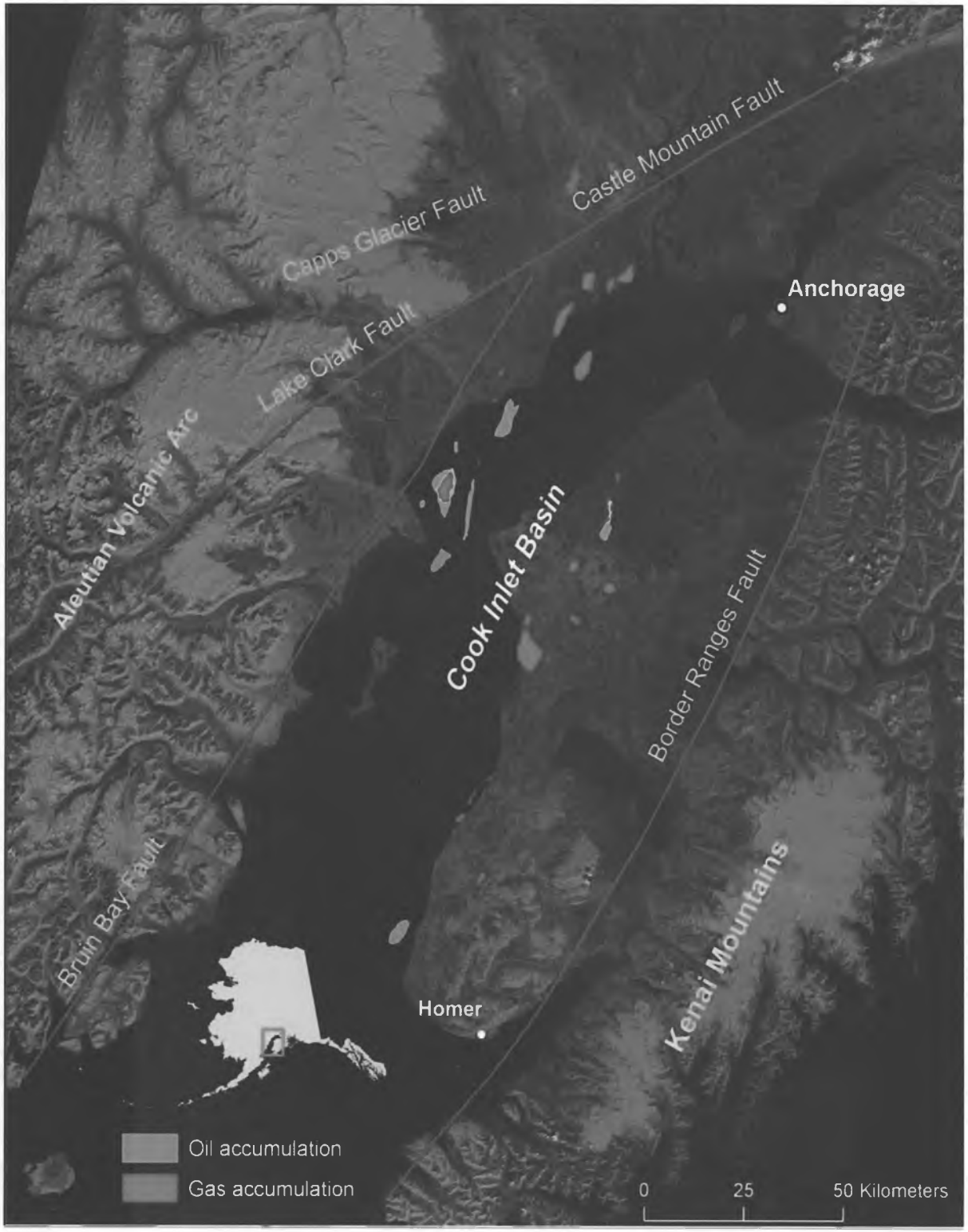
4/11/12 Hearings on the Short and Long Term Reliability and Sustainability of the Cook Inlet Natural Gas Field

<TARGET><BILL></BILL><SUBJECT>4-11-12 Hearings on the Short and Long Term Reliability and Sustainability of the Cook Inlet Natural Gas Field</SUBJECT><COMM>HENE27</COMM></TARGET>

State of Alaska
Department of Natural Resources
Division of Oil and Gas
Division of Geological & Geophysical Surveys

Cook Inlet Activity and Natural Gas Resource Update

Alaska Legislature
House Energy Committee
Tuesday, April 10, 2012

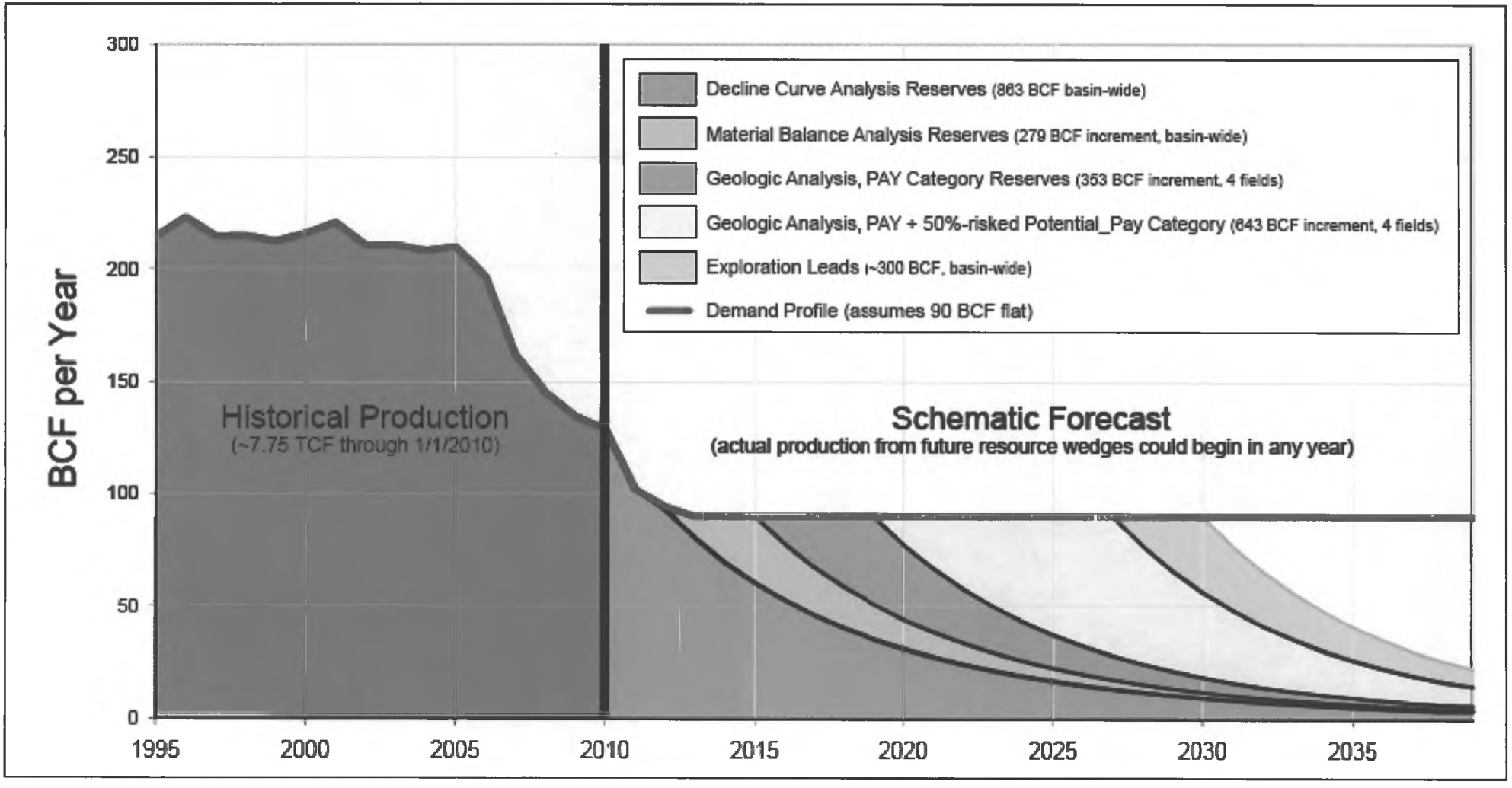


2009 and 2011 DNR Cook Inlet Natural Gas Studies

- 2009 Study
  - Integrated engineering and geological analysis to determine how much gas remains **in known fields** (reserves and potentially recoverable resources).
  - Also provided examples of undeveloped gas leads indicated by previous drilling (potential resource).
  - Did not attempt to include undiscovered gas resources (this is USGS assessment's goal).
- 2011 Study
  - What investment and associated producer revenue would be required to generate specific rates of return from developing DNR-identified gas reserves (2009 study) to meet existing demand requirements of 90 BCF per year through 2025?
  - Generated dozens of development scenarios ("projects") for recovering resources identified in 2009 study, and used Monte Carlo simulation to model their commerciality and production outcomes.

Cook Inlet Natural Gas Reserves and Resources Hypothetical Production Forecast

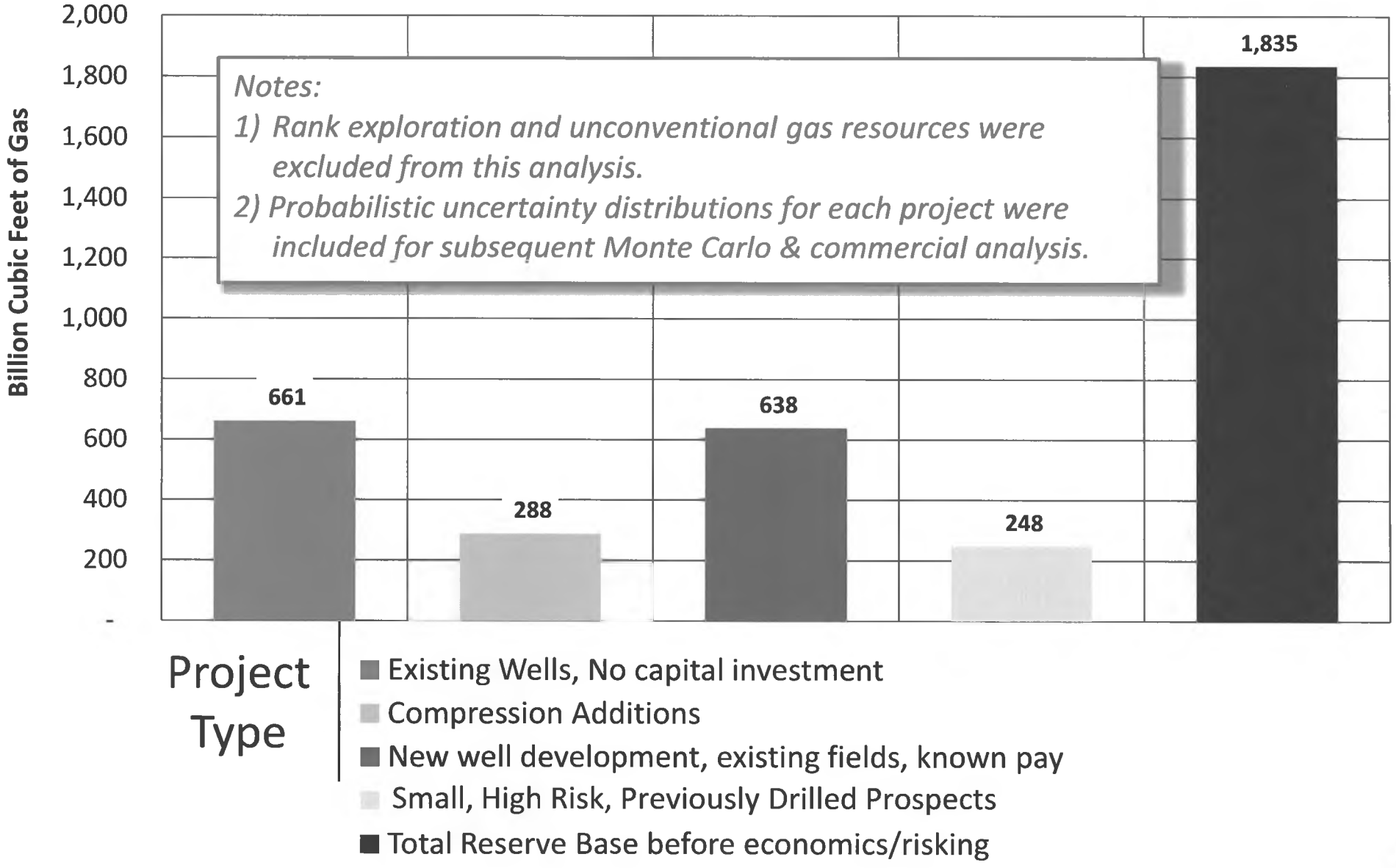
(Assumes aggressive redevelopment activity in existing fields + some exploration success)



Alaska Division of Oil & Gas, 2010

2011 DNR Cl Gas Production Cost Study

Base Case Production Estimates by Project Type, 2010-2039
(sums of all conceptual scenario projects before Monte Carlo modeling and commercial analysis)

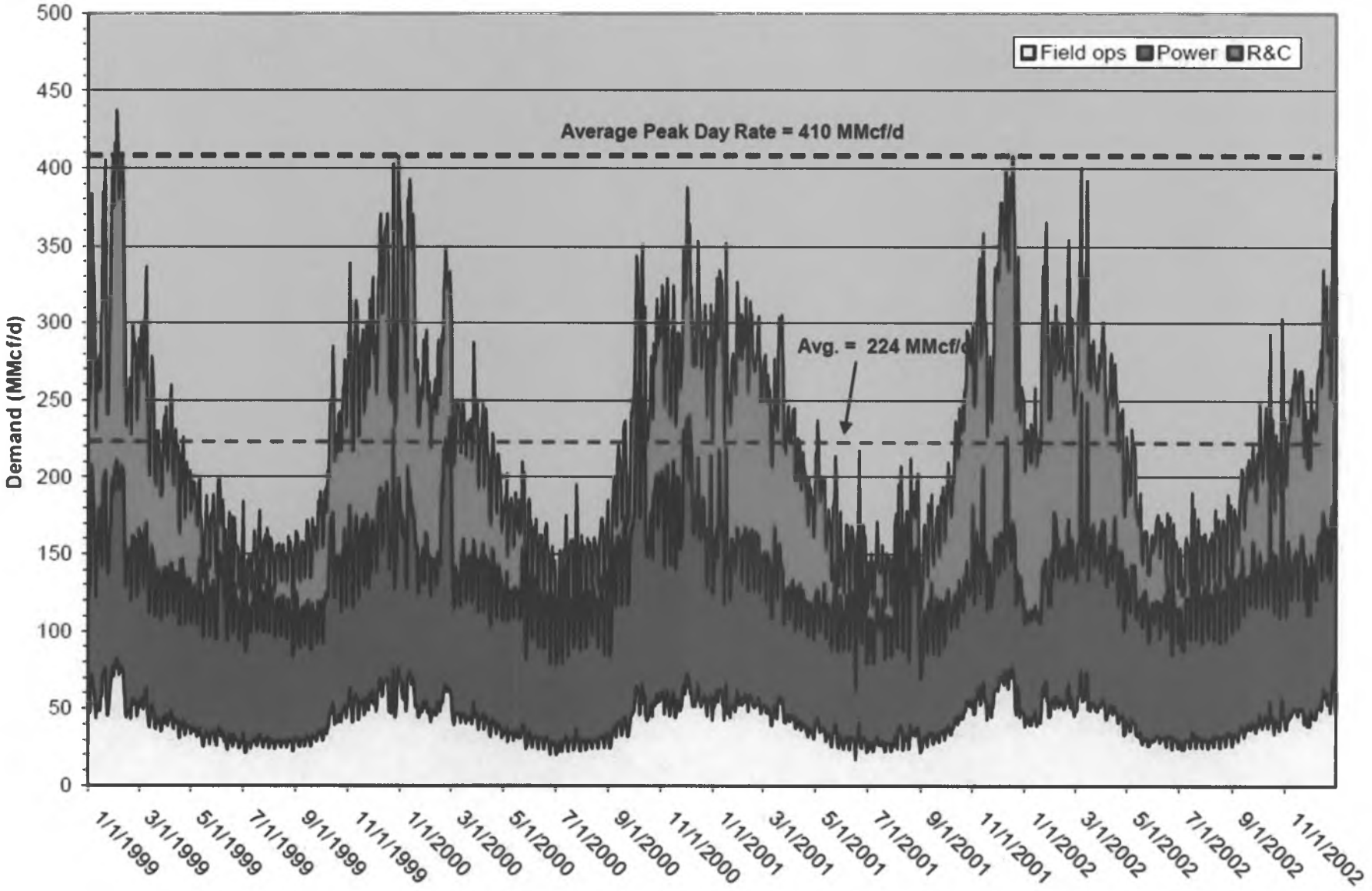


Summary and Conclusions
2011 DNR Study

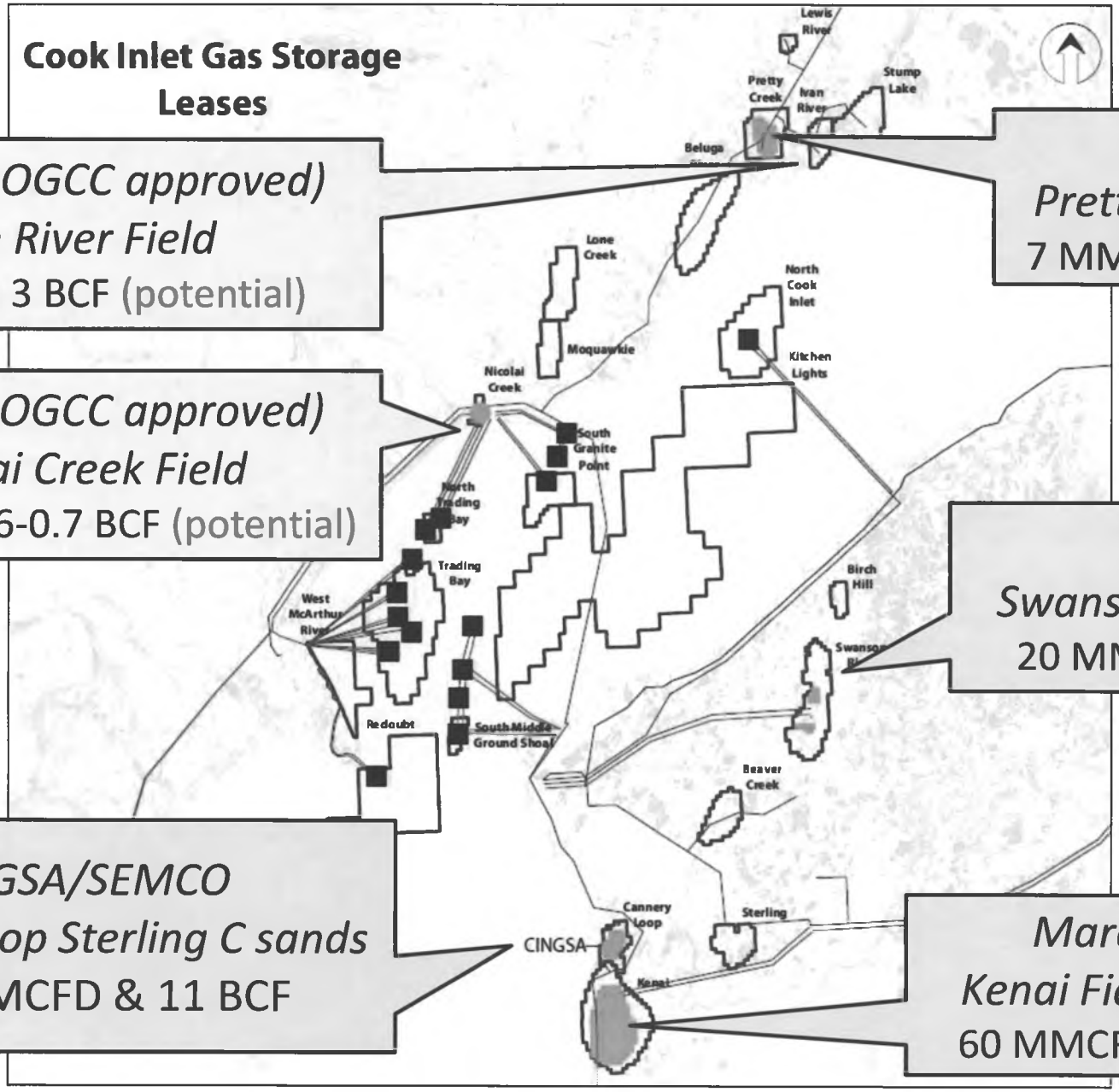
The Cook Inlet basin is capable given sufficient continued investments of supplying the regional natural gas needs until 2018-2020 timeframe. Exploration success would extend the timeframe further out into the future.

Natural gas storage will play an increasing important role in optimizing and managing deliverability and economics of the natural gas supply for south-central Alaska.

Illustrative South-Central Alaska Daily Demand



Gas Storage Design Rate & Capacity



Hilcorp (AOGCC approved)
Ivan River Field
Rate TBD, 3 BCF (potential)

Hilcorp
Pretty Creek Field
7 MMCFD & 0.7 BCF

Aurora (AOGCC approved)
Nicolai Creek Field
Rate TBD, 0.6-0.7 BCF (potential)

Hilcorp
Swanson River Field
20 MMCFD & 2 BCF

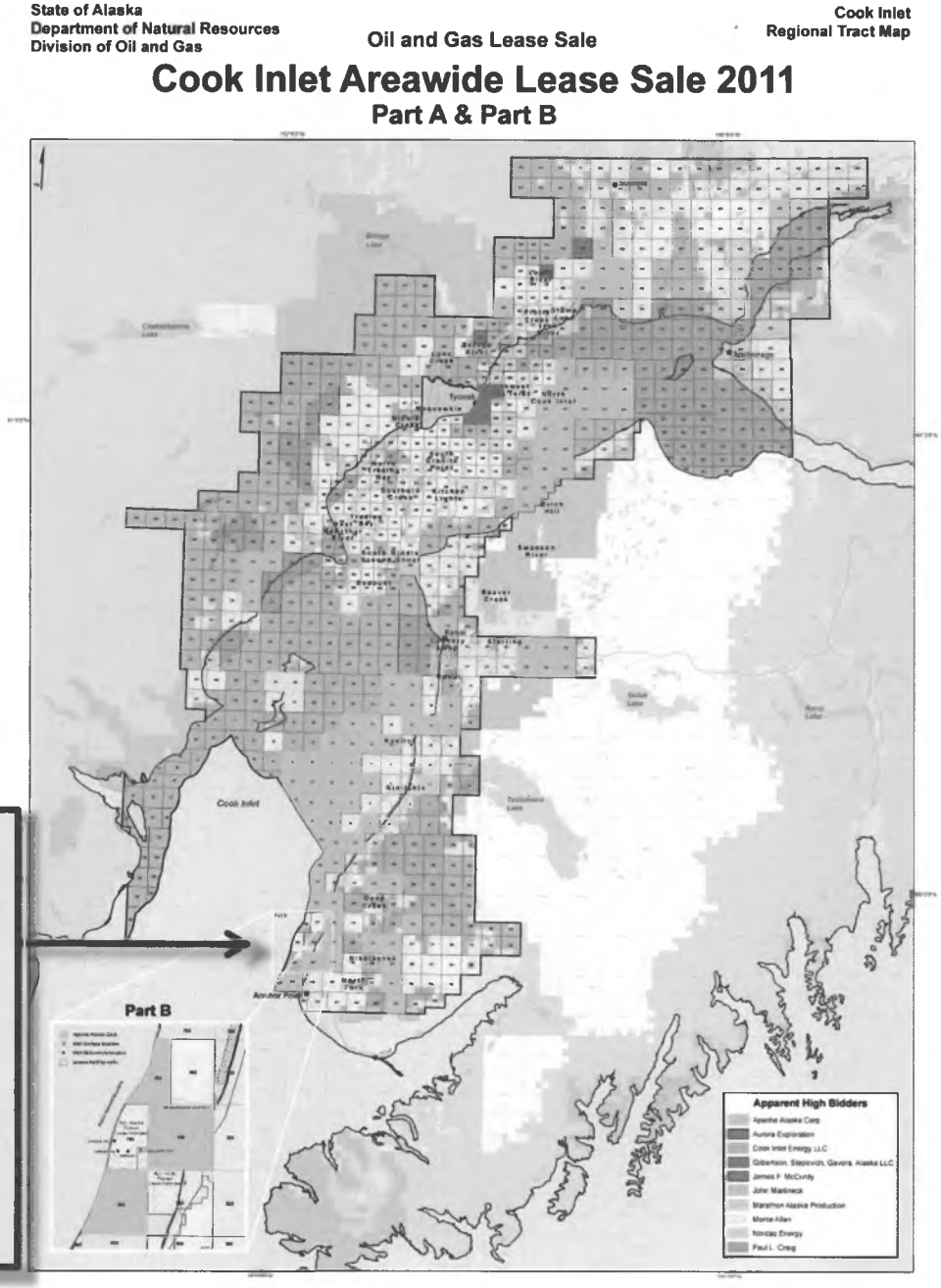
CINGSA/SEMCO
Cannery Loop Sterling C sands
150 MMCFD & 11 BCF

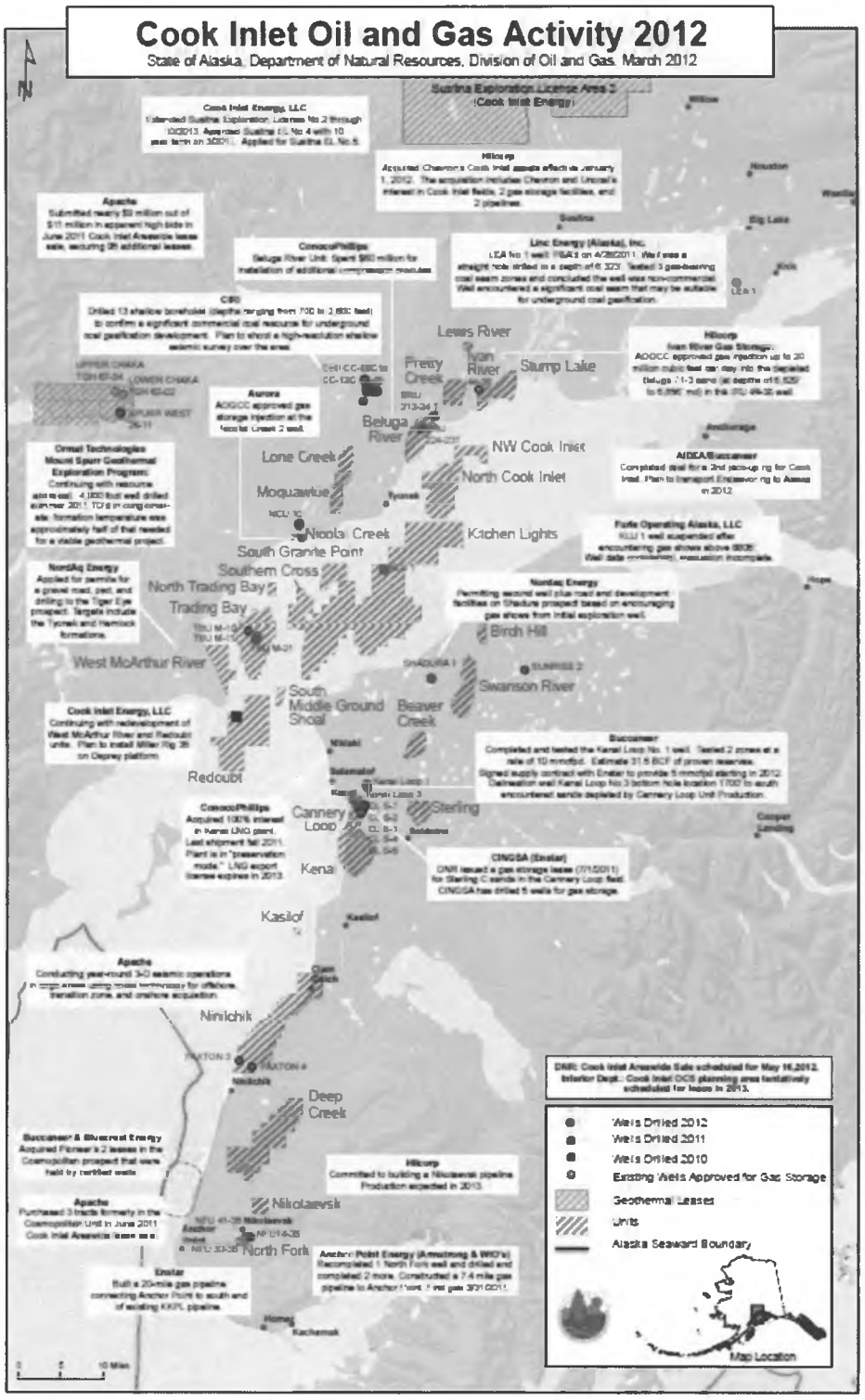
Marathon
Kenai Field Pool 6
60 MMCFD & 6 BCF

Cook Inlet 2011 Lease Sale Results

- Total tracts sold: 109
- Total acres sold: 575,202
- Total number of valid bids: 112
- Total high bonus bids: $11,125,063.80
- Exempt sale (Part B) for Cosmopolitan
- Apache showed largest interest ($9 MM)

Cosmopolitan: Known Oil
- bundled leases
- raised min bid
- raised rentals
- 5 yr primary term
- Work commitment
  - ➢ POE in < 6 months
  - ➢ Well to oil zone





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- Shooting 3-D nodal seismic year-round, 2 wells planned in 2012.

Hilcorp

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- Constructing a pipeline to bring Nikolaevsk Unit on in 2013.

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- Spartan 151 jack-up rig drilling to resume at Kitchen Lights Unit
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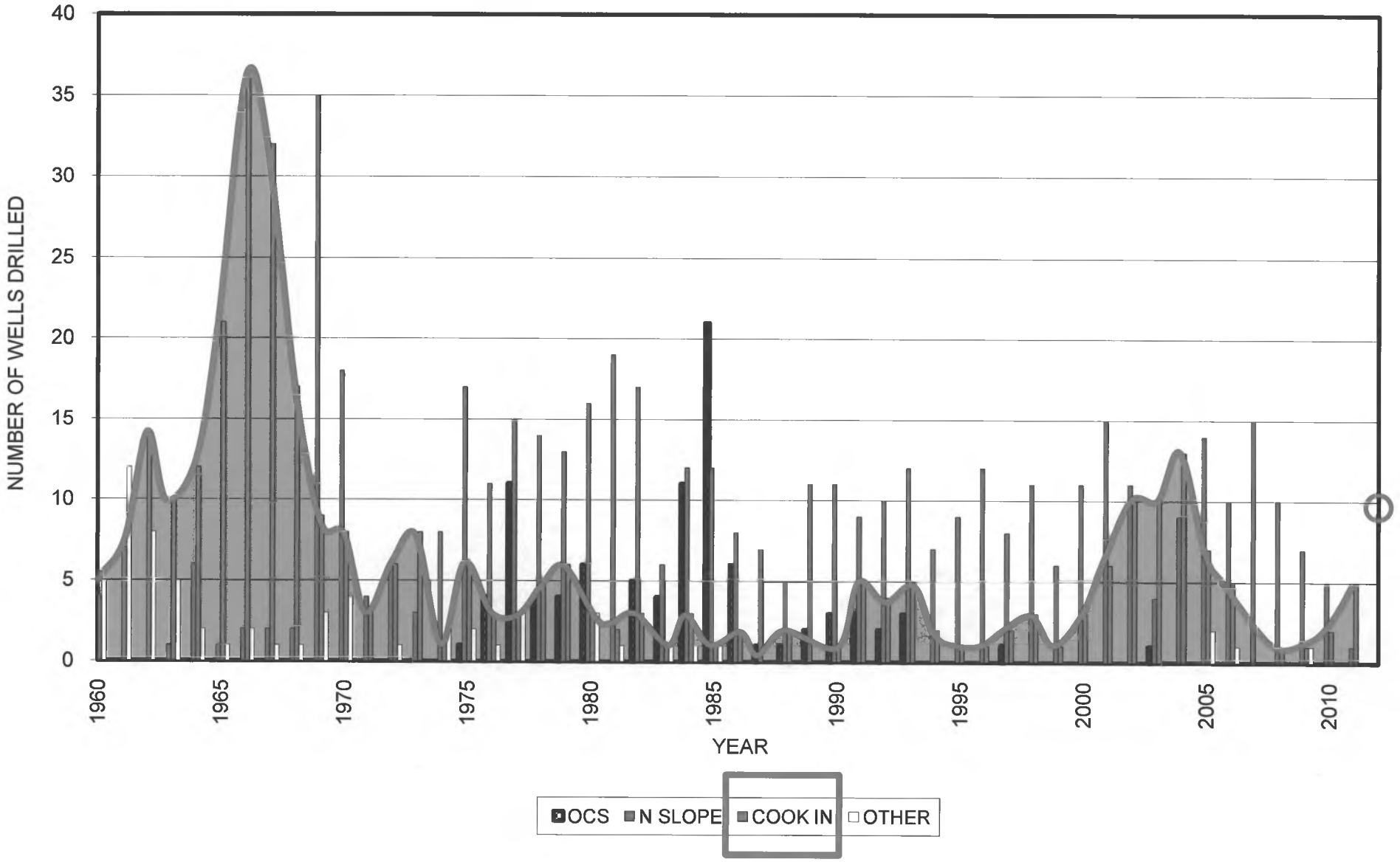
Gas storage

- New: CINGSA startup, Nicolai Creek, Ivan River approved
- Existing: Swanson River, Pretty Creek, Kenai

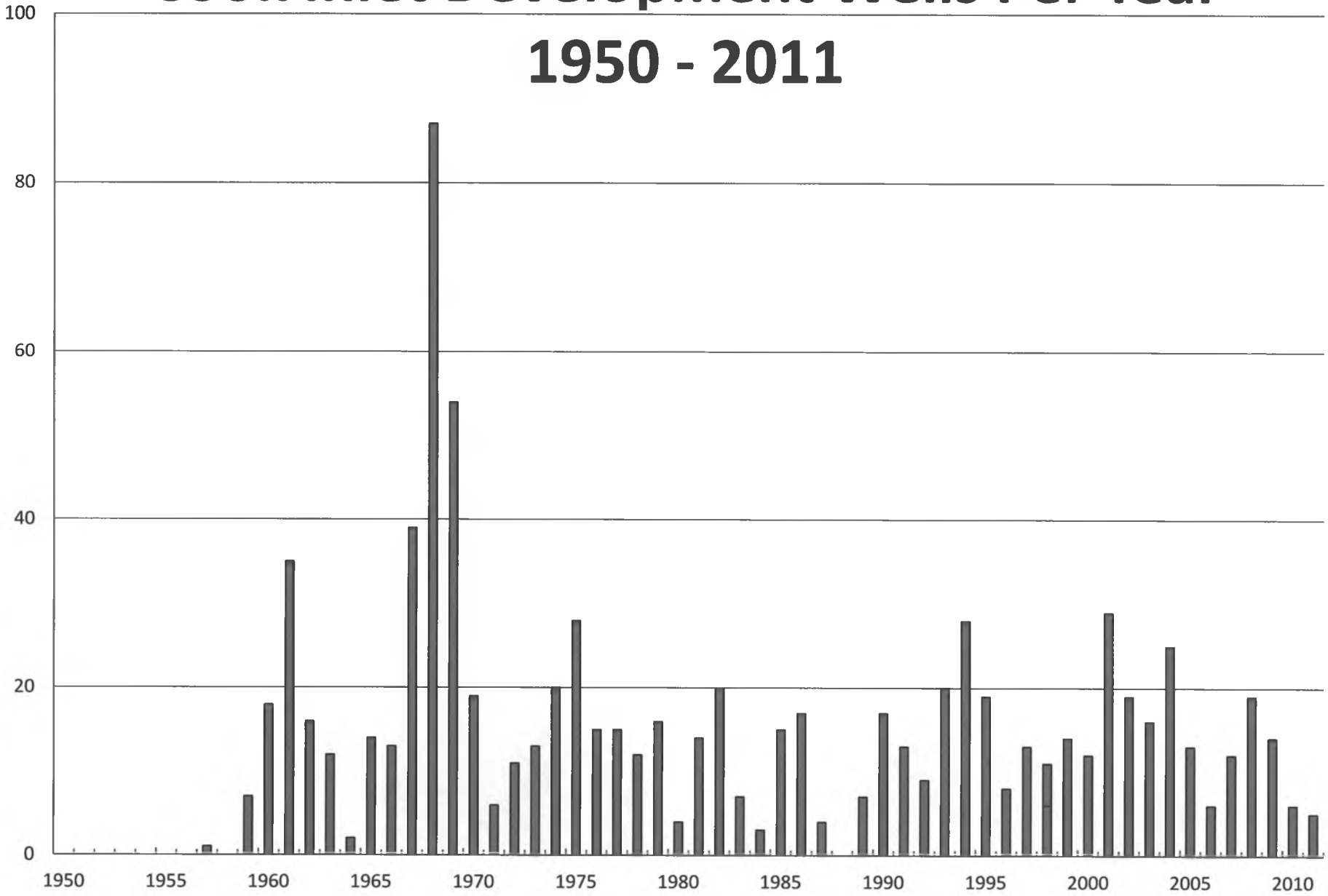
Spartan 151 jack-up rig at anchor in Kachemak Bay

Alaska Exploration Wells Per Year 1960-2011



Cook Inlet Development Wells Per Year

1950 - 2011



Oil and Gas Resources vs. Reserves

Undiscovered, Technically Recoverable Resource:

- Oil and gas estimated to exist in accumulations that have not yet been found by drilling, but if found, could be potentially produced using current technology and industry practices.
- Only an unknown fraction of this category will be commercially viable to find, develop, and produce. Sometimes called **Prospective Resources.**

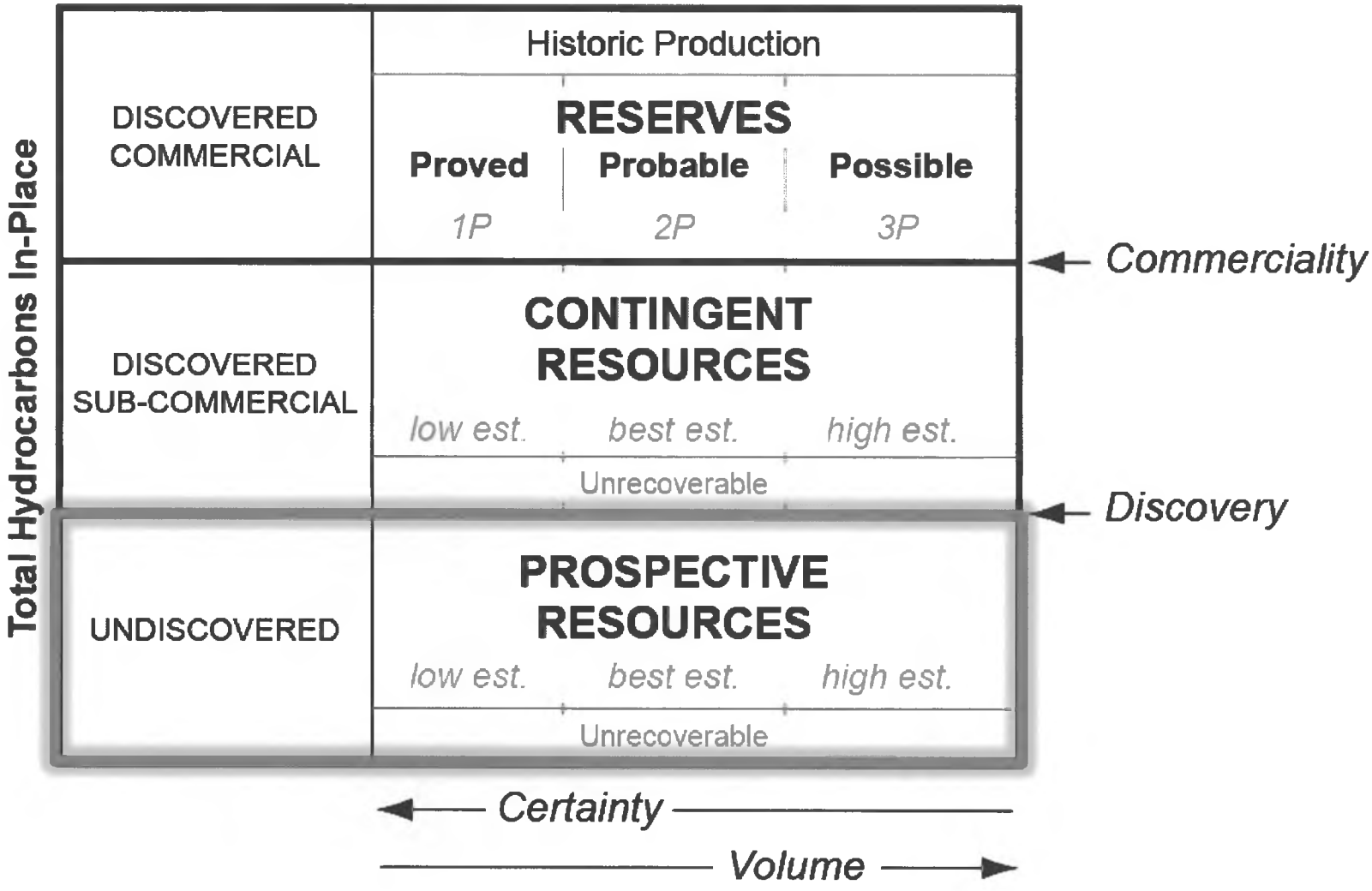
Proved Reserves:

- "oil and gas, which, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be economically producible—from a given date forward, from known reservoirs, and under existing economic conditions, operating methods, and government regulations…" *(Securities Exchange Commission, 2008).*
- Sometimes called **1P Reserves**, with a 90% certainty of meeting or exceeding the quoted value (SPE, 2007).

Proved Developed Reserves:

"Proved reserves that… can be expected to be recovered through existing wells with existing equipment and operating methods…" *(Securities Exchange Commission, 2008)*

Reserves and Resources Terminology



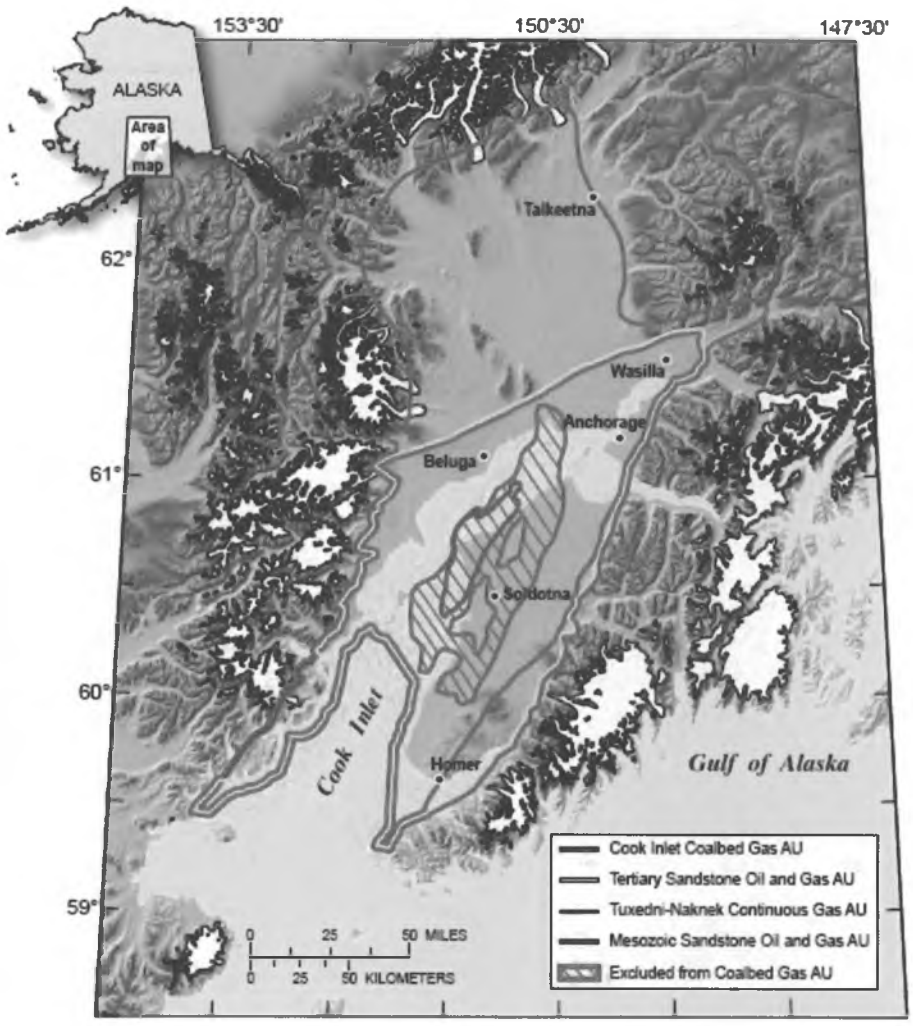
Adapted from SPE and others, 2007

Cook Inlet Gas Exploration Statistics

- 85% of gas discovered early in exploration cycle while drilling for oil
- Only structural traps had been explored for or developed – stratigraphic trap potential essentially untapped
- Nearly one in ten fields >2 tcf
- 4 largest fields have 86% of reserves
- Field-size distribution lacks discoveries in 300-1300 bcf range → yet to be discovered?

Cook Inlet Resource Potential

USGS Resource Assessment, 2011



Undiscovered, Technically Recoverable Oil and Gas

- mean conventional oil 599 MMBO

372 MMBO in Tertiary Ss play

227 MMBO in Mesozoic Ss play

- mean conventional gas 13.7 TCF

12.2 TCF in Tertiary Ss play

1.5 TCF in Mesozoic Ss play

- mean unconventional gas 5.3 TCF

0.6 TCF Mesozoic tight ss play

4.7 TCF Tertiary Coalbed play

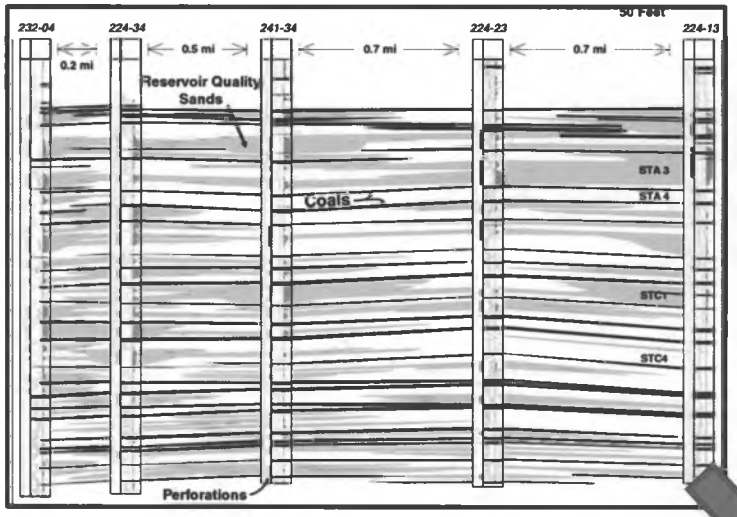
USGS 2011 Assessment of Cook Inlet Undiscovered Technically Recoverable Resources

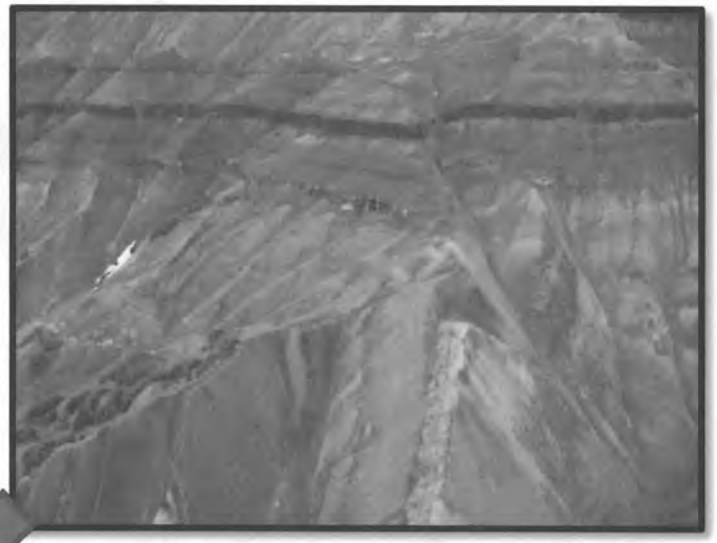
Cook Inlet assessment results.

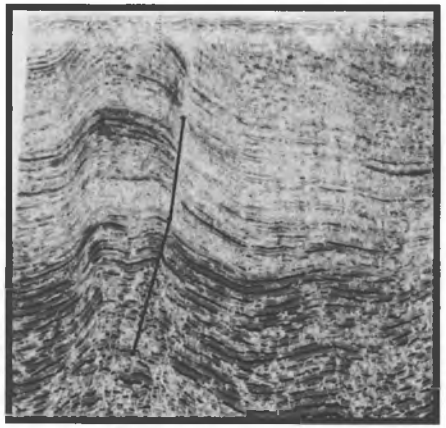
[MMBO, million barrels of oil. BCFG, billion cubic feet of gas. MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included as NGL (natural gas liquids). Undiscovered gas resources are the sum of nonassociated and associated gas. F95 represents a 95 percent chance of at least the amount tabulated; other fractiles are defined similarly. Largest expected oil field in MMBO, largest expected gas field in BCFG. TPS, total petroleum system; AU, assessment unit. Gray shading indicates not applicable]

	Total Petroleum Systems (TPS) and Assessment Units (AU)	Field type	Largest expected mean field size	*Total undiscovered resources*											
				Oil (MMBO)				*Gas (BCFG)*				*NGL (MMBNGL)*			
				F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Conventional Oil and Gas Resources	**Cook Inlet Composite Total Petroleum System**														
	Tertiary Sandstone Oil and Gas AU	***Oil***	111	68	322	844	372	32	156	443	186	0	2	5	2
		Gas	2,002					2,836	11,004	24,422	11,992	1	14	60	20
	Mesozoic Sandstone Oil and Gas AU	***Oil***	65	40	197	515	227	19	96	269	114	0	1	3	1
		Gas	426					251	1,241	3,280	1,434	2	12	34	14
	Total Conventional Resources			**108**	**519**	**1,359**	**599**	**3,138**	**12,497**	**28,414**	**13,726**	**3**	**29**	**102**	**37**
Continuous Oil and Gas Resources	**Tuxedni-Naknek Continuous Gas Total Petroleum System**														
	Tuxedni-Naknek Continuous Gas AU	***Gas***						257	568	1,254	637	3	8	19	9
	Cook Inlet Coalbed Gas Total Petroleum System														
	Cook Inlet Coalbed Gas AU	***Gas***						1,581	3,989	10,069	4,674	0	0	0	0
	Total Continuous Resources							**1,838**	**4,557**	**11,323**	**5,311**	**3**	**8**	**19**	**9**
	Total Undiscovered Oil and Gas Resources			**108**	**519**	**1,359**	**599**	**4,976**	**17,054**	**39,737**	**19,037**	**6**	**37**	**121**	**46**

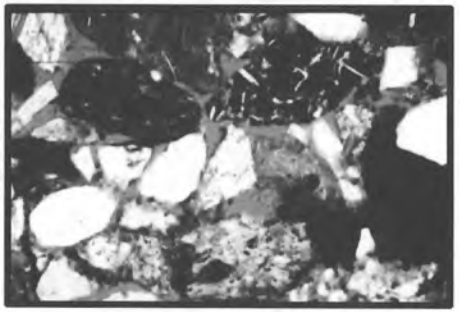
Assessment Inputs

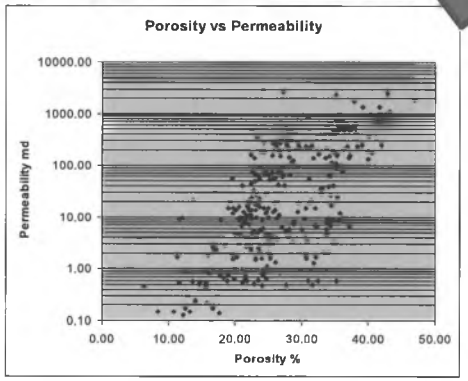


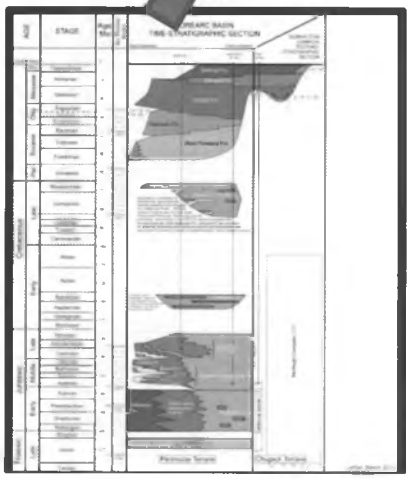


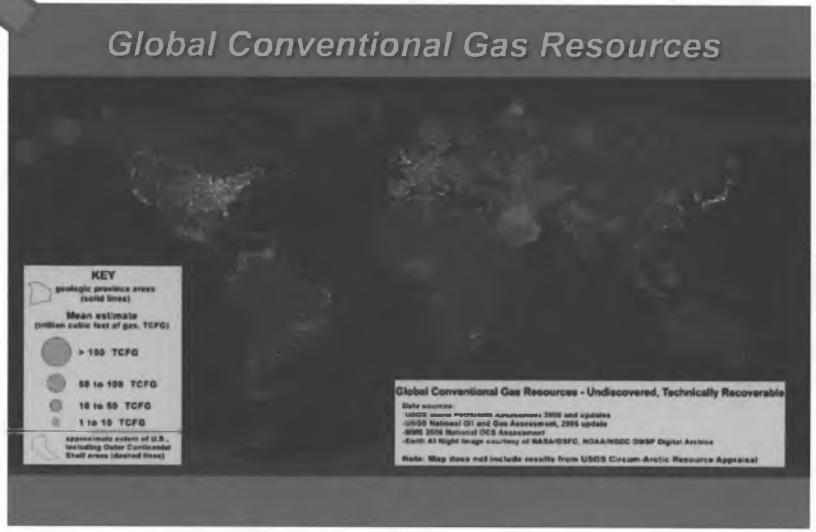


Petroleum System Model

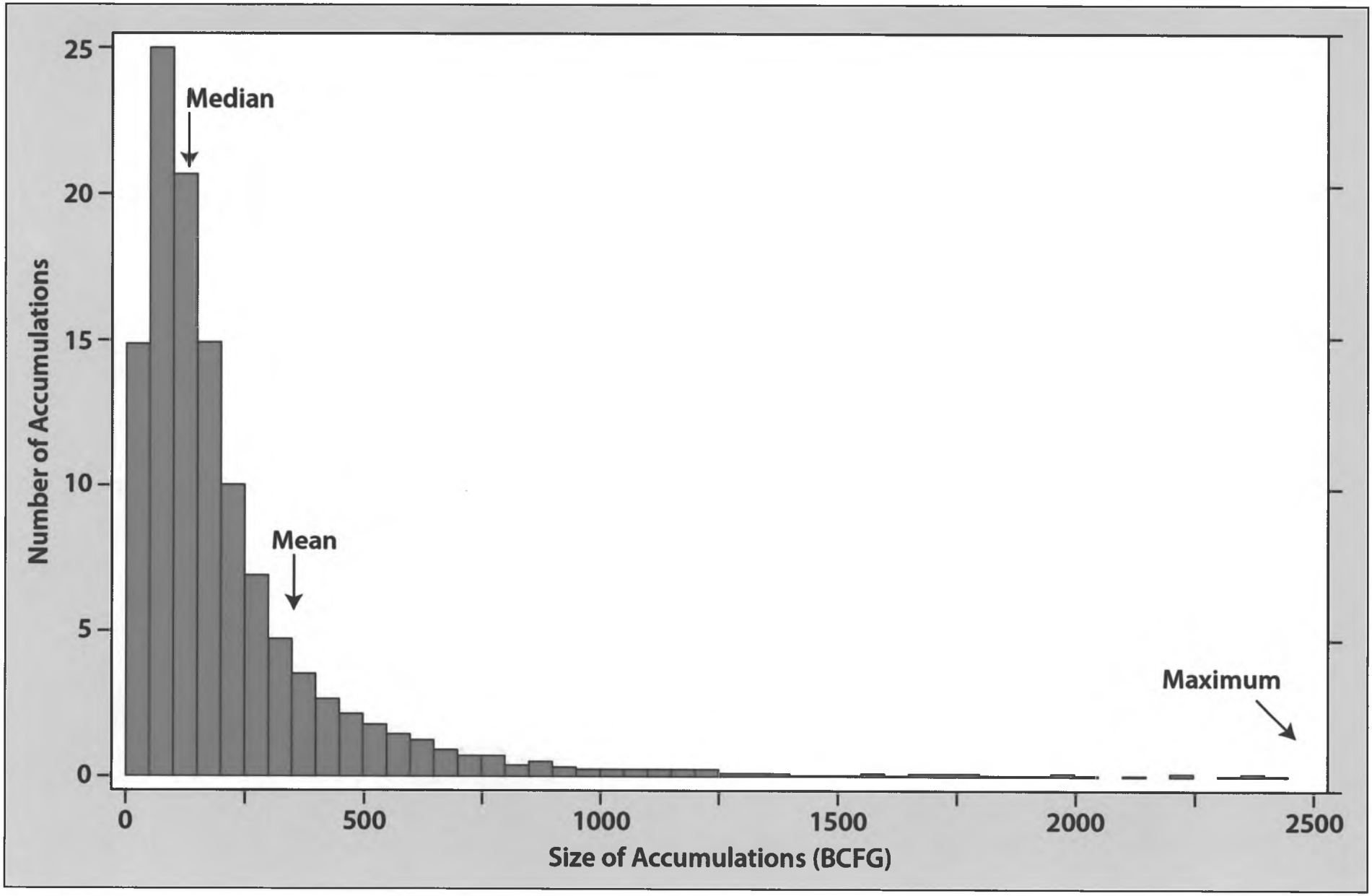




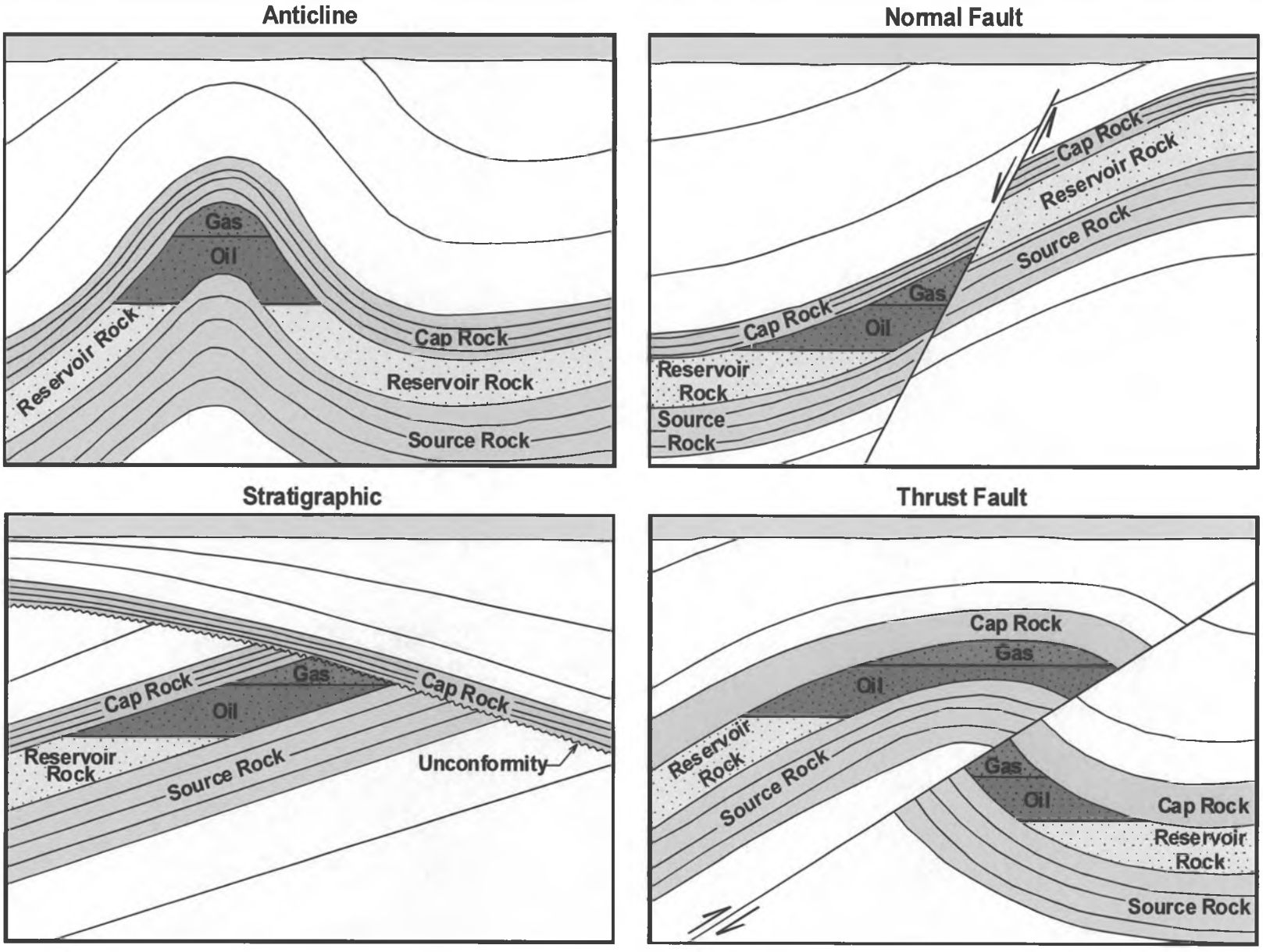




Log Normal Distribution of Gas Accumulation Size

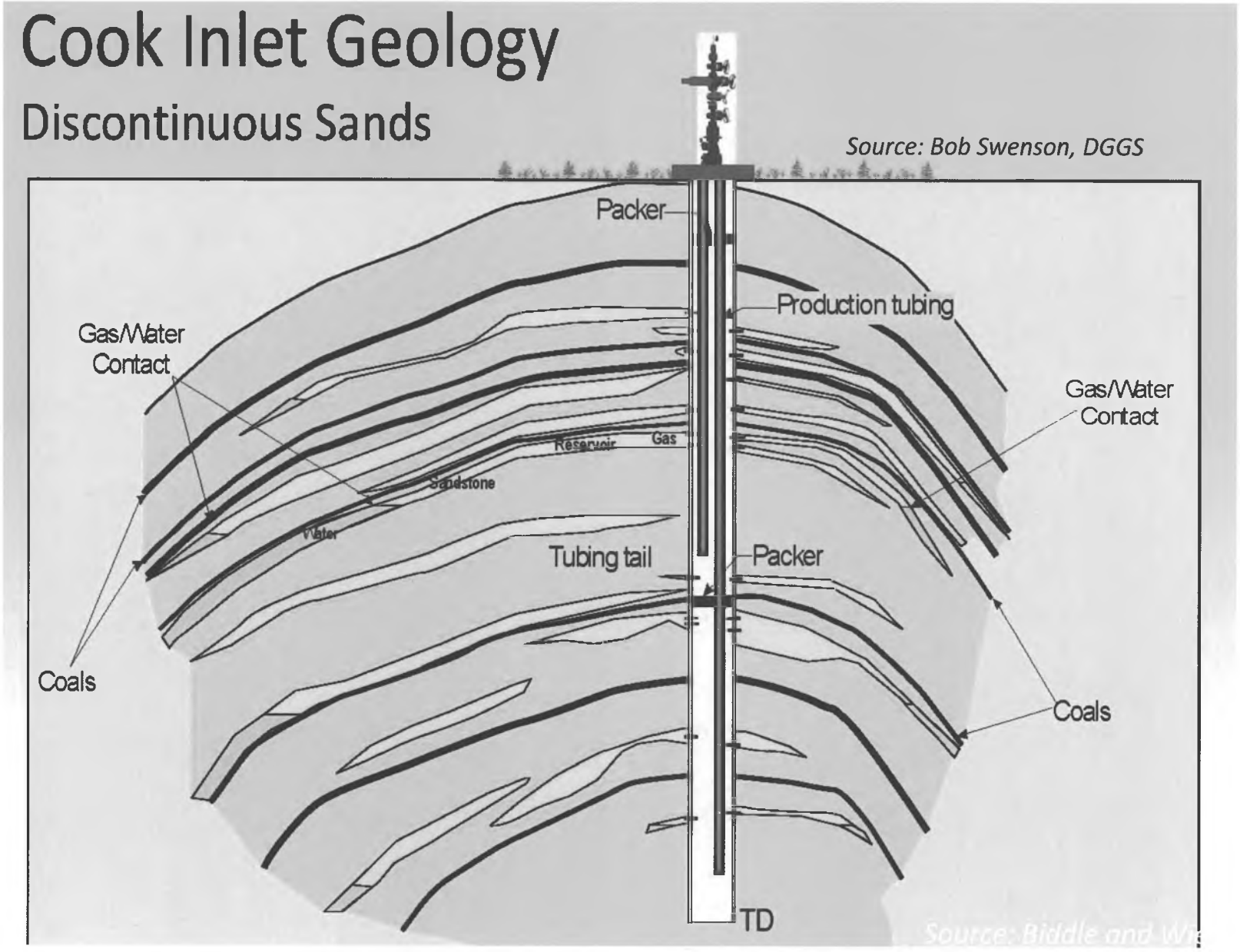


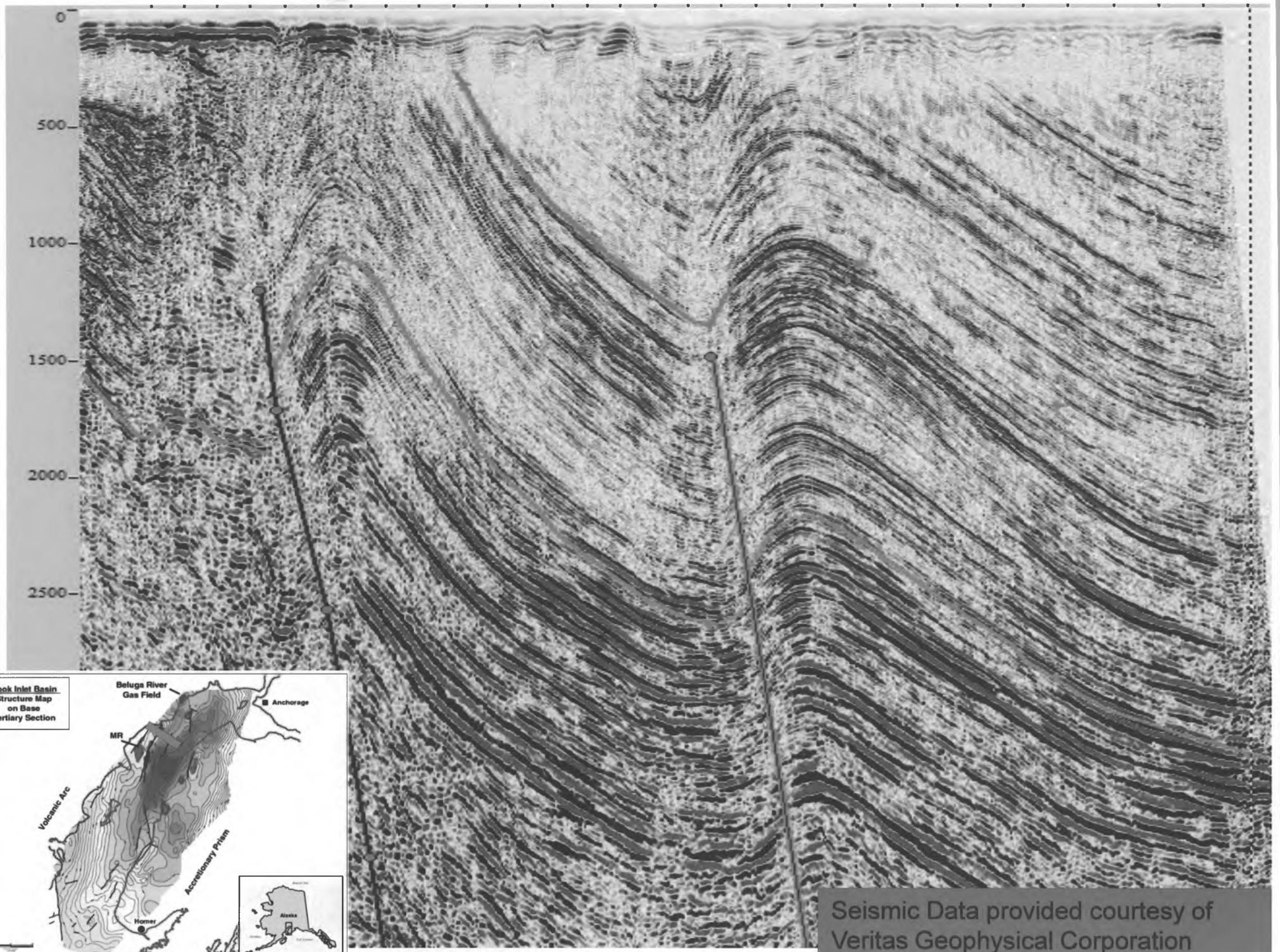
New Gas from New Exploration Play Types

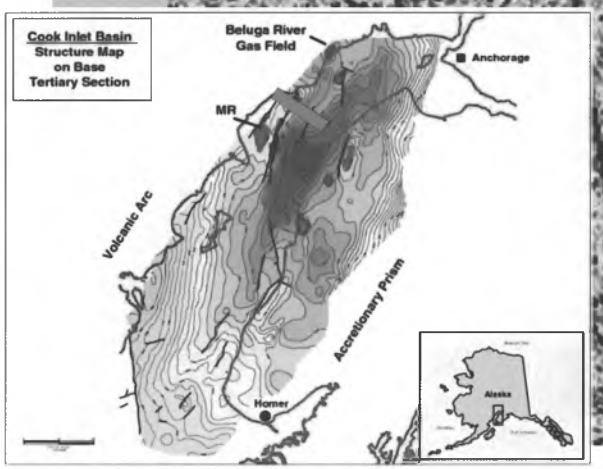


Oil and Gas Trapping Mechanisms

‘New’ Gas in Existing Fields

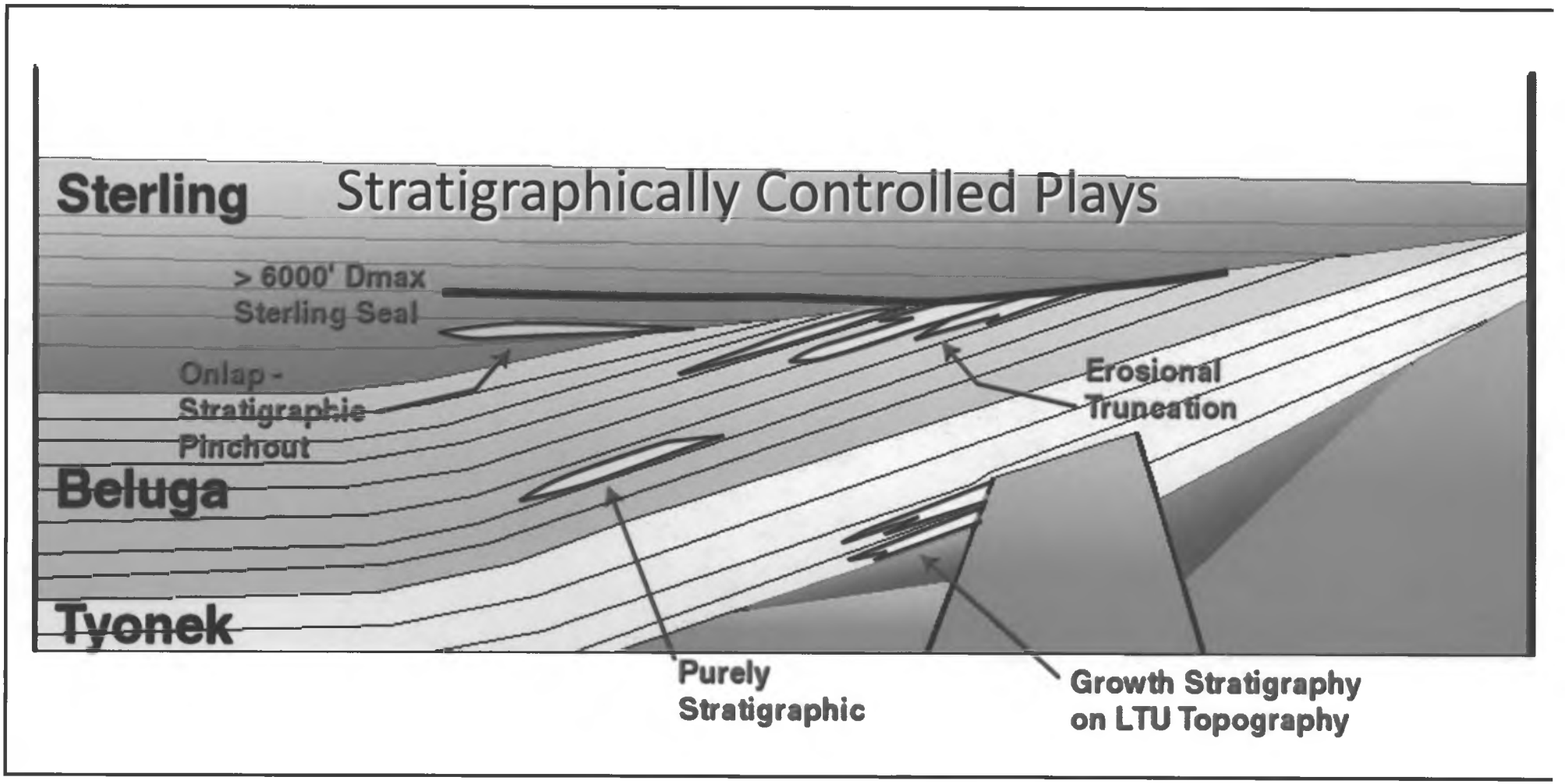


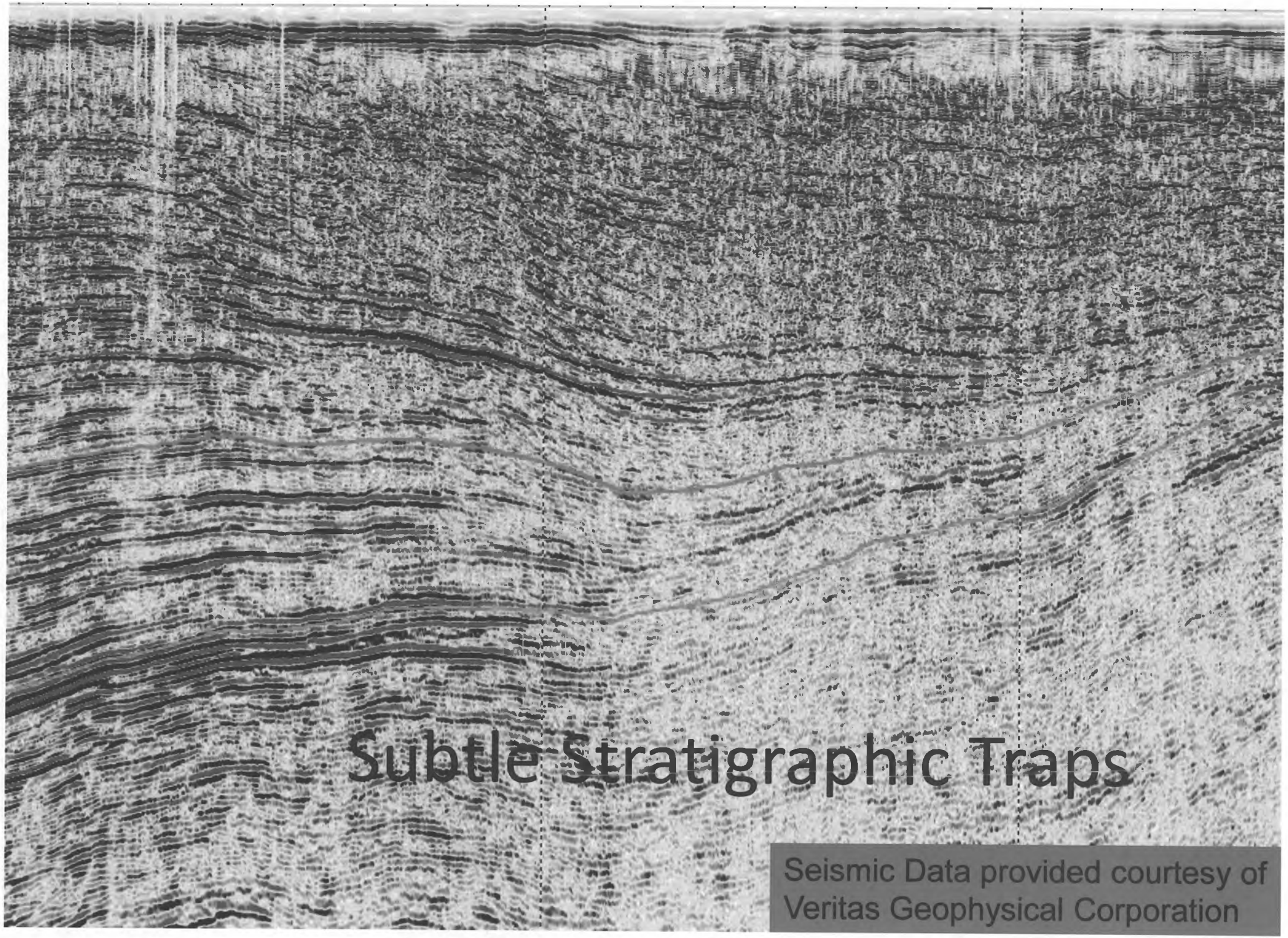




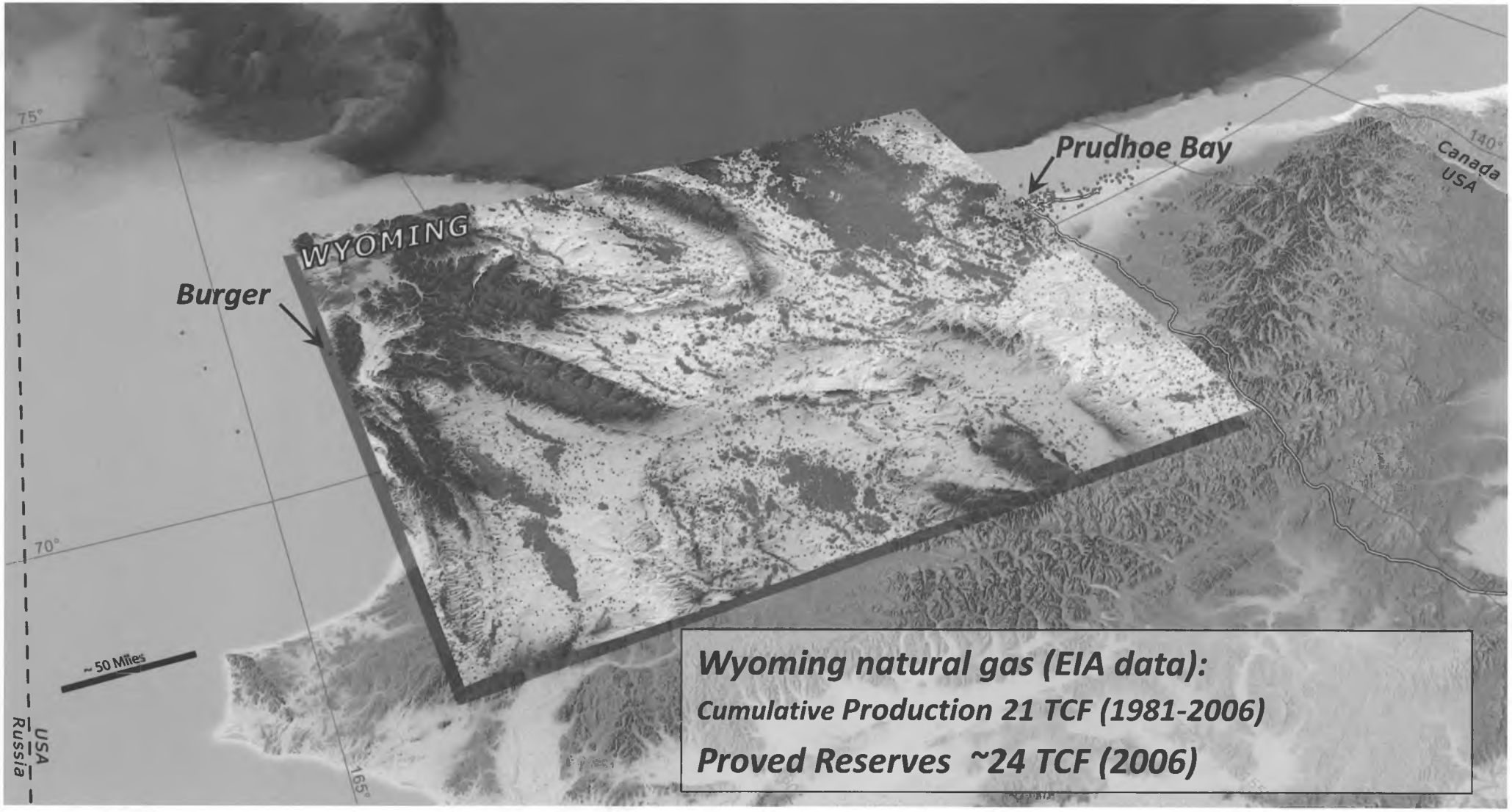
Seismic Data provided courtesy of
Veritas Geophysical Corporation

Un-Explored Plays




Subtle Stratigraphic Traps
Seismic Data provided courtesy of
Veritas Geophysical Corporation

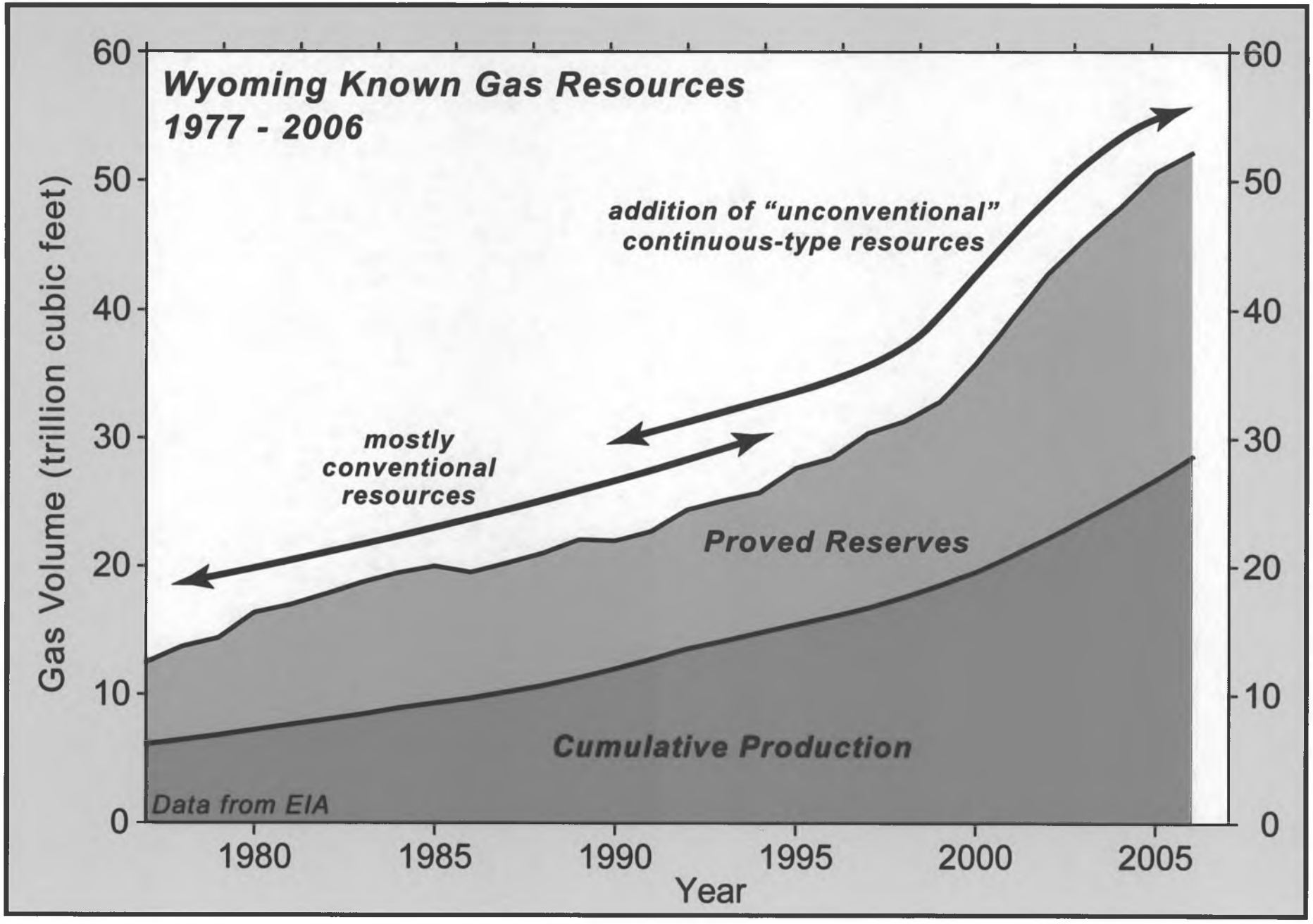
Exploration Maturity



- *Entire state of Wyoming ~100,000 mi² (~250,000 km²)*
- *Many thousand exploration wells; ~70,000 total wells*

USGS slide

Wyoming Gas Reserves & Production History

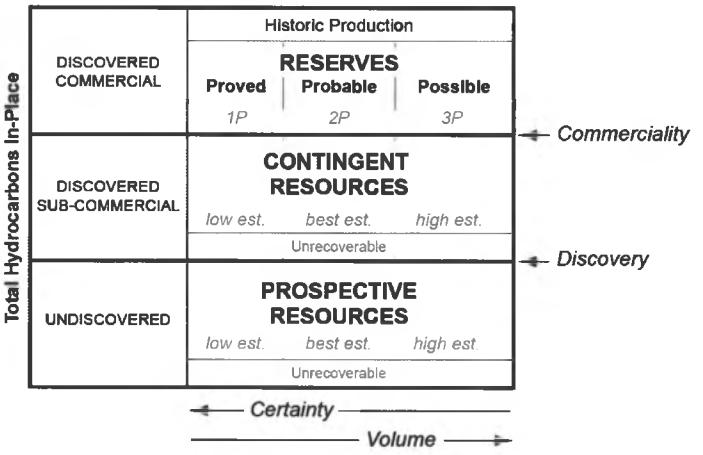


USGS slide

Getting From Undiscovered Resources to Proved Developed Reserves

The keys are exploration success and commercial validation

1. ***Find and Map Prospects with Seismic Data***
   - Recon seismic acquisition and G&G interpretation (coarse 2-D grid)
   - Prospect-scale seismic acquisition and GG&E interpretation (tight 2-D grid or 3-D)
2. ***Land/Lease Access to Prospect***
   - Competitive lease sale (e.g., DNR, BOEM, BLM)
   - Private lease (e.g., Native corporations)
   - Exploration license (DNR)
3. ***Exploration Drilling → Reservoir Discovery***
   - Wildcat exploration drilling, logging, testing (80-90% failure rate); refine prospect model
   - Appraisal and delineation drilling of discovery; extensive logging, testing; refine model
4. ***Project Sanction***
   - Engineering analysis, design, costing
   - Environmental/Permitting feasibility
   - Commercial hurdles, board/investor approval
5. ***Development***
   - Gravel construction
   - Facilities & pipeline construction and installation
   - Development drilling



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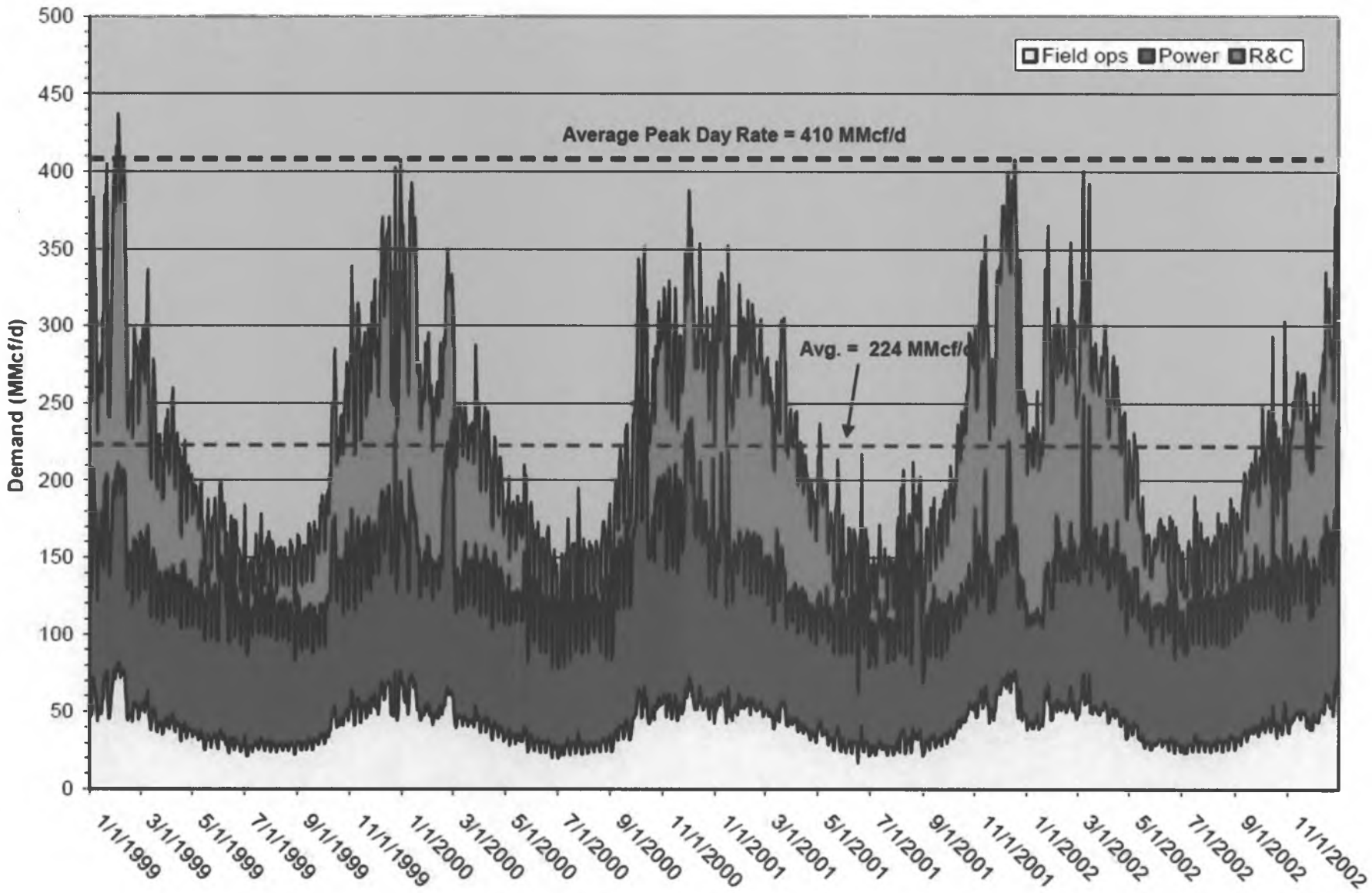
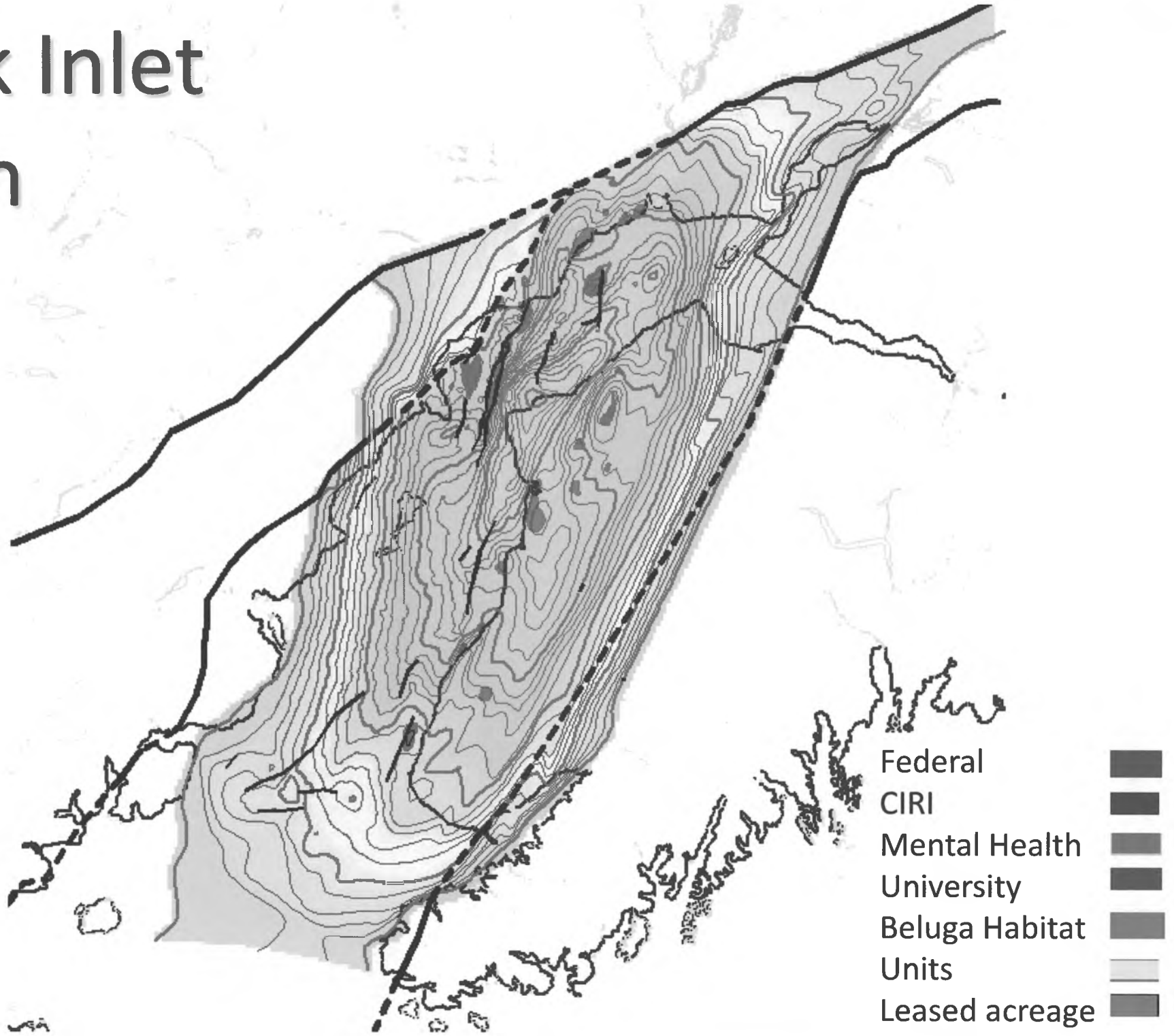


Cook Inlet Basin



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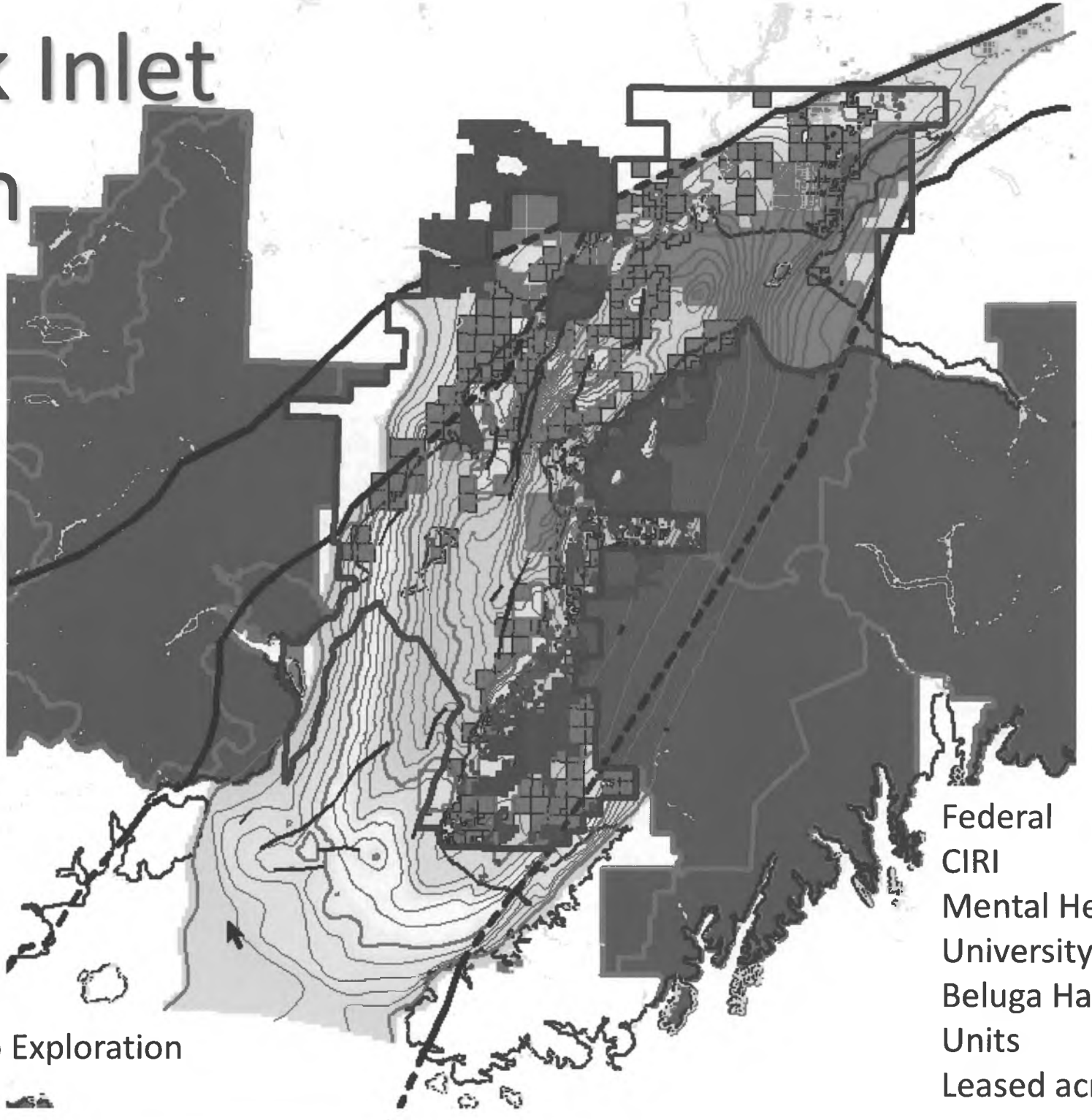
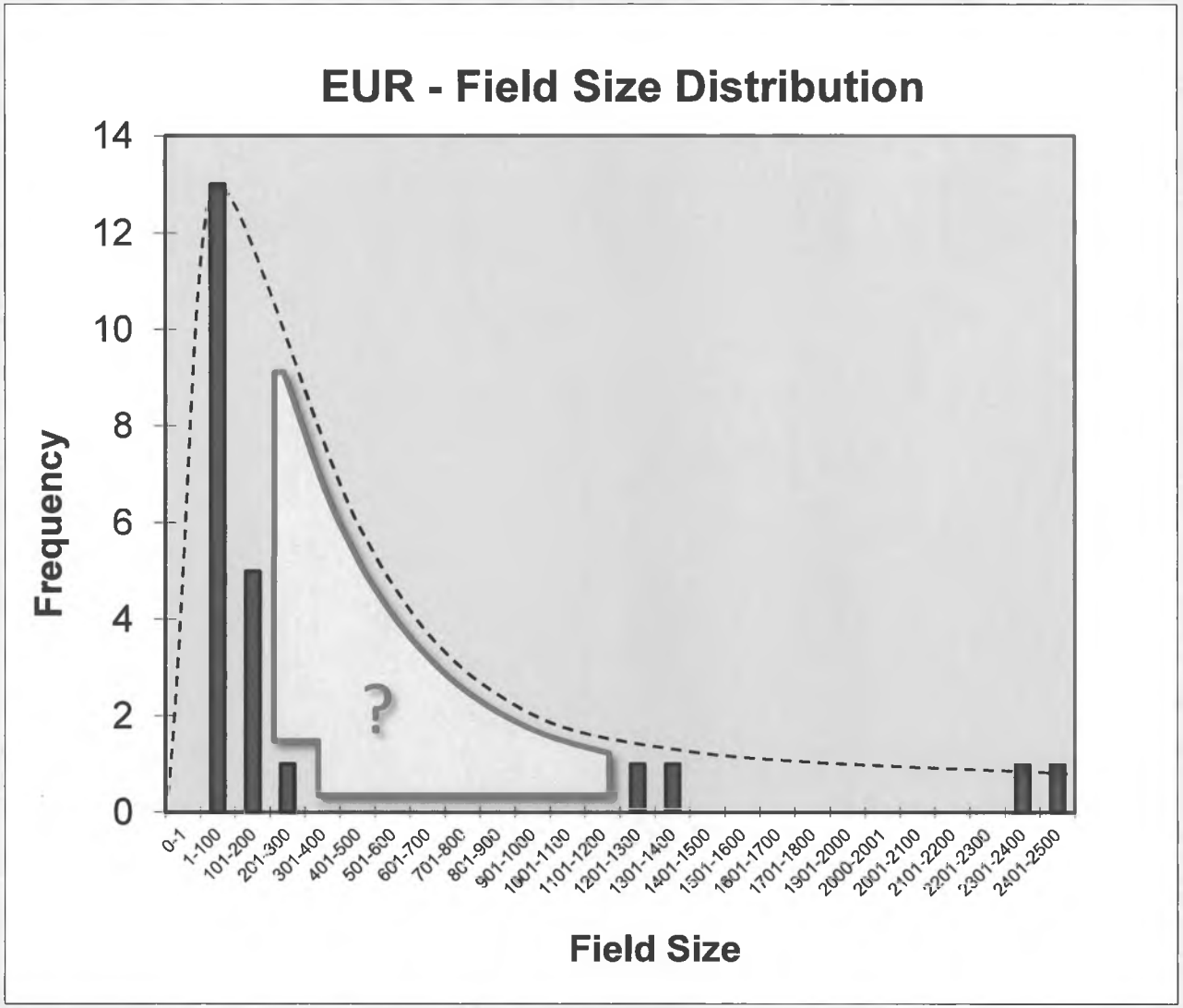


Hurdles to Exploration

Gas Field Size Distribution - EUR

Gaps in lognormal distribution suggest undiscovered fields

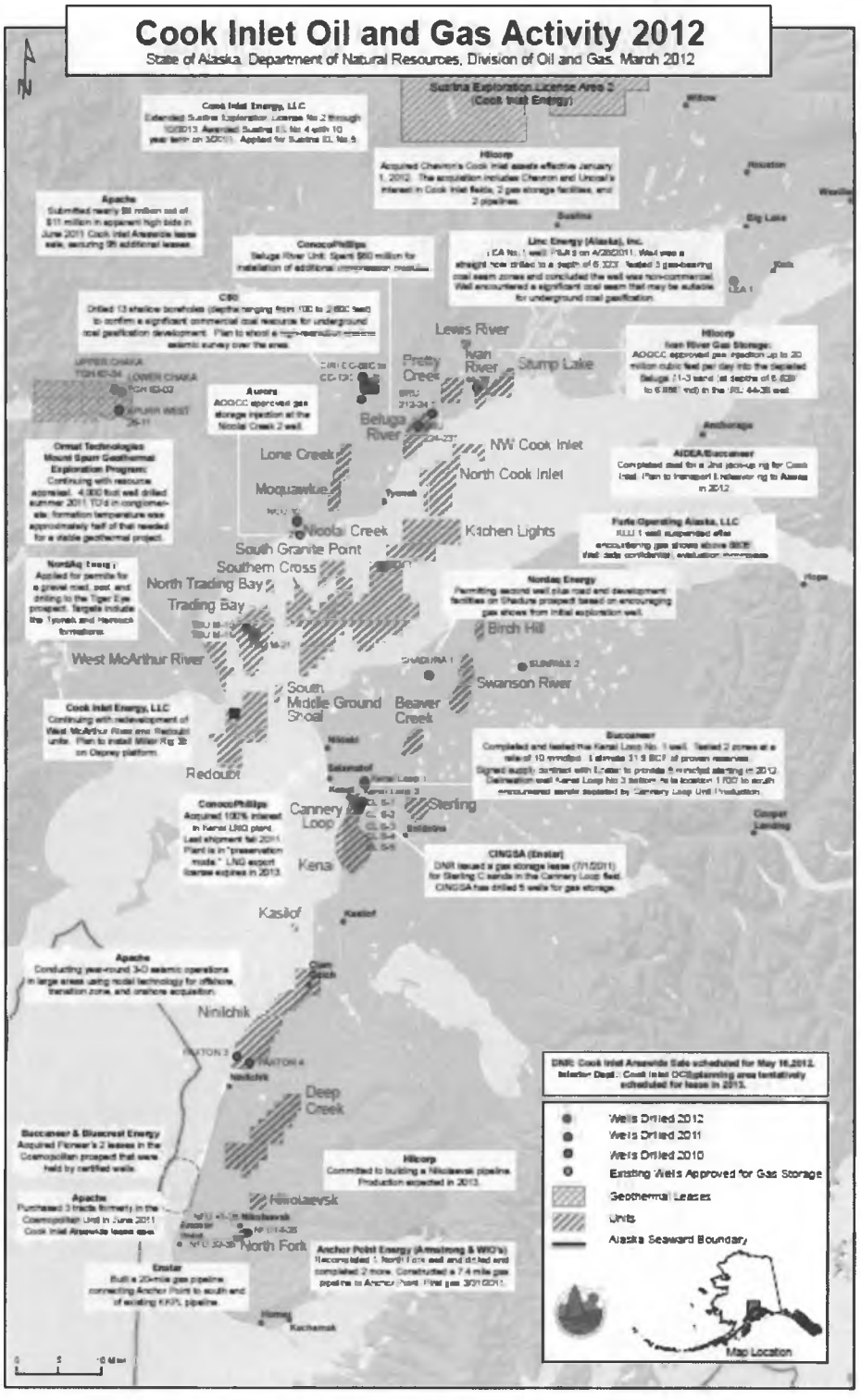


Stump Lake	6
Pretty Creek	6
West Fork	7
Lewis River	9
North Fork	12
Falls Creek	13
Birch Hill	22
Sterling	26
N Trading Bay Unit	30
Moquakie	43
Wolf Lake	50
Trading Bay	90
Ivan River	104
M G S	112
Cannery Loop	116
Granite Point	137
Swanson River	145
Beaver Creek	242
BRU	1266
McAurther River	1384
NCI	2328
Kenai	2425

TOTAL = 8576 Bcf

Mean = 373 Bcf

Dashed curve is schematic, for illustrative purposes only



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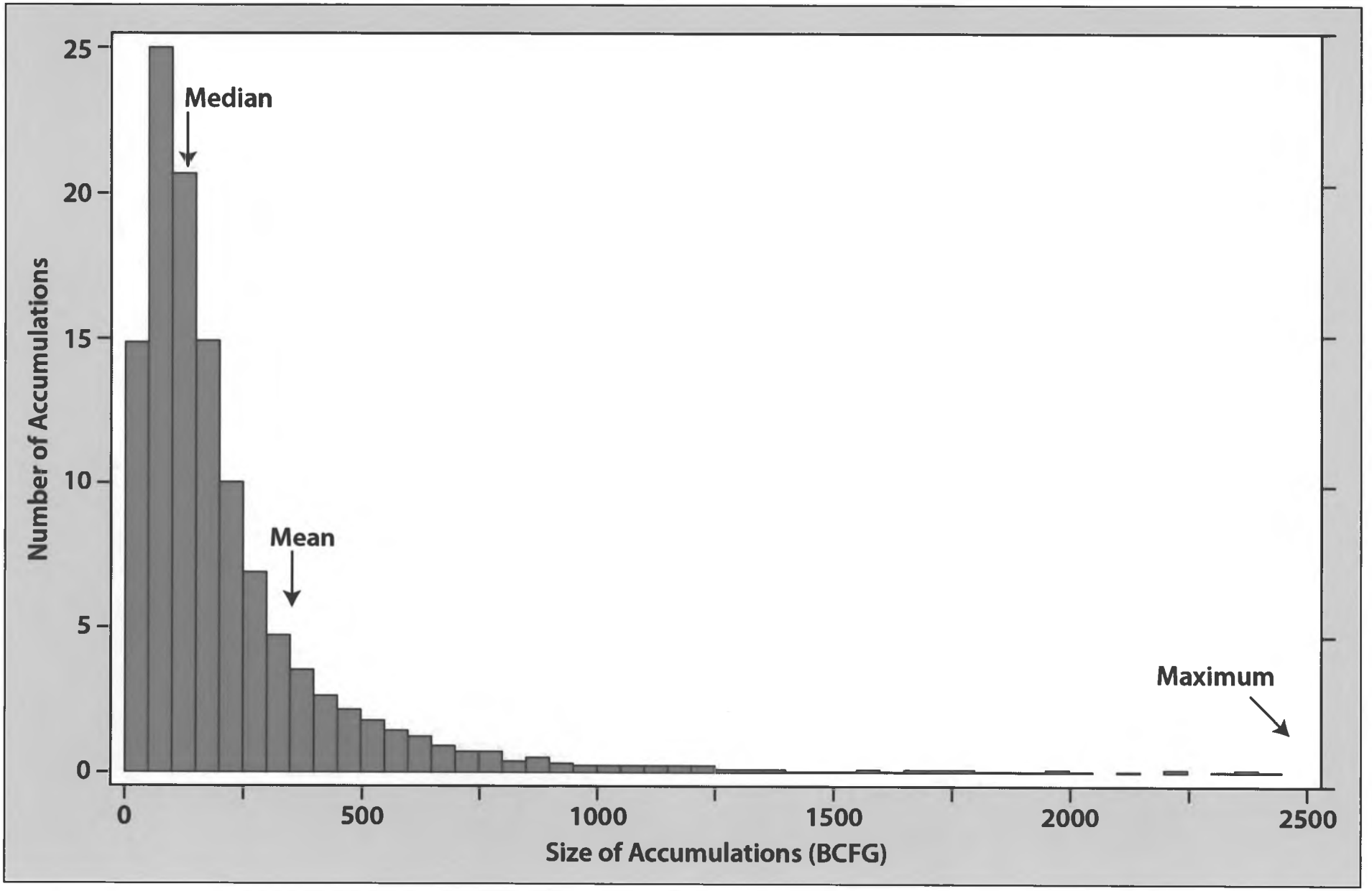
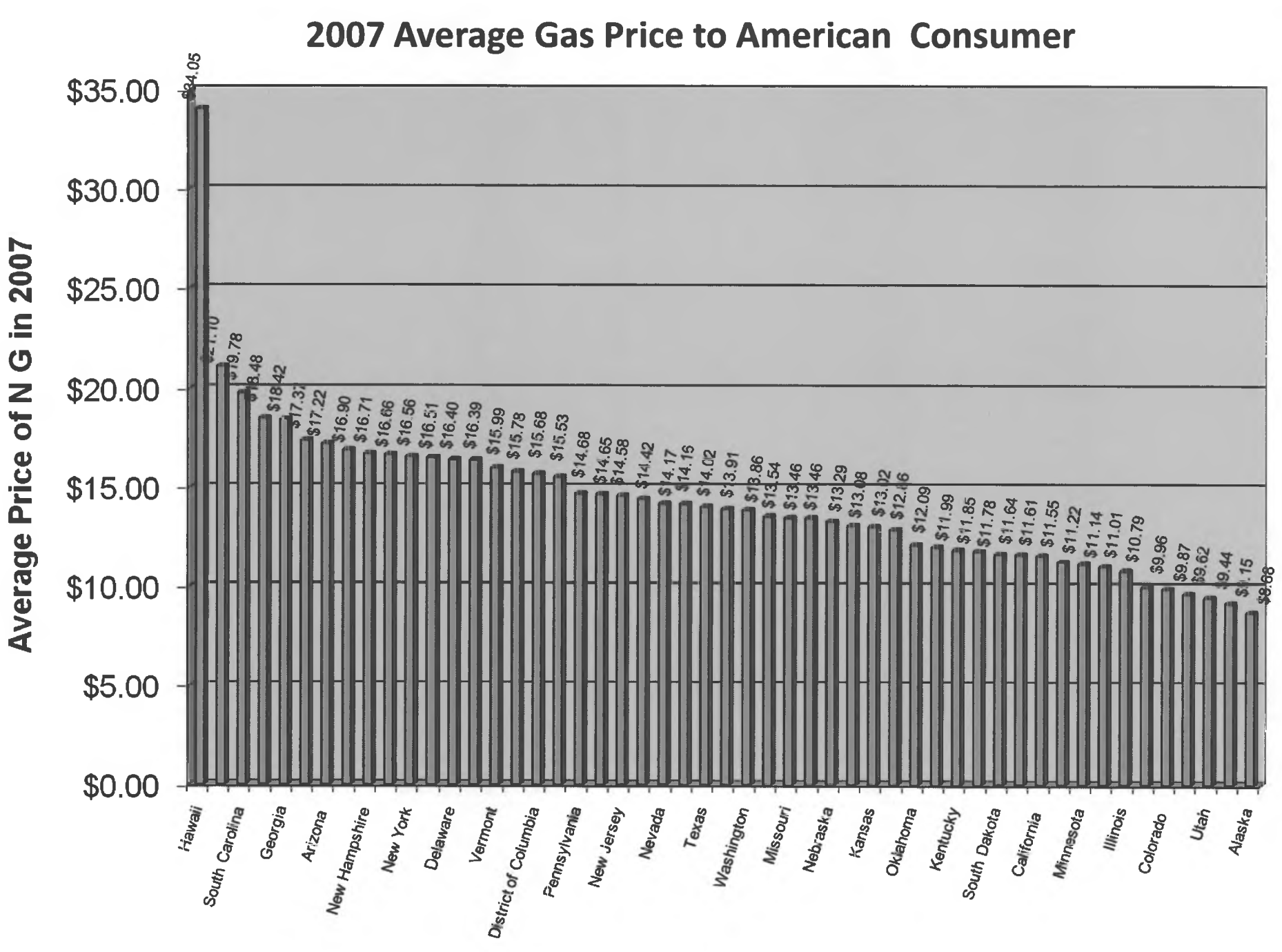
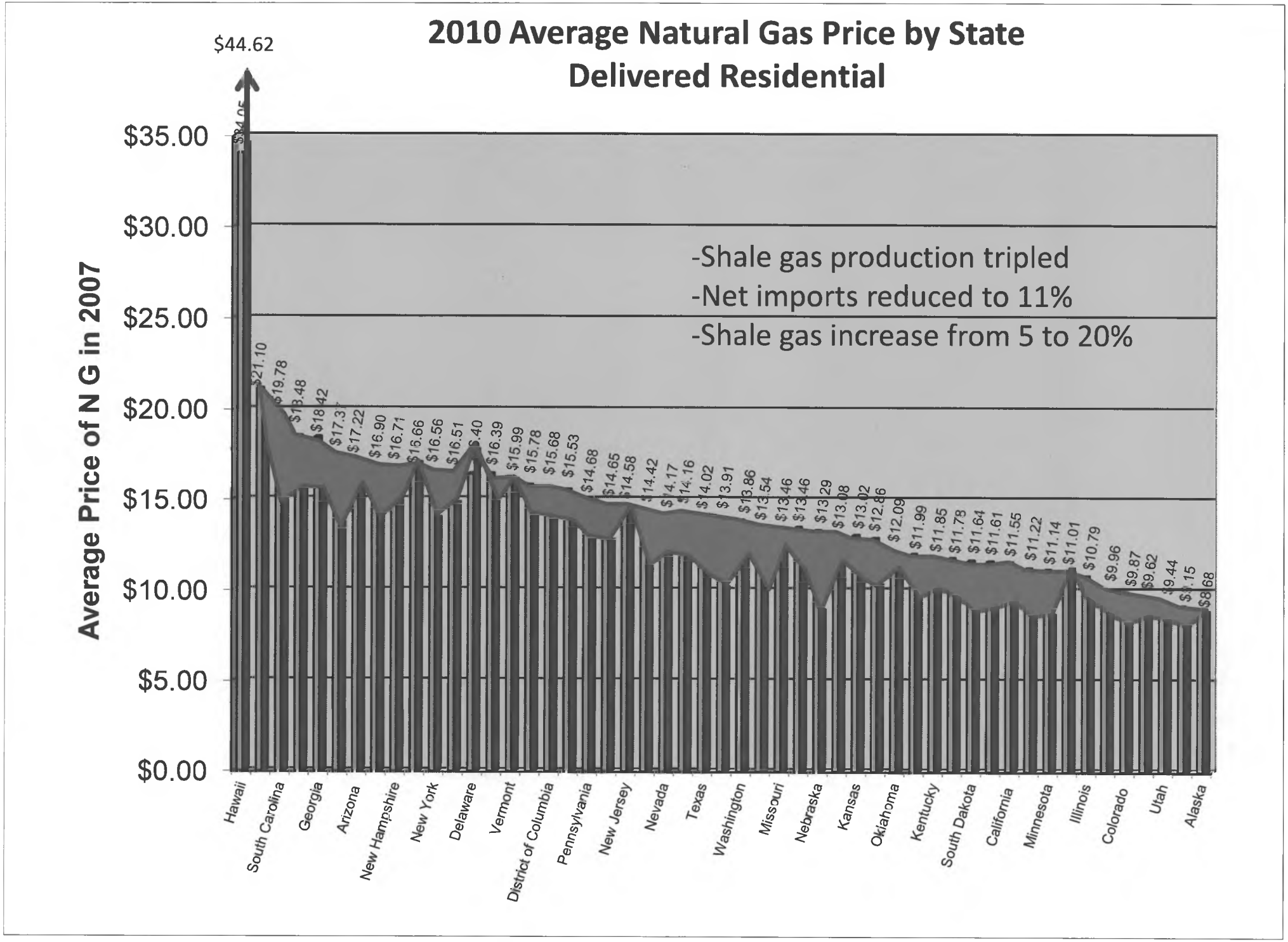
Log Normal Distribution of Gas Accumulation Size

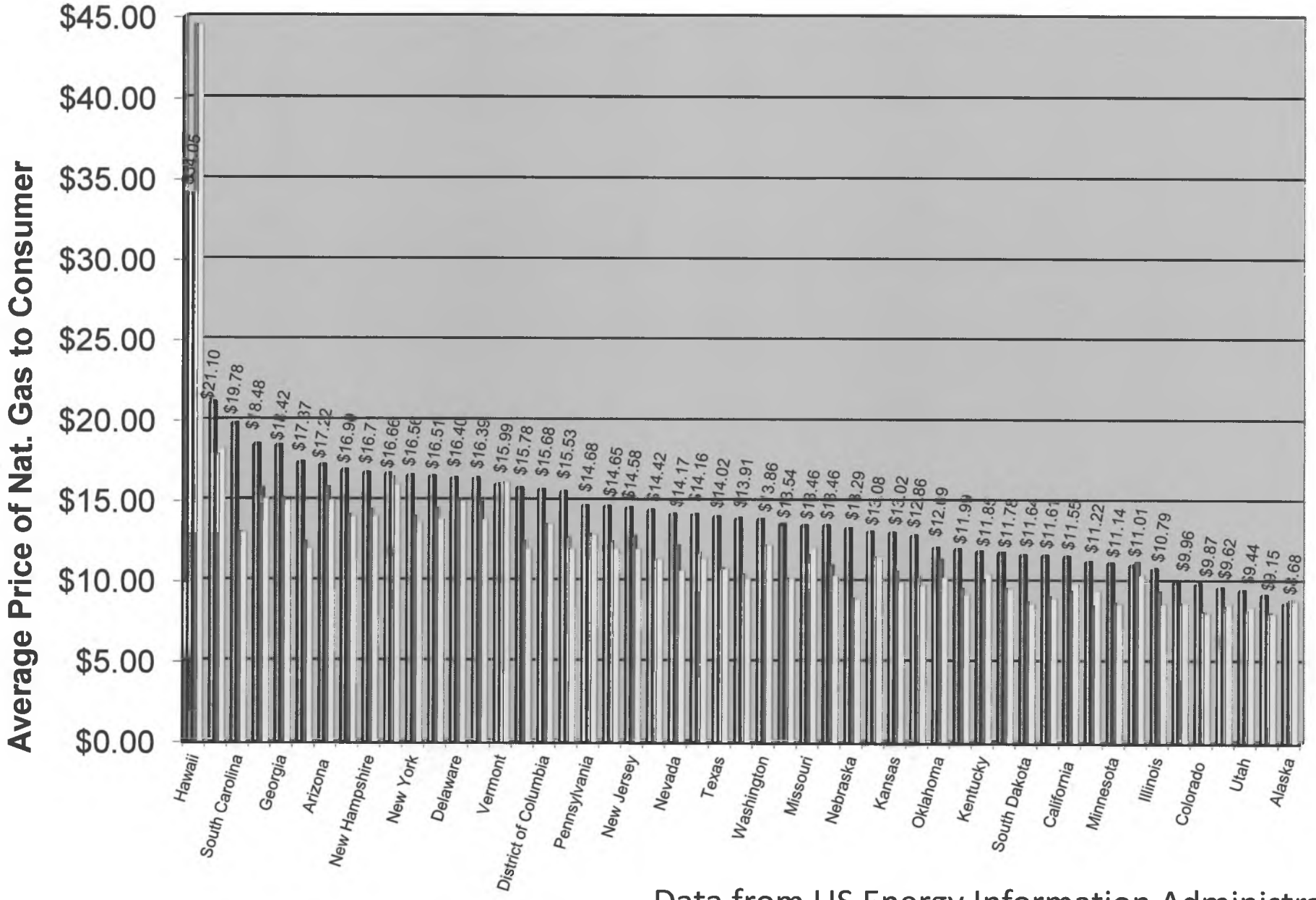




Data from US Energy Information Administration


2010 Average Natural Gas Price by State
Delivered Residential
$44.62
Average Price of N G in 2007
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$0.00
-Shale gas production tripled
-Net imports reduced to 11%
-Shale gas increase from 5 to 20%
$21.10
$19.78
$18.48
$18.42
$17.22
$16.90
$16.71
$16.66
$16.56
$16.51
$16.39
$15.99
$15.78
$15.68
$15.53
$14.68
$14.65
$14.58
$14.42
$14.16
$14.02
$13.91
$13.86
$13.54
$13.46
$13.46
$13.29
$13.08
$13.02
$12.86
$12.09
$11.99
$11.85
$11.78
$11.64
$11.61
$11.55
$11.22
$11.14
$11.01
$10.79
$9.96
$9.87
$9.62
$9.44
$9.15
$8.68
Hawaii
South Carolina
Georgia
Arizona
New Hampshire
New York
Delaware
Vermont
District of Columbia
Pennsylvania
New Jersey
Nevada
Texas
Washington
Missouri
Nebraska
Kansas
Oklahoma
Kentucky
South Dakota
California
Minnesota
Illinois
Colorado
Utah
Alaska

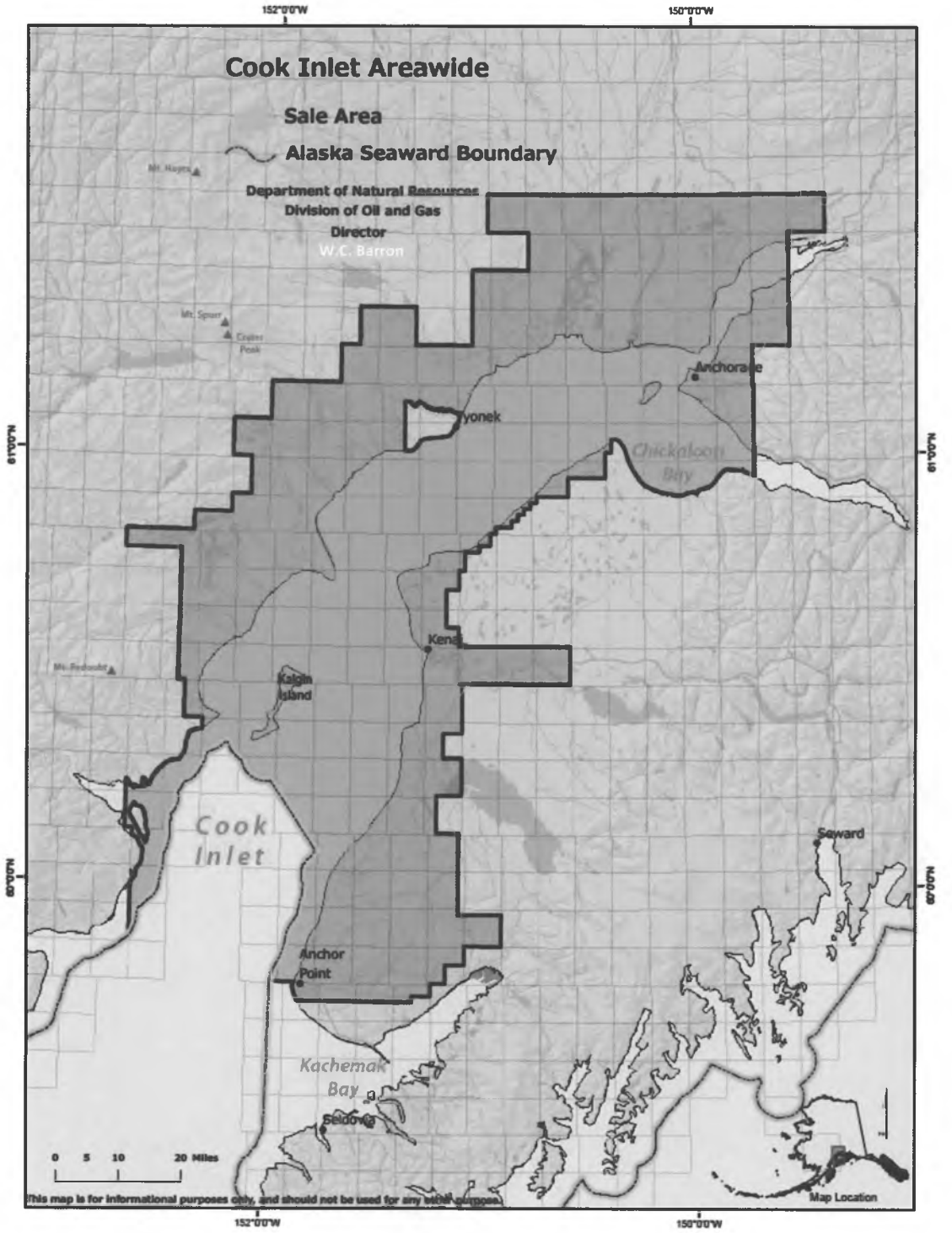
2007 vs. 2010 vs. 2011 Average Gas Price to American Consumer



Data from US Energy Information Administration

Cook Inlet Areawide Lease Sale

- Recent exploration buzz
  - new players
  - new discoveries
- 4.2 million acres
- All open acreage offered
- Notice of Sale with sale details due April 1, 2012
- Bids due May 14, 2012
- Bid opening May 16, 2012



Cook Inlet Gas Supply Study Update

Alaska House of Representatives
Special Committee on Energy
Tom Walsh
April 10, 2012

ENSTAR Natural Gas Company

CHUGACH POWERING ALASKA'S FUTURE

75 SEVENTY-FIVE YEARS MLP ANCHORAGE, AK

By: Petrotechnical Resources of Alaska

2009 Cook Inlet Study

- In 2009, ENSTAR, Chugach Electric and ML&P commissioned PRA to perform a study of Cook Inlet Supply from existing Fields
- Study allowed Cook Inlet Utilities to better understand their gas supply
  - Impact and drivers of drilling/development activity
  - Further understanding of DNR 2009 CI Gas Report
  - Help predict when gas would need to be imported into the Cook Inlet market
- In 2012, PRA updated the supply study

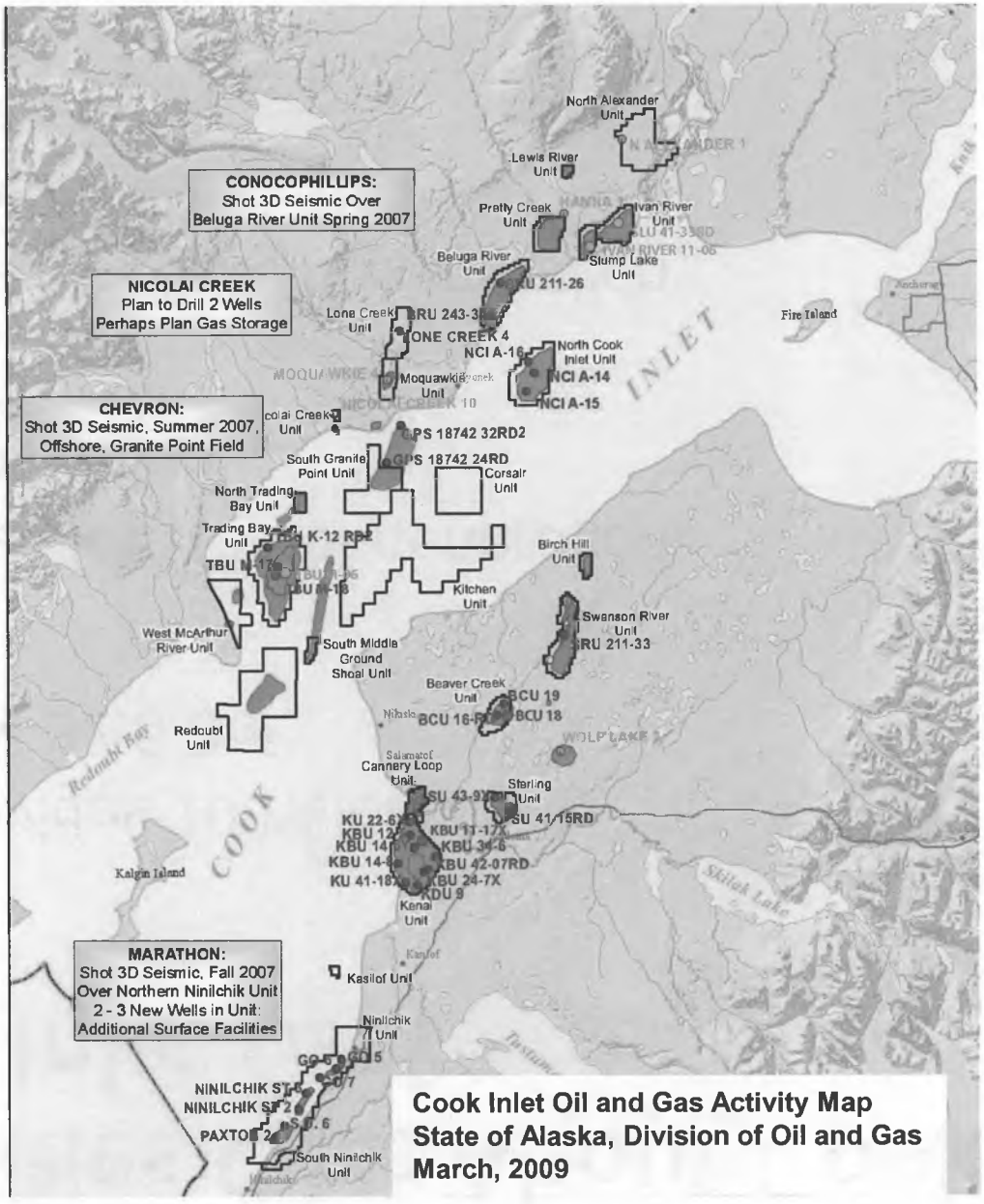
Why Do Utilities Care About Cook Inlet Gas?

- ENSTAR
  - Cook Inlet gas provides 100% of supply
  - 2009 consumption: 32.5 Bcf
- Chugach
  - Cook Inlet gas used for 90% of generation
  - 2009 consumption: 26 Bcf
- ML&P
  - Cook Inlet gas used for 88% of generation
  - 2009 consumption: 10.8 Bcf

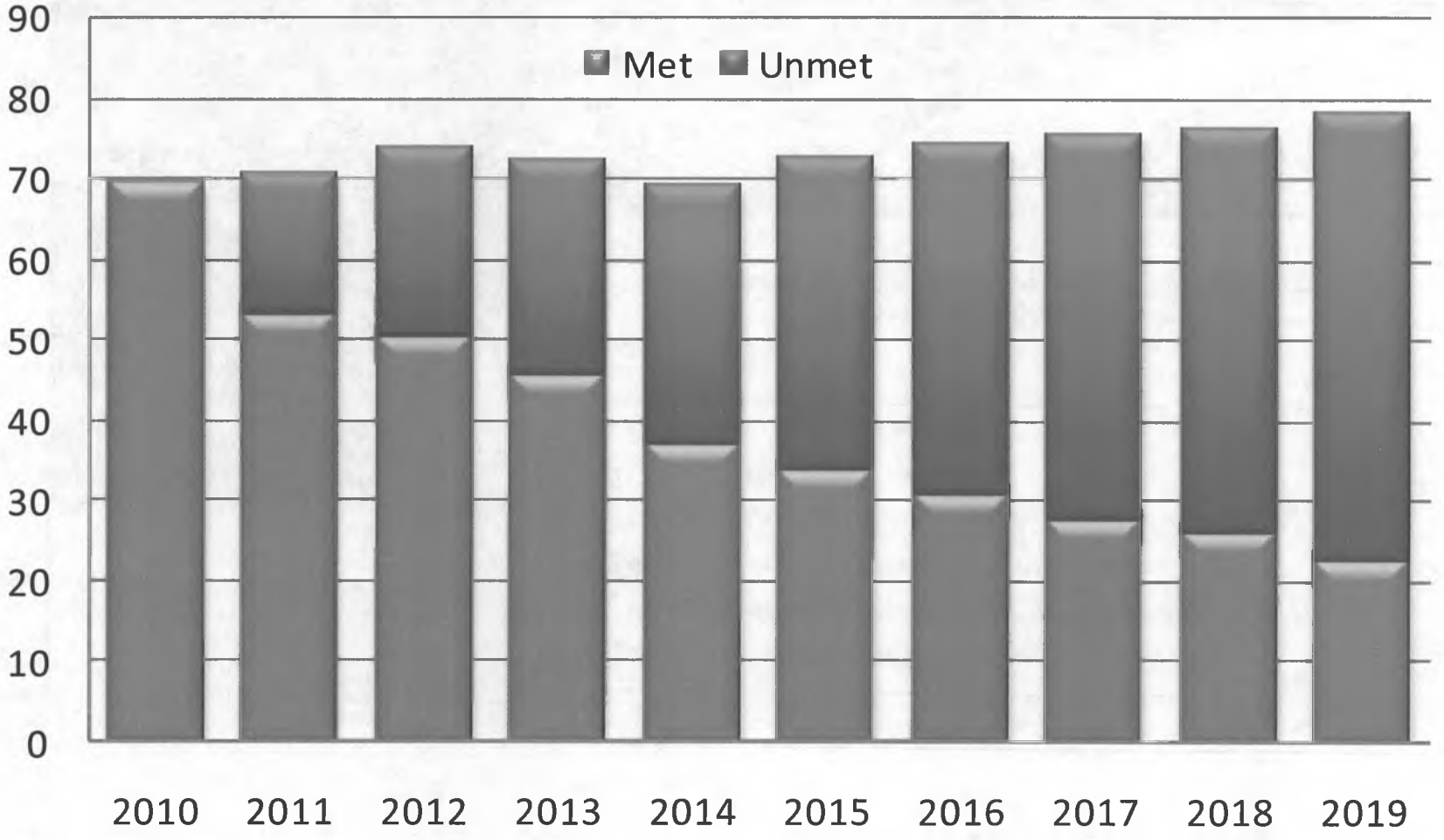
Cook Inlet Fields

2011 Gas Production

Beluga River Unit	27%
TBU	21%
No. CI	13%
Ninilchik	13%
Kenai Unit	11%
Others	15%



2009 Combined Utility Met and Unmet Gas Demand



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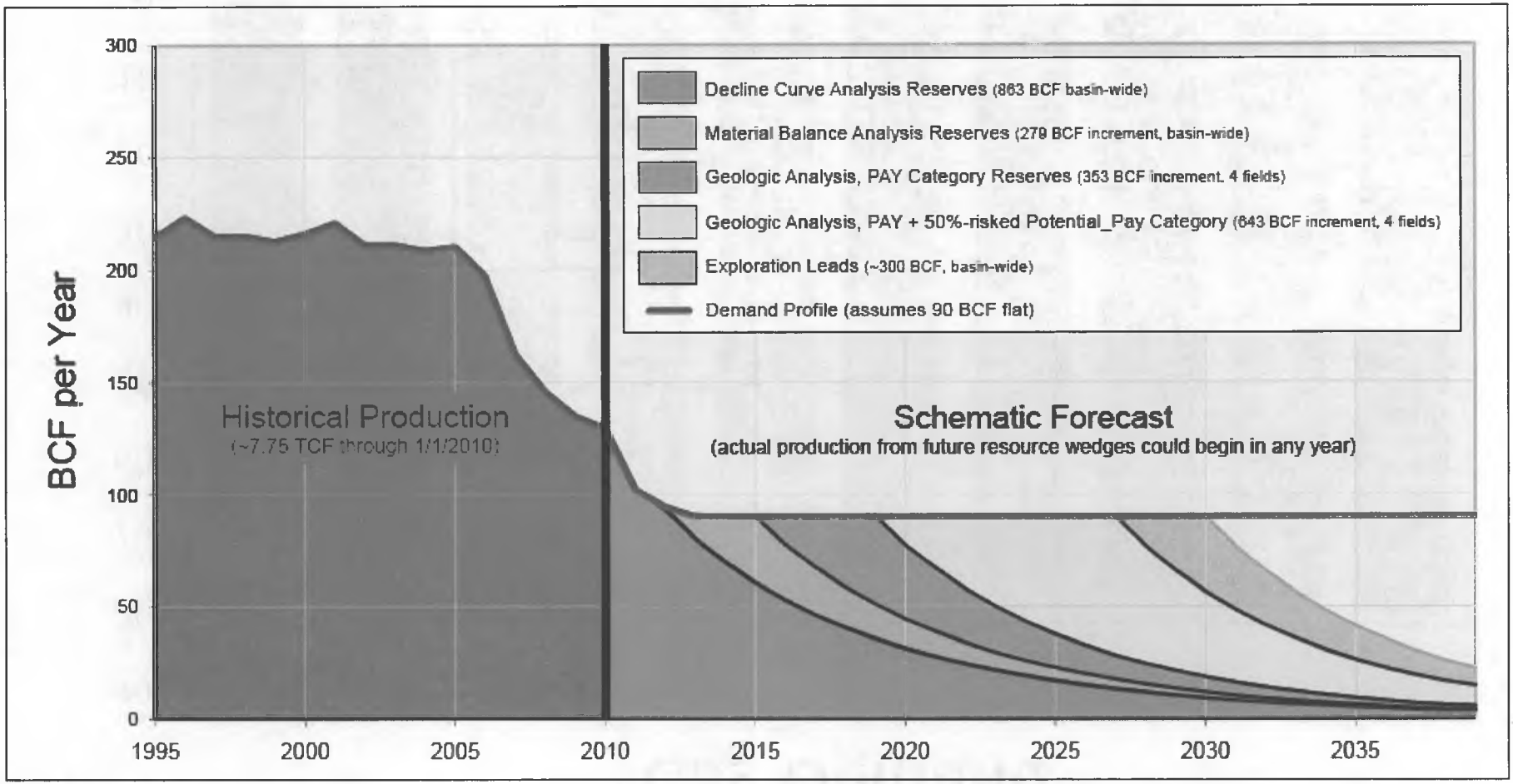
Annual Supply – DNR 2009 Report



Source: AK DNR December 2009 Study

2009 CI Gas Study for Cook Inlet Utilities by PRA

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Study Objectives

- Review DNR reserves analysis
- Review the deliverability of Cook Inlet gas wells drilled from 2001-2009
- Forecast deliverability of existing and future gas wells
- Analyze timing required for delivery of non-Cook Inlet gas sources

Study Methodology

- Field-level decline curve analysis – most fields
- Individual well decline curve analysis – 5 largest fields: BRU, KU, NCI, NU, TBU
- New well IP decline through time
- Calculate activity required to meet future demand
- POD review
- Analysis of business drivers

Cook Inlet Drilling Results

Period	Gas Wells Drilled	Gas Wells Completed	Initial Production (MMCF/day)
2001–2009	128	105	3.6 per well
2007–2009	34	34	3.1 per well

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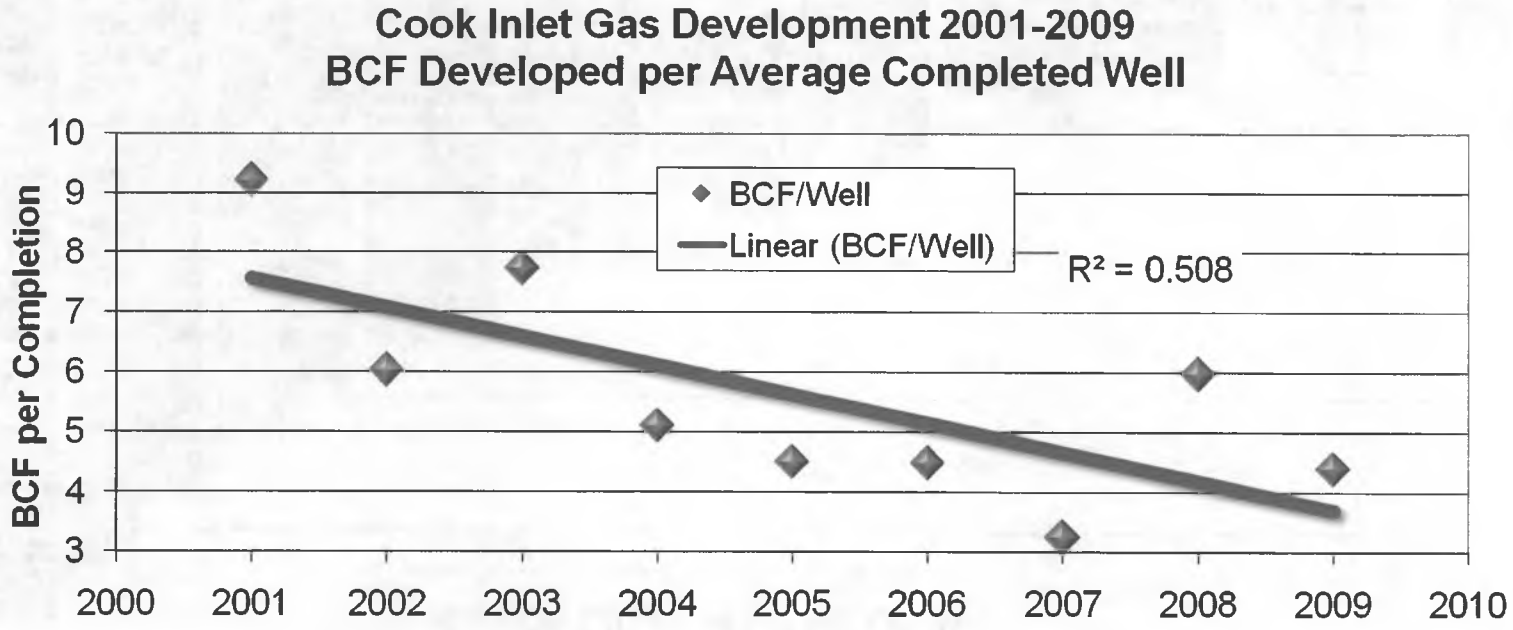
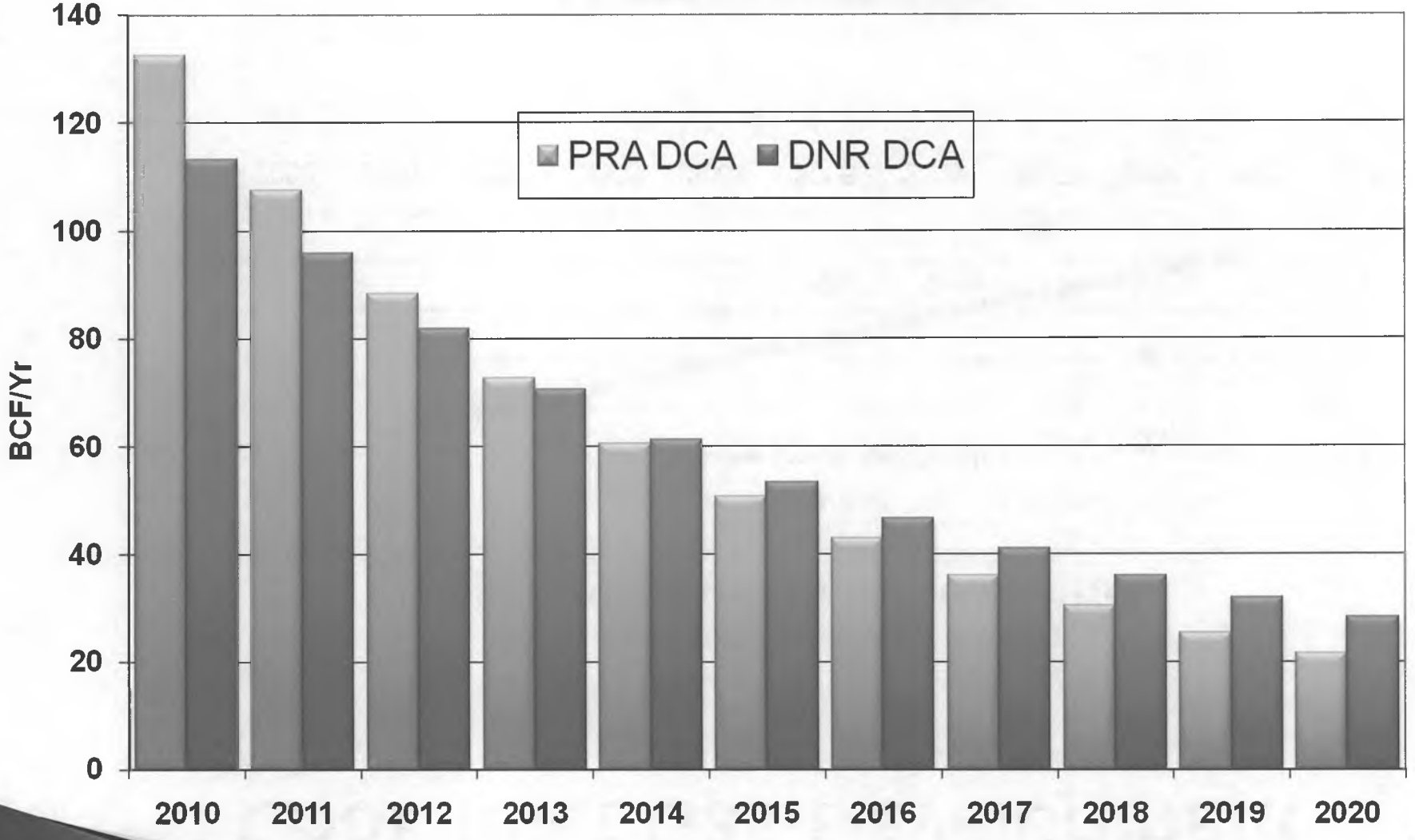
Cook Inlet Gas Development



Cook Inlet Gas Production Forecast from Decline Curve Analysis PRA and DNR 2009 Studies



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The Problem – 2009

- Both PRA and DNR conclude from decline curves we have annual supply problems by 2013 if no new wells are drilled
- PRA study concludes that significant development activity is required

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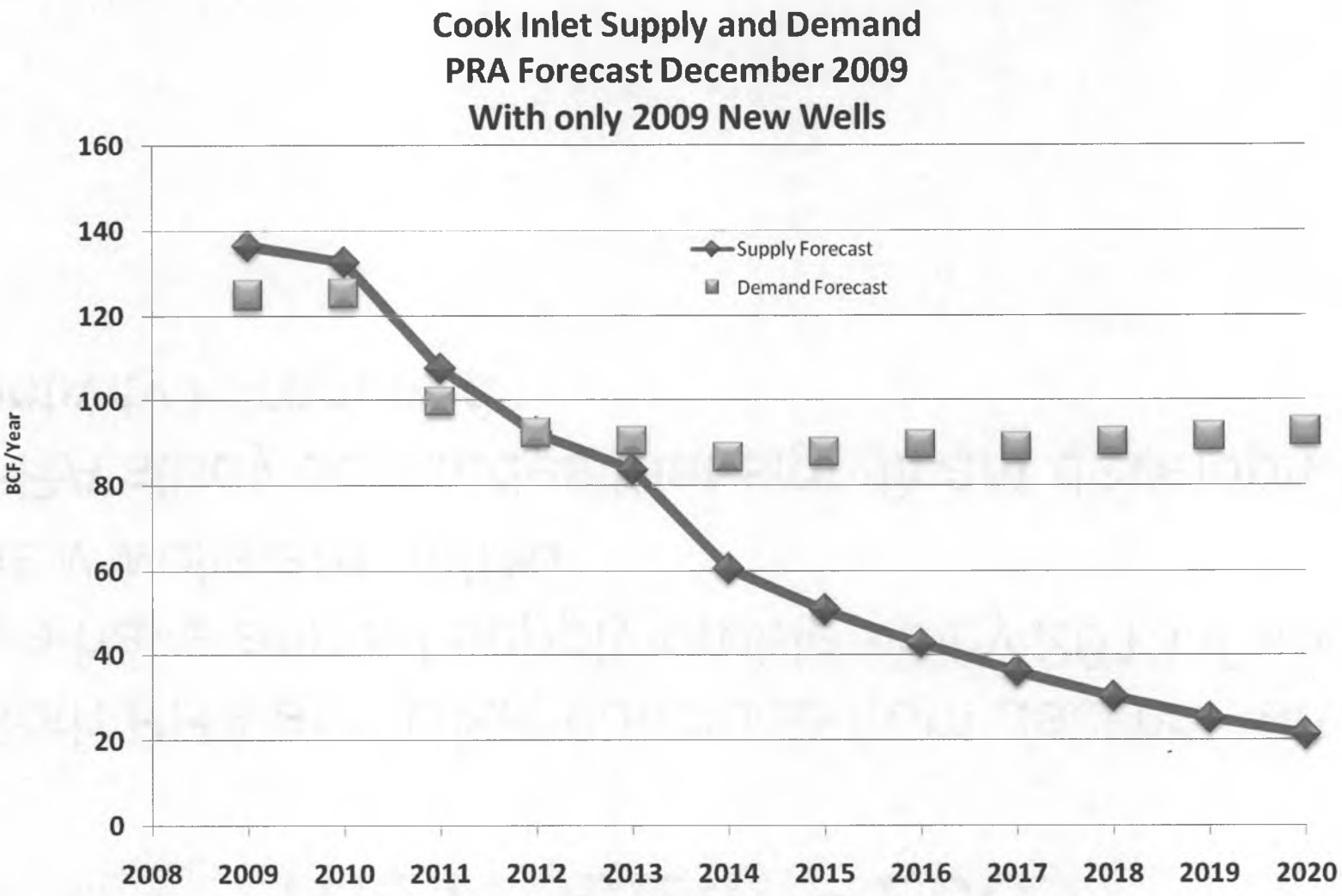
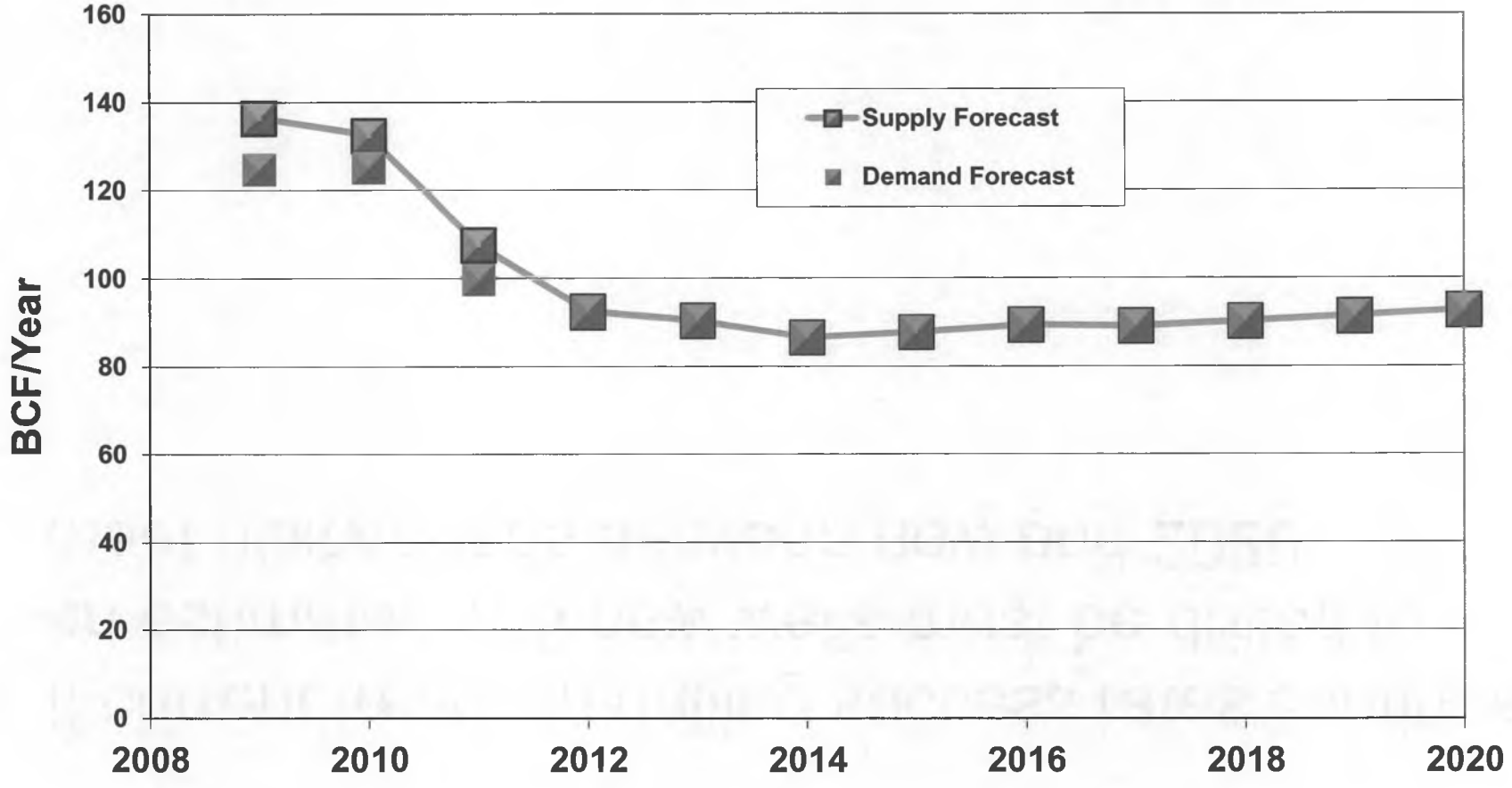
Annual Supply and Demand



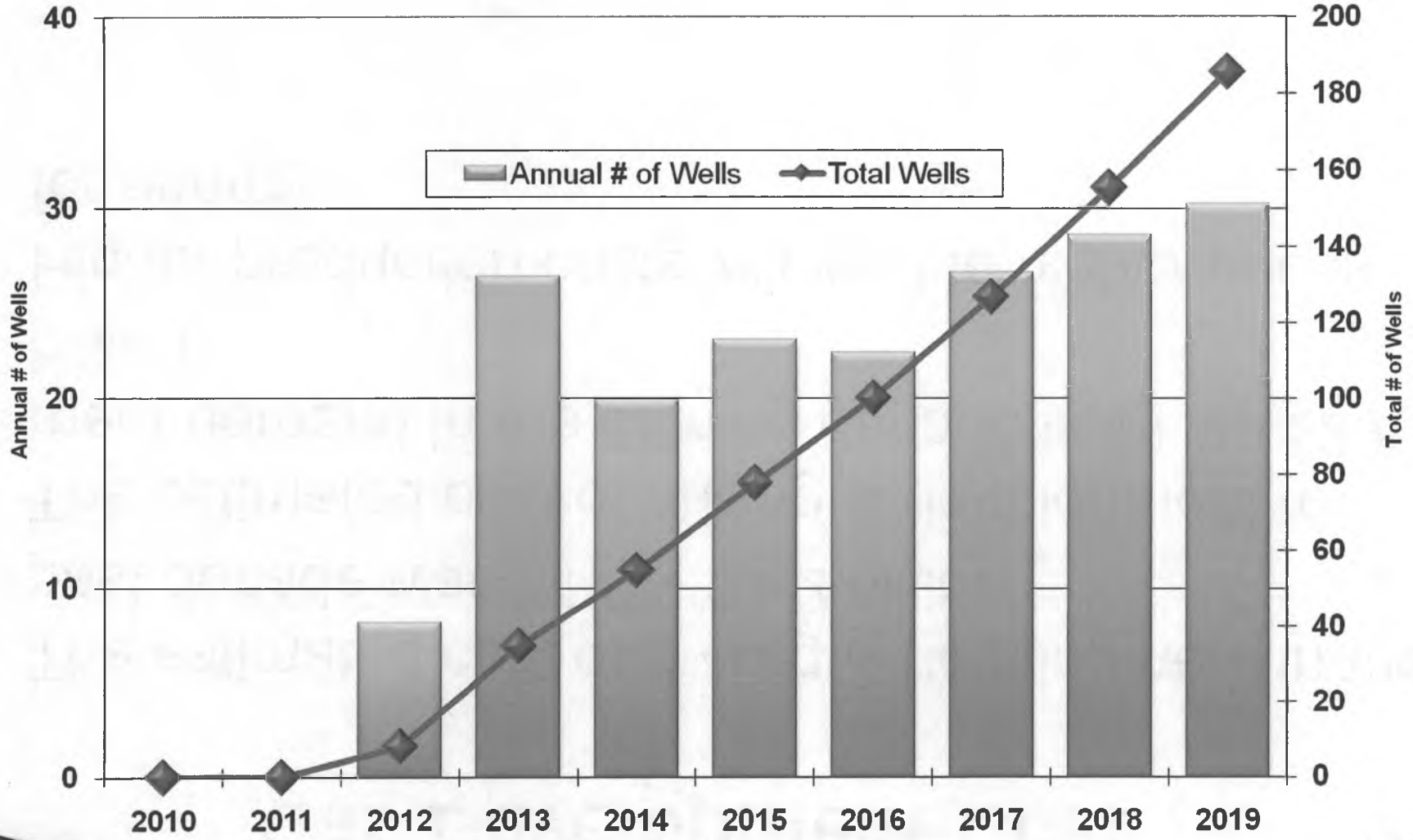
Scenario in 2009 Study

- If current trends in drilling success rates continue, an estimated 185 new wells must be drilled to meet utility needs between now and 2020

Cook Inlet Supply and Demand
PRA Forecast December 2009
Includes 185 Wells Completed to Meet Demand to 2020



185 Wells Completed 2012 to 2019
Meet Demand Through 2020



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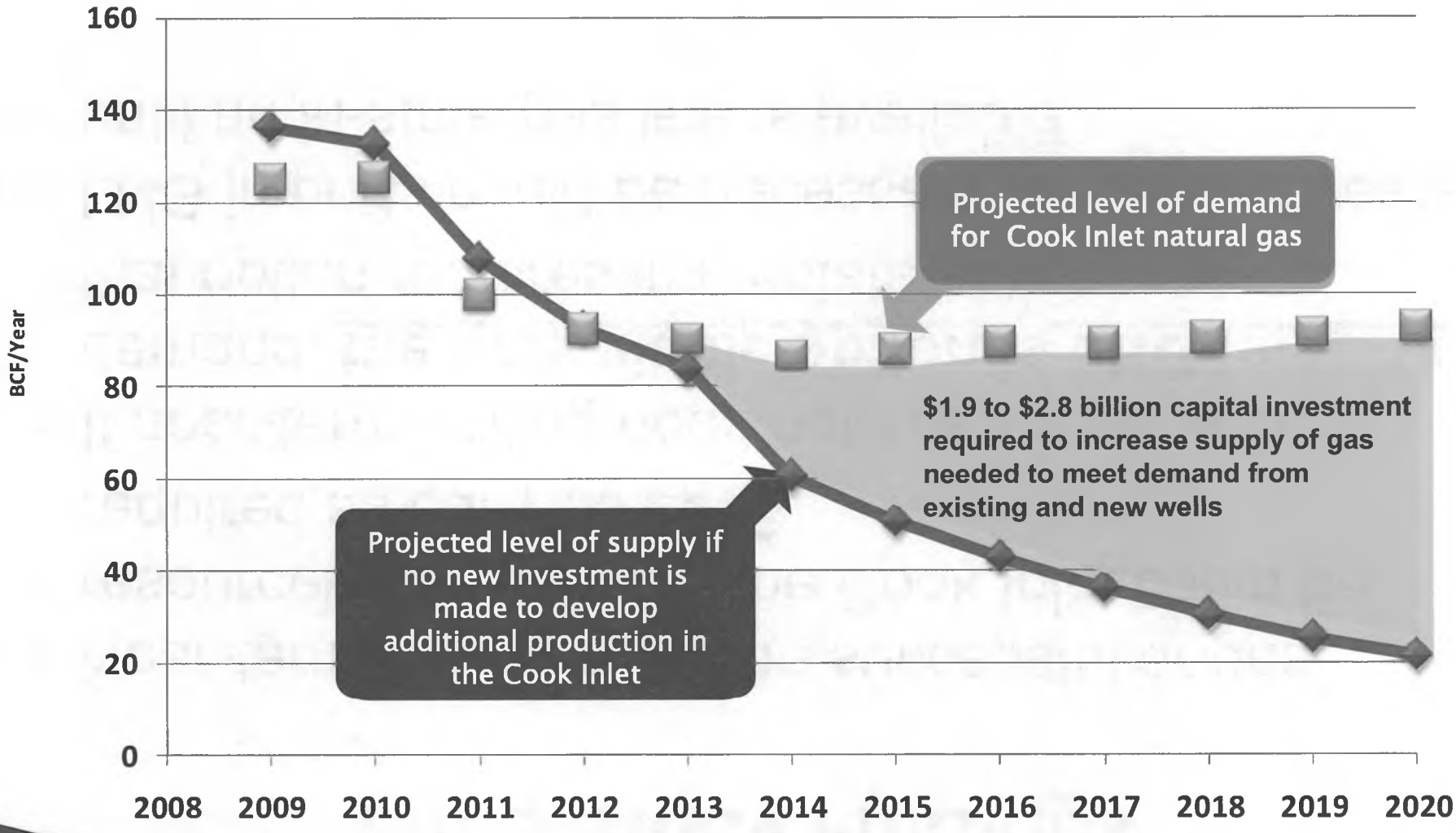
Gas Development Cost

- The estimated cost of drilling & development in the past decade was $1.0 – $1.2 billion
- The estimated cost of drilling & development to meet demand in the coming decade is $1.9 - $2.8 billion
- Higher production costs will lead to higher prices for energy

2009 Study Findings

- Near-term drilling **must** be successful or gas resources from outside the Cook Inlet could be required as early as 2013
- If near-term drilling does not keep pace with demand, **the only viable option is LNG imports**; that option requires immediate action
- LNG imports could be necessary for several years until an in-state gas line is available

2009 Summary



DNR 2011 CI Gas Cost Study

- CI Basin, with investment, is capable of meeting needs until 2018-2020 at prices below available alternatives
- Failure to make investments in lockstep with demand will result in need of alternative sources sooner.

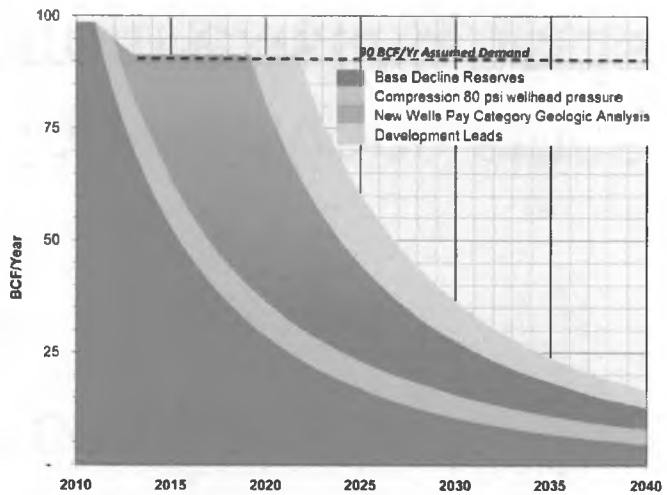


Figure 7. Hypothetical production forecasts resulting from this study for the Cook Inlet basin assuming a constant 90 BCF/Year demand after 2011. Production from future resource wedges could begin in any year. The projected "pay" volumes (green wedge) for this study are greater than that of the 2009 study (Figure 2) due to an error resulting in the understatement of McArthur River Grayling Gas Sands new well pay reserves potential. This error is corrected in this Figure.

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2012 Update

- PRA was asked by CI Utilities to Update the 2009 Study to make a current estimate of supply from existing Cook Inlet Fields for comparison to the current CI Demand Forecast.

- Due to drilling and compression additions since 2009, the predicted shortfall from existing fields has changed from 2013 to 2014.

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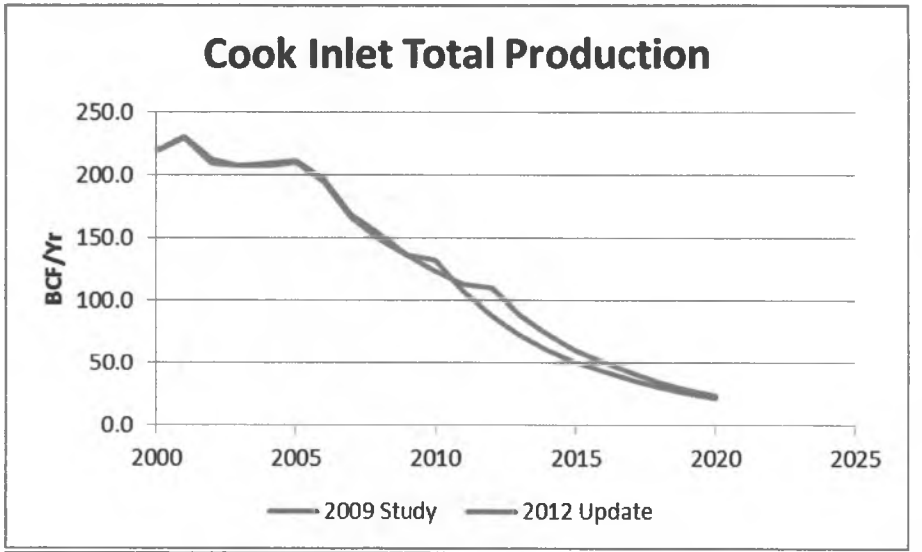
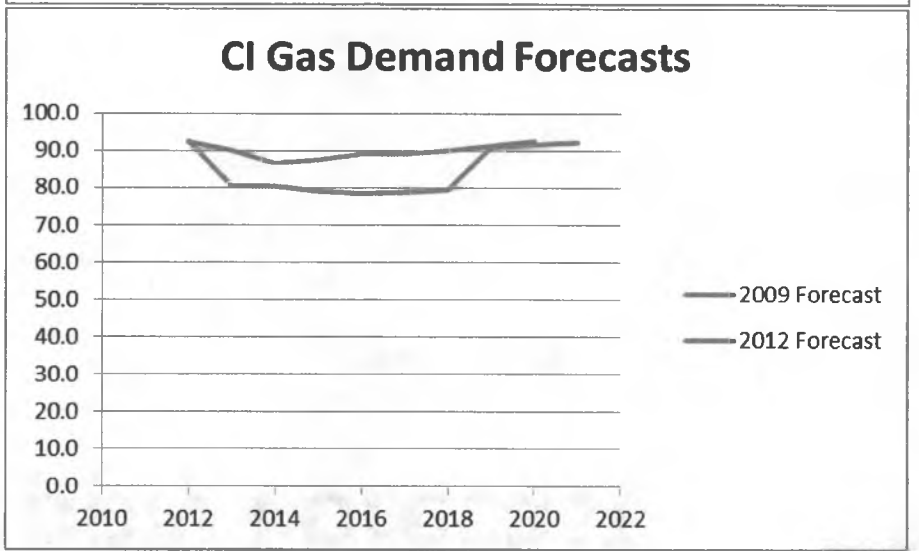
Forecast Changes since 2009 Study

- Supply Forecast is slightly higher than 2009
  - New wells and field compression added
- Generally, Demand Forecast is slightly lower than 2009 except
  - LNG Export 2012
  - Donlin Creek in 2019

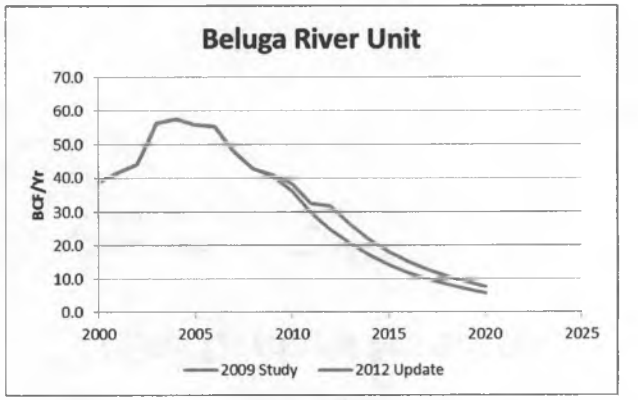


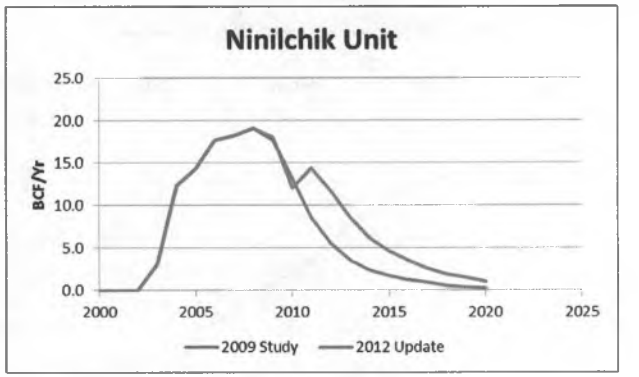


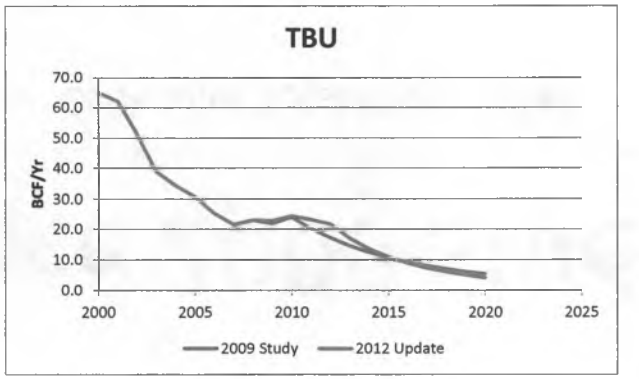
Changes in Supply Forecast

Material increases were in performance in wells mainly in the Beluga River, Trading Bay and Ninilchik Units

- Beluga River
  - Compression
  - 2 redrills
- Ninilchik
  - Compression
  - 2 new wells
- TBU
  - 4 new wells







2009-2011 Drilling Activity and Production Adds

Period	# New Completions	Production Rate Added MMSCF/D
Nov-09 to Oct-10	5	18.5
Nov-10 to Oct-11	6	9.9

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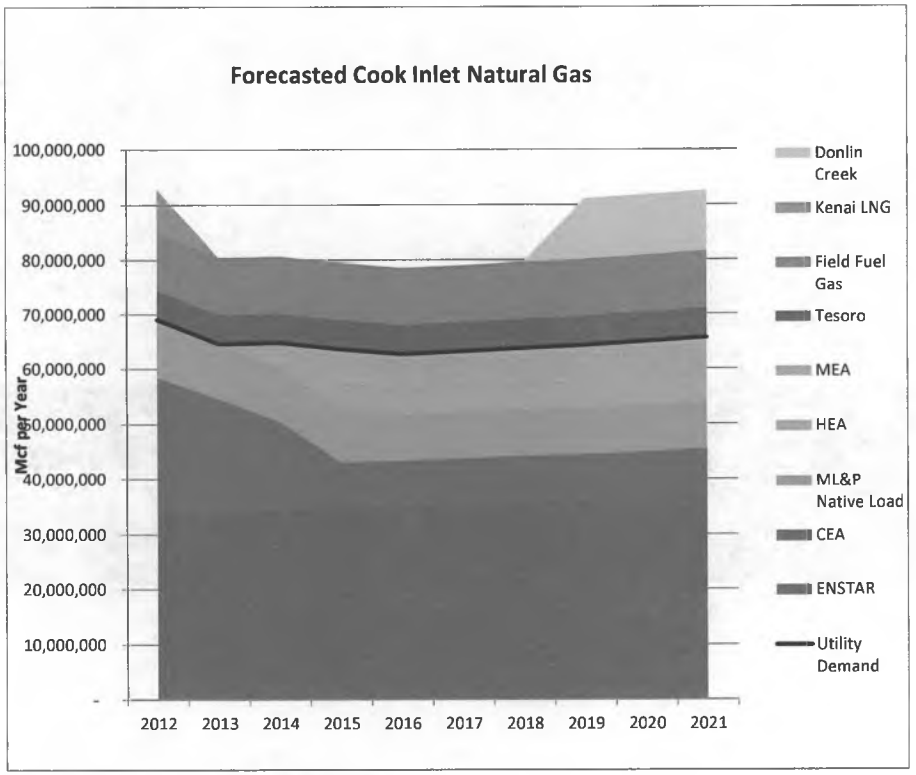
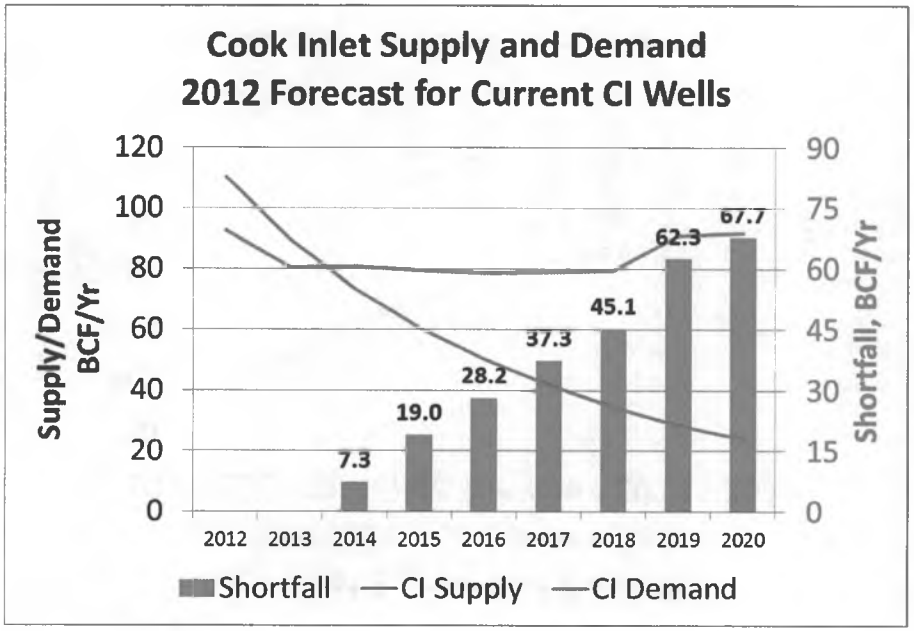
2012 Forecasted CI Demand

- LNG: 3-4 Cargos expected in 2012
- CEA new plant
- HEA and MEA will start contracting for needs (formerly under CEA)
- Field Fuel & Flare 10.5 BCF/year
- Donlin Creek startup 2019



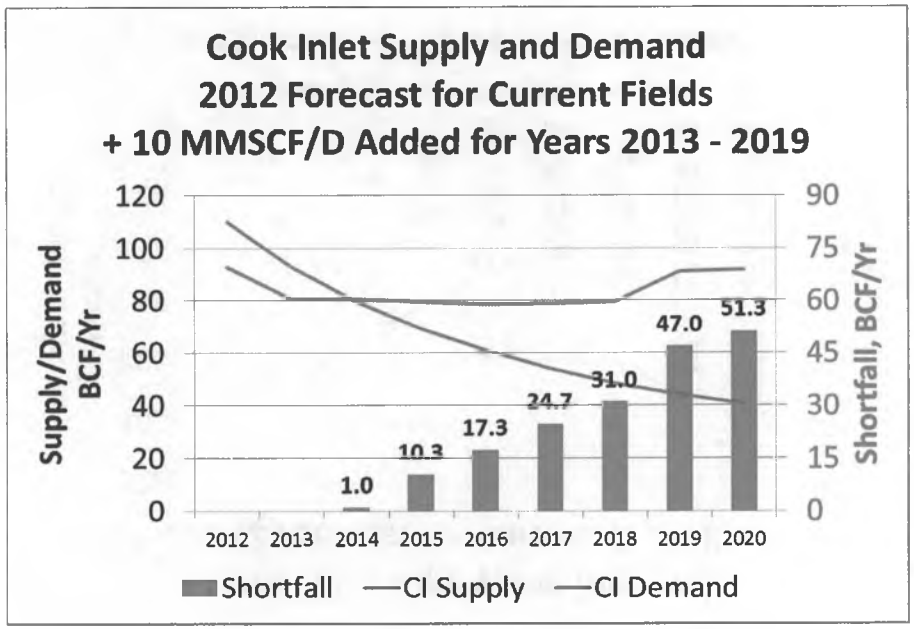
Supply/Demand and Shortfall

- With supply forecast from Annual Average production of existing CI wells, shortfall predicted to occur in 2014



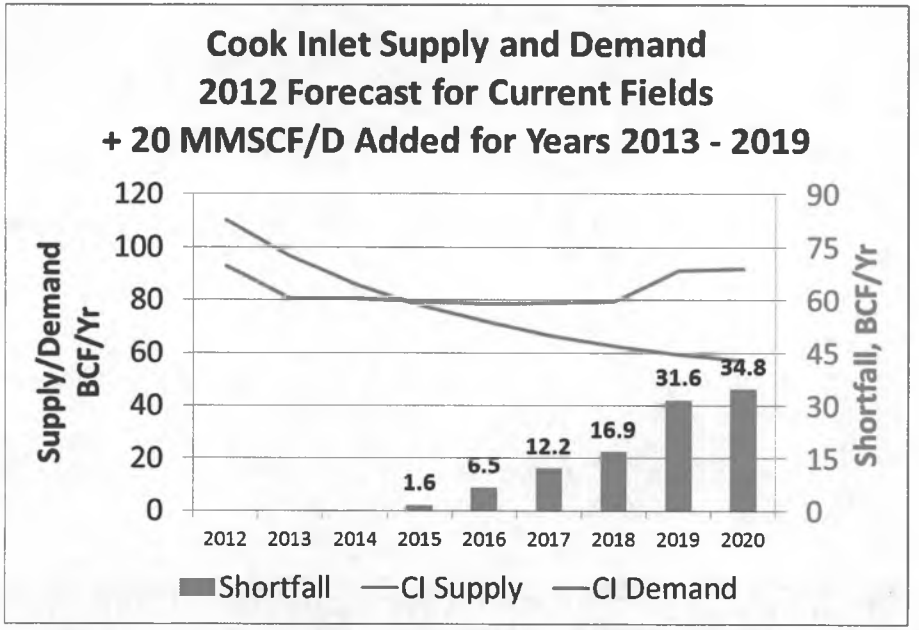
Sensitivity: Current Fields plus 3–4 New Wells Per year going forward

Assuming 3-4 new wells are drilled each year resulting in 10 MMSCF/D of new production added each year from 2012-2019, there still is a shortfall in supply in 2014



Sensitivity: Current Fields plus 6-8 New Wells Per year going forward

Assuming 6-8 new wells are drilled each year resulting in 20 MMSCF/D of new production added each year from 2012-2019, the shortfall in supply occurs in 2015



Summary of CI Shortfall Cases

Case	Initial Year of Shortfall	Initial Year Shortfall Amount, BCF
Existing CI Fields	2014	7.3
Existing Fields + Annual Addition of 10 MMSCF/D Production from New Wells 2013–2019	2014	1.0
Existing Fields + Annual Addition of 20 MMSCF/D Production from New Wells 2013–2019	2015	1.6

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Conclusion

- Absent major new large discoveries that can be brought online in 1-2 years, the current pace of development will mean a shortfall in Cook Inlet supply to meet demand in 2014 or 2015.

Questions?

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