



WHERE ARE NATURAL GAS MARKETS HEADED IN THE 21ST CENTURY?

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Western States CMM Conference

Presented by:

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Advanced Resources International, Inc.

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BACKGROUND

The U.S. natural gas market is in “turmoil.”

PAST

Decade of stability with low wellhead prices and surplus capacity.

PRESENT

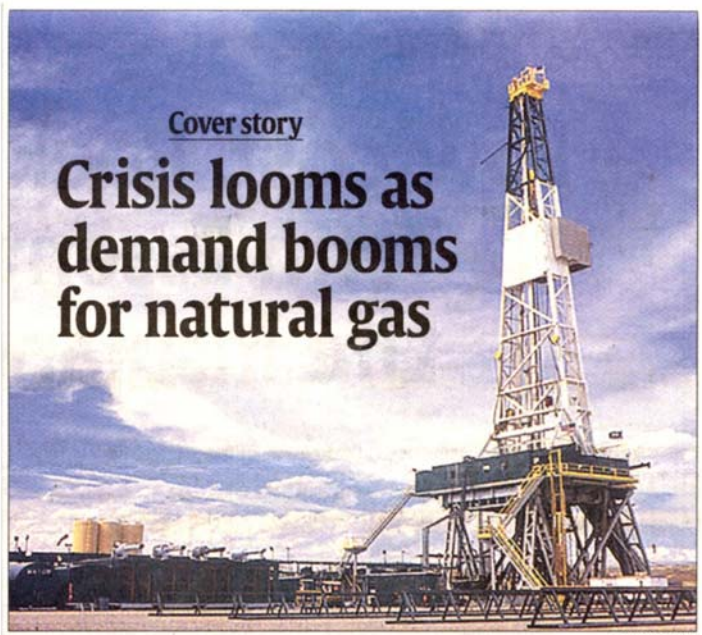
Growing demand, market tightness and extreme price volatility.

FUTURE

Controversies and uncertainties on underlying “trends.”

- *Will demand continue to grow at recent historic pace?*
- *Why has natural gas production not responded to increased drilling?*
- *Why are the majors abandoning domestic E&P?*
- *Are we “running out” of resources and quality prospects?*





Cover story

Crisis looms as demand booms for natural gas

Grey Wolf Drilling

Well, well: A crew used the largest land-drilling rig in the USA to drill the Bighorn 8-35 in Wyoming. A typical gas well goes about 11,000 feet deep. Bighorn went to 25,018 feet and will cost about \$35 million.

Production falls as it gets hard to get popular fuel

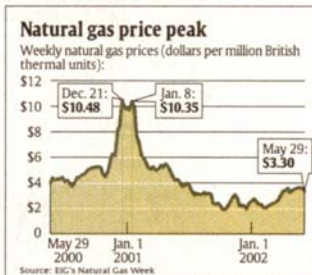
By George Hager
USA TODAY

LYSITE, Wyo. — What looks odd in this tiny town in the middle of Wyoming's vast Wind River Basin is all the windsocks. There's no operating airport here, so why all the fluorescent orange wind-direction indicators?

It turns out that Burlington Resources wants you to know where upwind is at any given moment, because that's where you need to go — and fast — if there's a hydrogen sulfide leak from any of the six ultra-deep natural gas wells Burlington and others have drilled near here into the nearly 5-mile-deep bedrock that holds one of the most prolific gas fields in the USA.

Along with prodigious quantities of natural gas, what boils up out of the wells' specially made, high-alloy tubing is 126,000 parts per million of hydrogen sulfide, which can quickly kill you in concentrations of as little as 500-1,000 parts per million. Each visitor gets a mandatory safety lecture and a portable tank of emergency air.

With U.S. production in inexorable decline, producers are increasingly turning to exotic wells like this one to try to keep up with Americans' burgeoning demand for natural gas. Gas burns much



By Marcy E. Mullins, USA TODAY

more cleanly than coal and, after any hydrogen sulfide has been stripped out of deep-well gas and turned into sulfur, it carries few of the safety worries that come with nuclear power.

That makes it a premium, environmentally benign and increasingly popular fuel for homes, factories and electric utilities. Most new electrical generating plants are designed to burn gas, and 55% of American homes use it for heating or cooking, according to the American Gas Association.

But while public worry tends to focus on sup-

Please see COVER STORY next page ▶

The Shaping of Public Perceptions and Policy

- Views on the natural gas market outlook are shaped by the press, financial community, and special interests.
- Public policy and future gas prices are heavily influenced by these perceptions.
- Today's perception is that gas is an environmentally premium fuel, in short supply.



UNDERSTANDING THE FORCES OF CHANGE

Numerous studies and forums have sought to gain a better handle on the “*turmoil and trends*” for U.S. natural gas markets:

- NRC Workshop, “Looking Toward the Future” (Apr, 2003)
- NPC Study, “Balancing Natural Gas Policy (Sep, 2003)
- CERA, “The Worst is Yet to Come” (Spring, 2004)





SUMMARY OF A WORKSHOP ON
U.S. NATURAL GAS
DEMAND, SUPPLY, AND
TECHNOLOGY

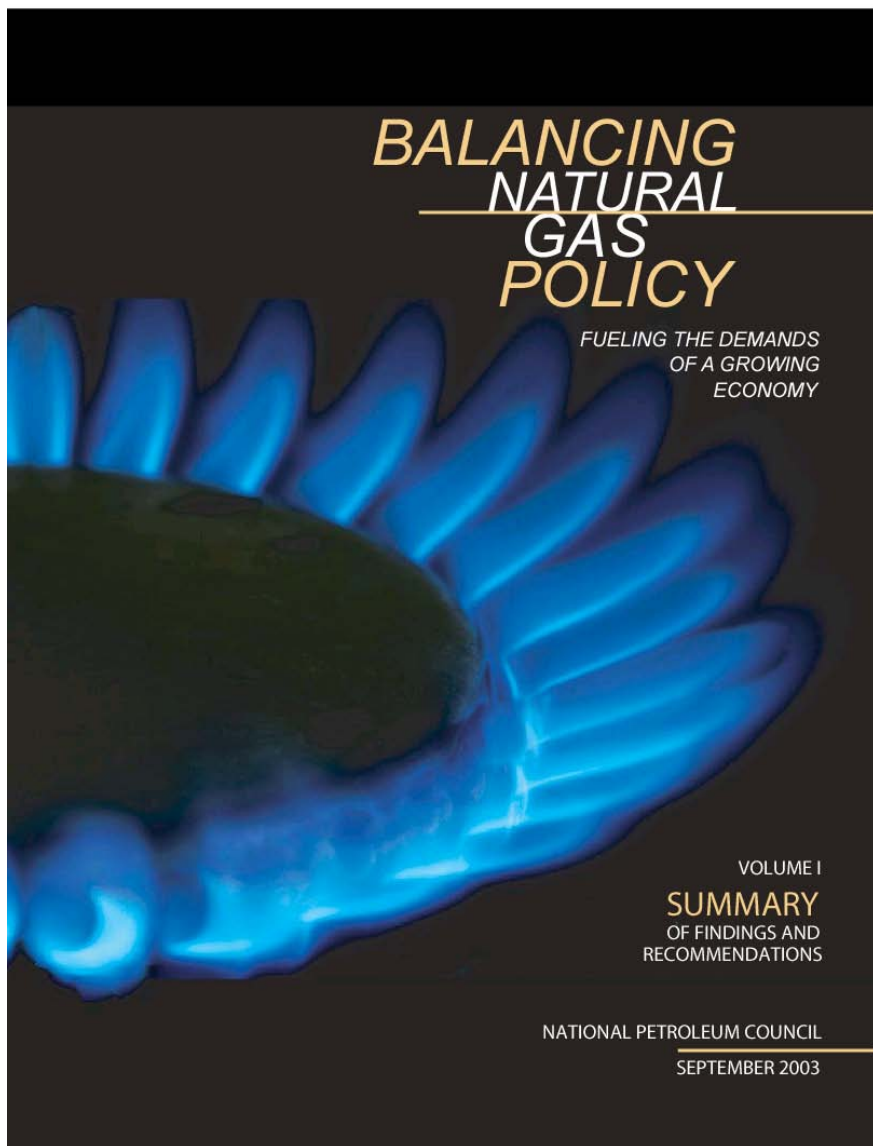
LOOKING TOWARD
THE FUTURE

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

KEY MESSAGES

- Gas demand will increase by 40% to 50%, to 32 Tcf by 2020.
- Substantial domestic natural gas resource base of 1,289 Tcf.
- Rate of technology progress critical for the outlook and future cost (price) of gas supply.
- Sharp decline in public and private sector funding for oil and gas R&D puts technology progress at risk.





KEY MESSAGES

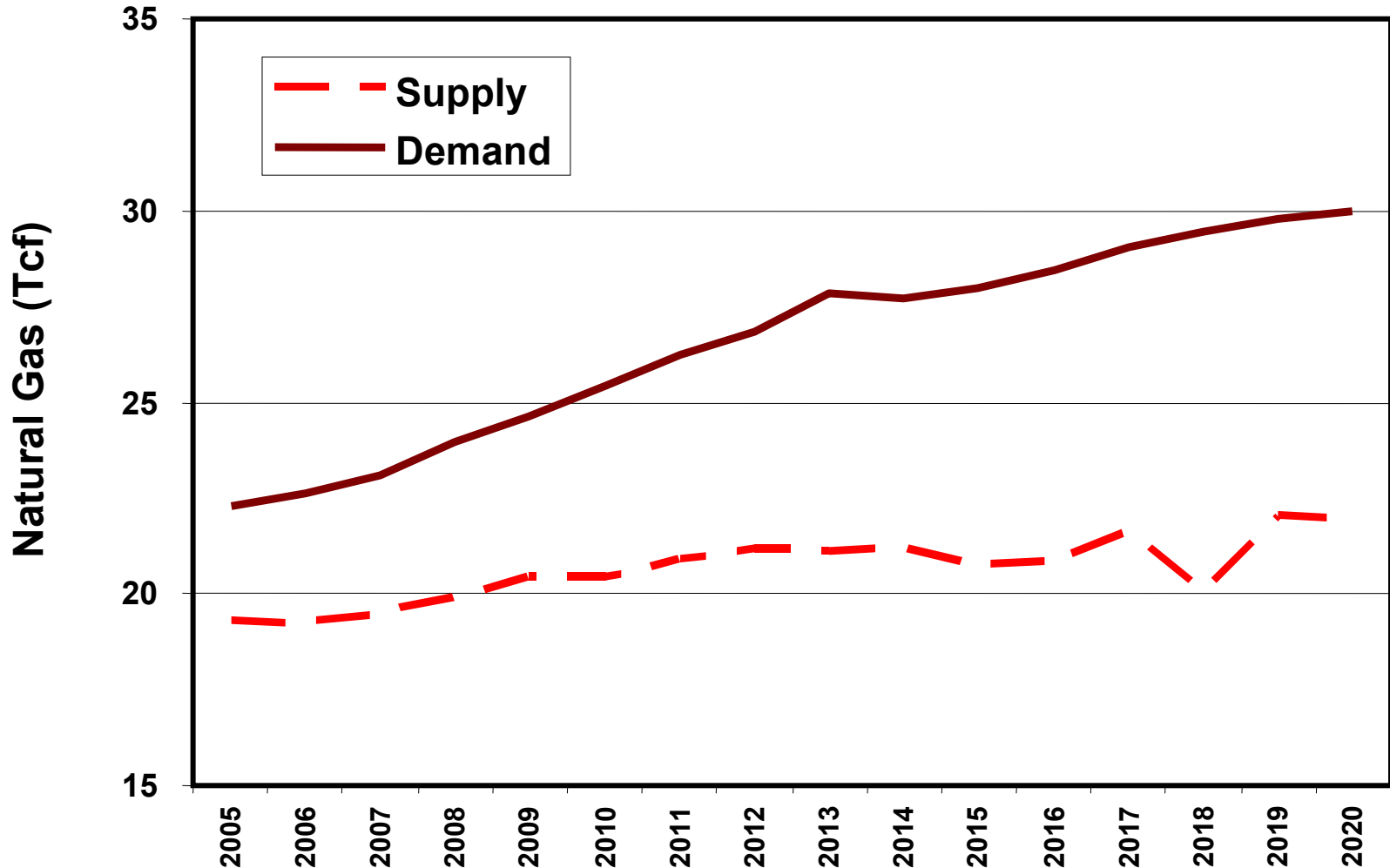
- Gas consumption will grow, but growth will be moderated as the most price-sensitive industries become less competitive
- Significant U.S. natural gas resource base of 1,450 Tcf; advances in E&P technology could add 440 Tcf in the next 25 years.
- Natural gas production from the lower-48 could grow by 4 Bcfd in the next ten years.
- This outlook reflects the NPC's "Balanced Future" Scenario which requires significant policy actions and technology advances.
- The NPC's "Reactive Path" Scenario would lead to a much more pessimistic outlook.

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LNG IS EXPECTED TO MEET AN INCREASING GAP BETWEEN GAS SUPPLY AND GAS DEMAND



Source: EIA



TWO POINTS OF VIEW FOR THE ABILITY OF DOMESTIC SUPPLIES TO RESPOND TO GROWING DEMAND

"TERMINAL DECLINE"

- No production response to "record" gas well drilling.
- Exit of majors from U.S. onshore.
- Poor results from conventional gas exploration.
- Replacement costs are increasing.

"RECOVERY & REBOUND"

- Proved reserves are up; change in mix of reserves.
- Growth of large, gas oriented independents.
- Increase in unconventional gas production.
- Drilling and completion are becoming more efficient.



TURMOIL AND TRENDS

Trend #1. Domestic natural gas drilling has been increasing while productive capacity has remained flat.

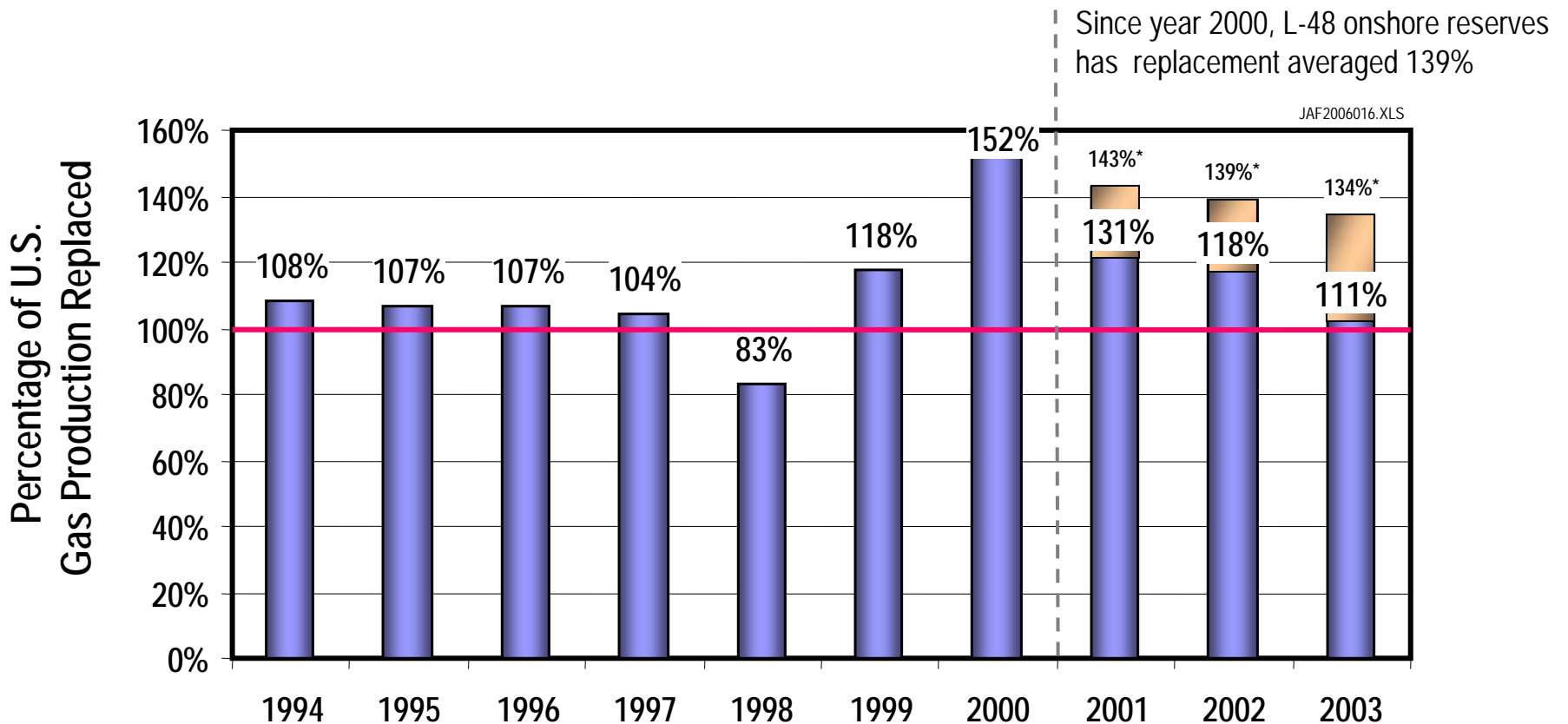
Trend #2. Unconventional gas (also called resource plays) increasingly dominates U.S. natural gas supplies.

Trend #3. Domestic natural gas supplies are becoming increasingly the domain of independents.

Trend #4. More efficient drilling and stimulation practices are holding down replacement costs.



NATURAL GAS RESERVES REPLACEMENT, 1994-2003



*Lower -48-Onshore (includes state waters)

Source: U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1994 through 2003 annual reports, DOE/EIA-0216.



SHIFT TOWARD LOWER DEPLETING (LOWER PRODUCTIVE-CAPACITY) RESERVES

Increase in Slower Depleting Reserves

(Coalbed Methane)

Year	BOY Reserves	Production
	(Tcf)	(Bcfd)
2000	13.2	3.8
2004	18.7	4.5(e)
Change 2000-2004	+5.5	+0.7

Decrease in Highly Depleting Reserves

(Gulf of Mexico Federal Offshore)

Year	BOY Reserves	Production
	(Tcf)	(Bcfd)
2000	25.5	13.1
2004	22.1	11.4
Change 2000-2004	-3.4	-1.7

New CBM reserves have more than replaced GOM reserves, but productive capacity has dropped by 1 Bcfd.



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ESTIMATE OF TECHNICALLY RECOVERABLE UNCONVENTIONAL GAS RESOURCES

Advanced Resources assessment of the size and performance of 84 unconventional gas plays in 39 U.S. basins shows a large remaining resource base.

	Advanced Resources (2004) (Tcf)	National Petroleum Council (2003)* (Tcf)
Tight Gas Sands	377	189
Coalbed Methane	81	58
Gas Shales	78	35
TOTAL	536	282

*Based largely on USGS resources estimates, as modified by NPC study.



EIGHT OF THE TOP TWELVE U.S. NATURAL GAS FIELDS ARE UNCONVENTIONAL GAS FIELDS

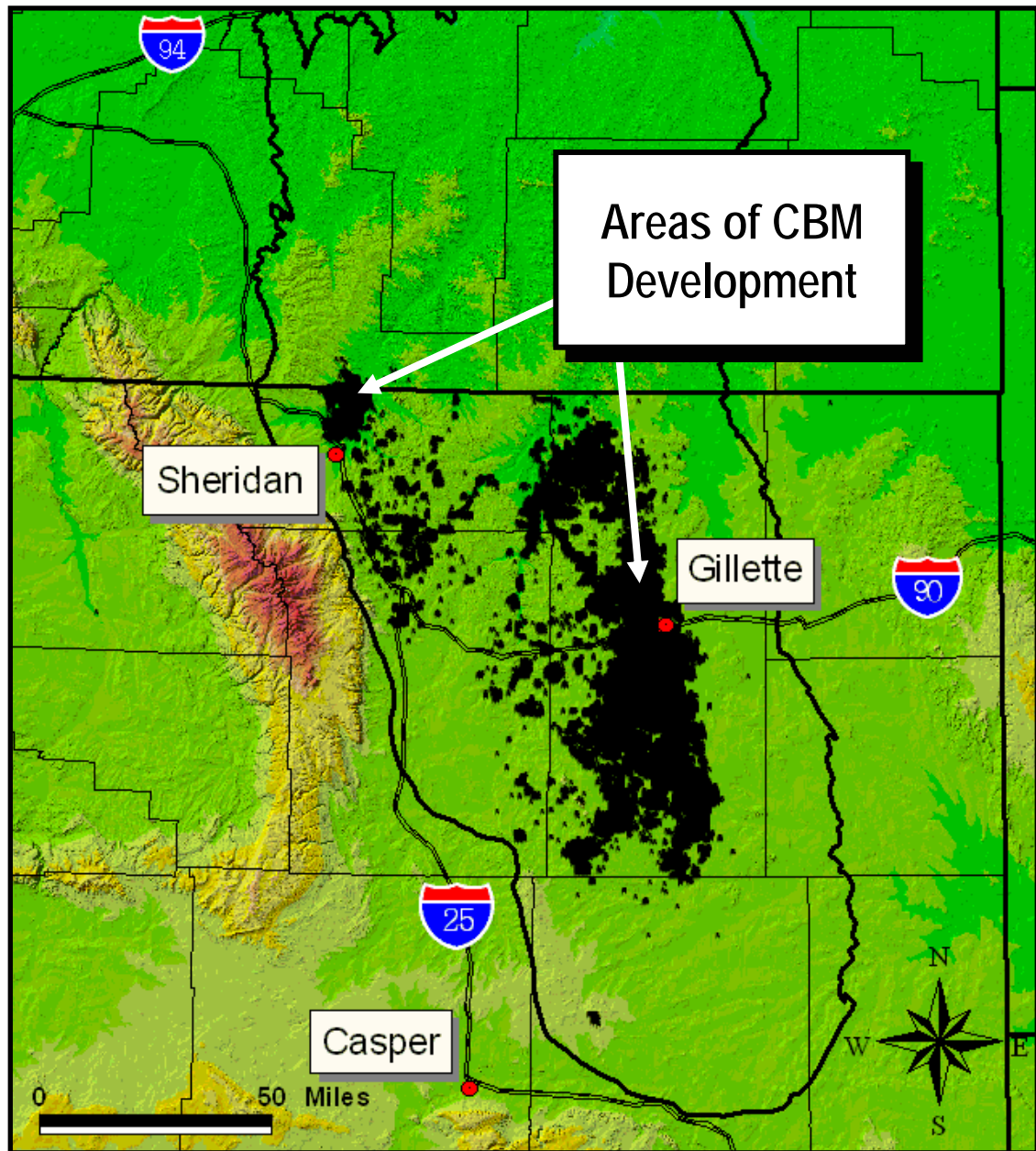
Rank (in 2002)	Field Name	Basin/State	Type of Resource	Year 2002 Production (Bcfd)	Year 2003 Production (Bcfd)
1	San Juan Gas Area	San Juan, NM/CO	CBM/Tight Gas Sands	3.9	4.1
3	Newark East	Ft. Worth, TX	Gas Shale	0.6	0.8
4	Wyodak/Big George	Powder River, WY	CBM	0.9	0.8
5	Jonah	GGRB, WY	Tight Gas Sands	0.6	0.7
7	Wattenberg/DJ Basin	Denver, CO	Tight Gas Sands	0.5	0.5
9	Carthage	East Texas, TX	Tight Gas Sands	0.5	0.5
10	Antrim	Michigan, MI	Gas Shale	0.5	0.4
11	S. Piceance Gas Area*	Piceance, CO	Tight Gas Sands/CBM	0.3	0.4

*Includes Mamm Creek, Rulison, and Grand Valley/Parachute.

Note: Fourteen of the twenty largest gas fields, based on proved reserves, hold unconventional or high CO2 gas.

Sources: EIA 2002/2003 Annual Reserve Reports, Advanced Resources Data Base.



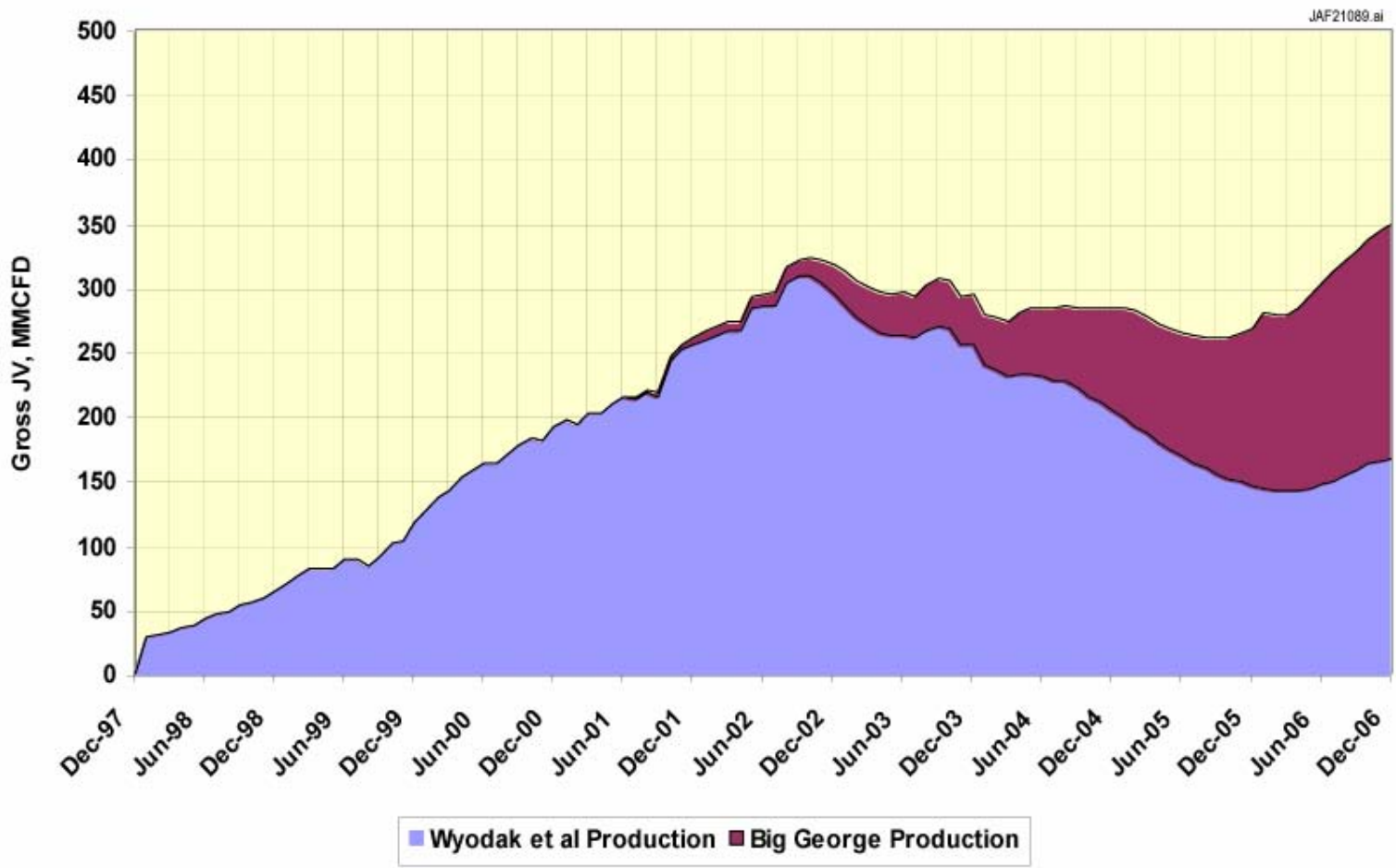


POWDER RIVER BASIN

- Currently producing at 1 Bcfd, up 20 fold from five years ago.
- Over 10,700 producing CBM wells.
- Play expanding to deeper area of basin.
- Multi-seam technology essential
 - 50% + increase in economic recovery potential



WILLIAMS' PRB CBM PRODUCTION



Source: Williams



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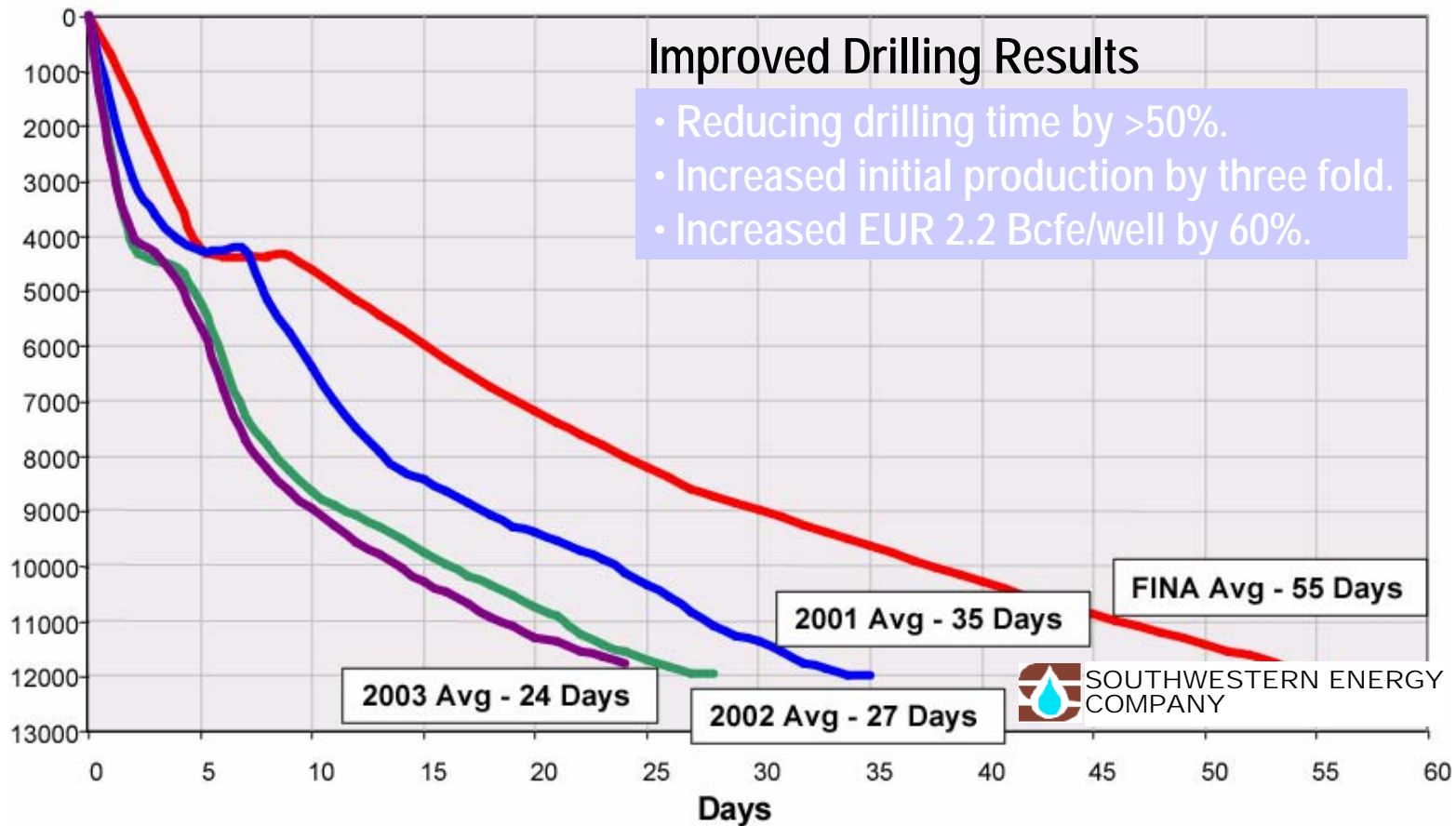
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OVERTON FIELD, EAST TEXAS (COTTON VALLEY TIGHT GAS SANDS)

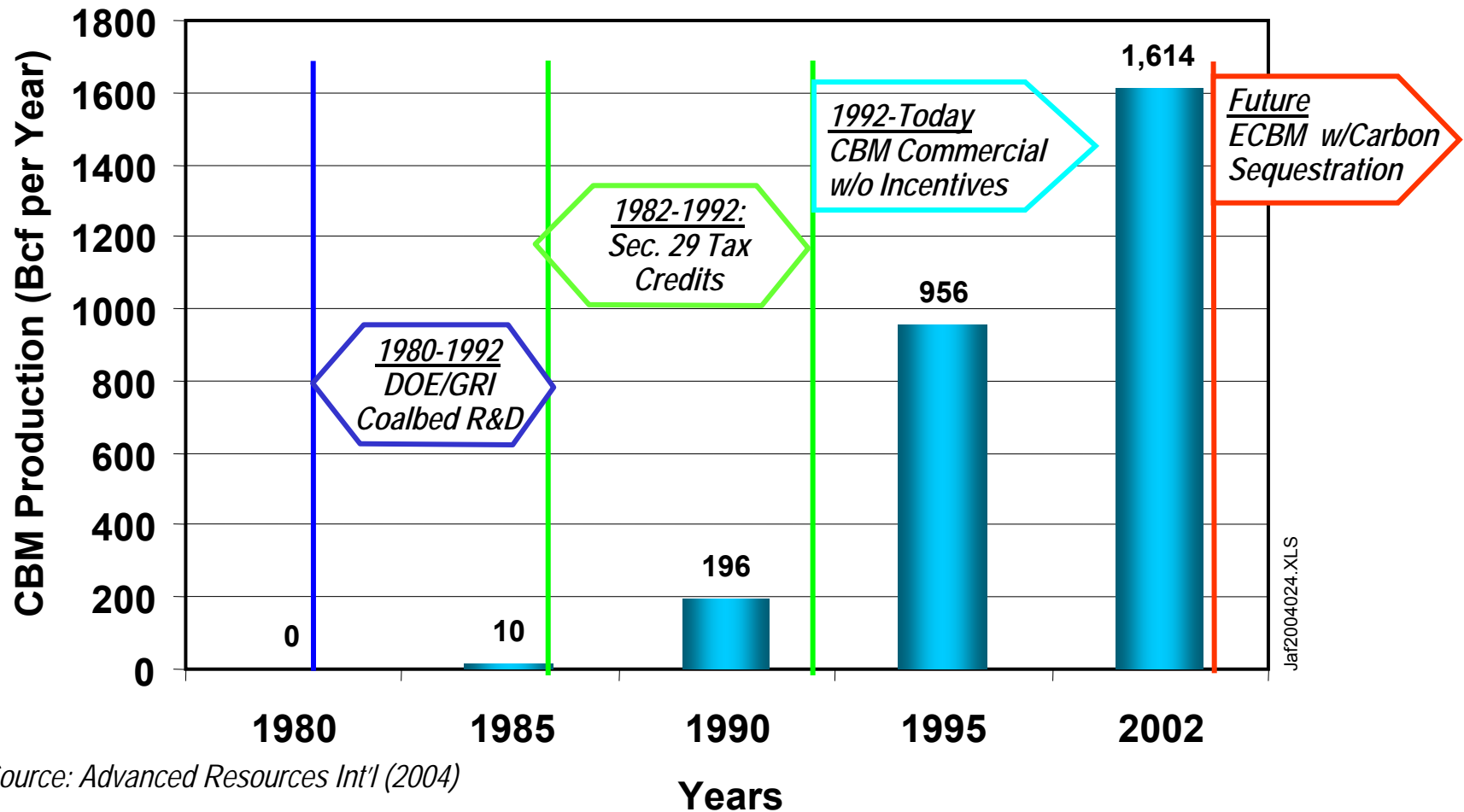


Developing Potential U.S. Gas Supplies: *Public Policy Can Play Key Role*

- Technological advances
- Financial incentives
- Environmental requirements
- Safety and health regulations
- Adequate infrastructure



R&D and Performance Based Incentives Launched the Coalbed Methane Play





Closing Observations



- **Potential future U.S. gas markets remain uncertain**
 - Examination of recent trends leads to mixed reviews
- **Realizing U.S. supply potential requires action by industry and government**
 - Investment in and demonstration of new knowledge and technology
 - Industry pursuit of more challenging resources
 - Greater industry risk tolerance
 - Supportive government policies
- **Coal mine methane can play an important role**



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