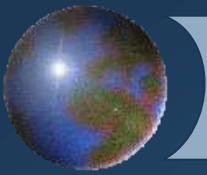


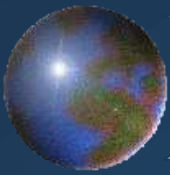
The Niobrara: Who, What and Where

Peggy Williams
Director, Unconventional Resources
Hart Energy Publishing

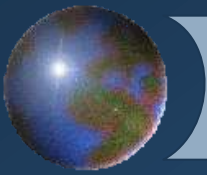


Who: A Host of Companies

- ✦ Abraxas Petroleum
- ✦ Anadarko Petroleum Corp.
- ✦ Ballard Petroleum
- ✦ Bear Oil & Gas
- ✦ Bill Barrett Corp.
- ✦ Black Hill Exploration
- ✦ Bonanza Creek Energy Operating Co. LLC
- ✦ Carrizo Oil & Gas Inc.
- ✦ Chesapeake Energy Corp.
- ✦ Chevron Corp.
- ✦ Cirque Resources
- ✦ Comet Ridge Resources LLC
- ✦ Continental Resources Co.
- ✦ Crimson Exploration Inc.
- ✦ Cypress Drilling LLC / Cypress Production
- ✦ Delta Petroleum Corp.
- ✦ Diversified Operating Corp.
- ✦ Double Eagle
- ✦ Duncan Oil
- ✦ East Resources Inc.
- ✦ Encana Corp.
- ✦ Energas Resources Inc.
- ✦ Entek Energy
- ✦ EOG Resources Inc.
- ✦ Fidelity Exploration & Production Co./MDU Resources
- ✦ Helis Oil & Gas Co.

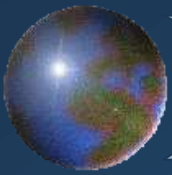


- ✦ Jonah Gas Co.
- ✦ Julander Energy Co.
- ✦ Laramie Energy
- ✦ Mountain Production Corp. / Mountain Energy LLC
- ✦ New Frontier Energy Inc.
- ✦ Noble Energy, Inc.
- ✦ North Finn LLC
- ✦ PDC Energy
- ✦ Petroquest
- ✦ Pine Ridge Oil & Gas
- ✦ Quicksilver Resources Inc.
- ✦ QEP
- ✦ Resolute Energy Corp.
- ✦ Retamco Operating Inc.
- ✦ Rex Energy Corporation
- ✦ Rose Exploration Associates
- ✦ Rosetta Resources Inc.
- ✦ Rubicon Oil & Gas
- ✦ MBI Oil & Gas
- ✦ Running Foxes/Night Hawk
- ✦ Samson Oil & Gas Ltd.
- ✦ Simray Production
- ✦ Slawson Exploration Co.
- ✦ SM Energy
- ✦ Sundance
- ✦ Synergy Resources Corp.
- ✦ Texas American Resources
- ✦ Warren Resources Inc
- ✦ Wellstar Energy Corp.
- ✦ Whiting Petroleum Corp.
- ✦ Williams Production RMT Co.
- ✦ Wiepking Fullerton Energy
- ✦ Yates Petroleum Corp.



Selected Acreage Positions by Operator

◆ Noble Energy:	750,000
◆ Encana Corp:	600,000
◆ Anadarko Petroleum:	500,000
◆ Chesapeake Energy:	400,000
◆ Cirque Resources:	400,000
◆ EOG Resources:	400,000
◆ Fidelity E&P:	80,000
◆ PDC Energy:	70,500
◆ Carrizo Oil & Gas:	58,000
◆ Rex Energy:	39,100
◆ SM Energy:	25,000

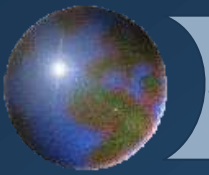


What: The Niobrara



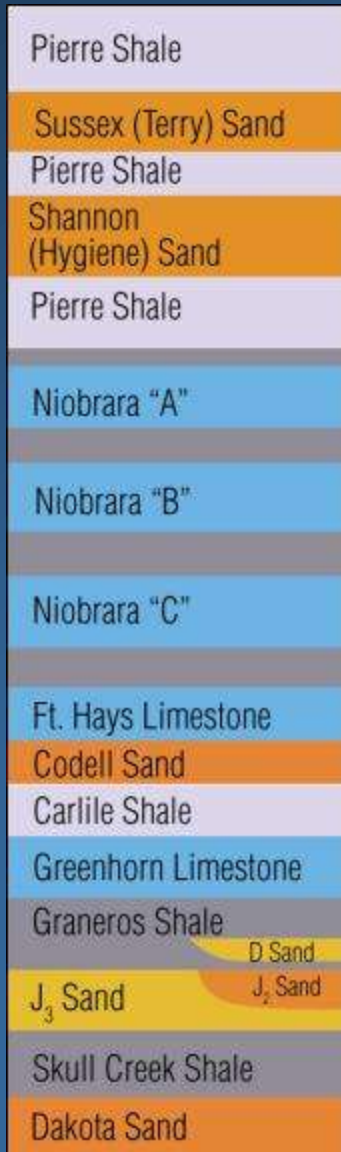
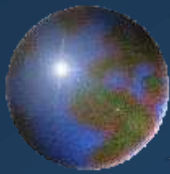
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A cyclist cruises past a Niobrara outcrop along Colorado Highway 7, north of Boulder.



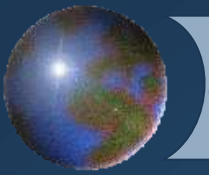
Niobrara Characteristics

Age:	Upper Cretaceous
Depth:	4,000-11,000 ft.
Thickness:	150 to 1,500 ft. (280-330 ft. in DJ Basin)
TOC:	up to 10%
Porosity:	8% to 14%
Pressure:	0.55 psi/ft. to normal
Lithology:	shale/marl/chalk/limestone
OOIP:	20- to 30 Million bo/section



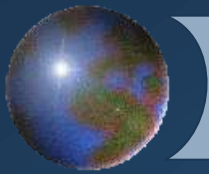
Niobrara Stratigraphy, DJ Basin

Historical vertical Niobrara production is from A, B and C chalk intervals, which are 20 to 40 feet thick.

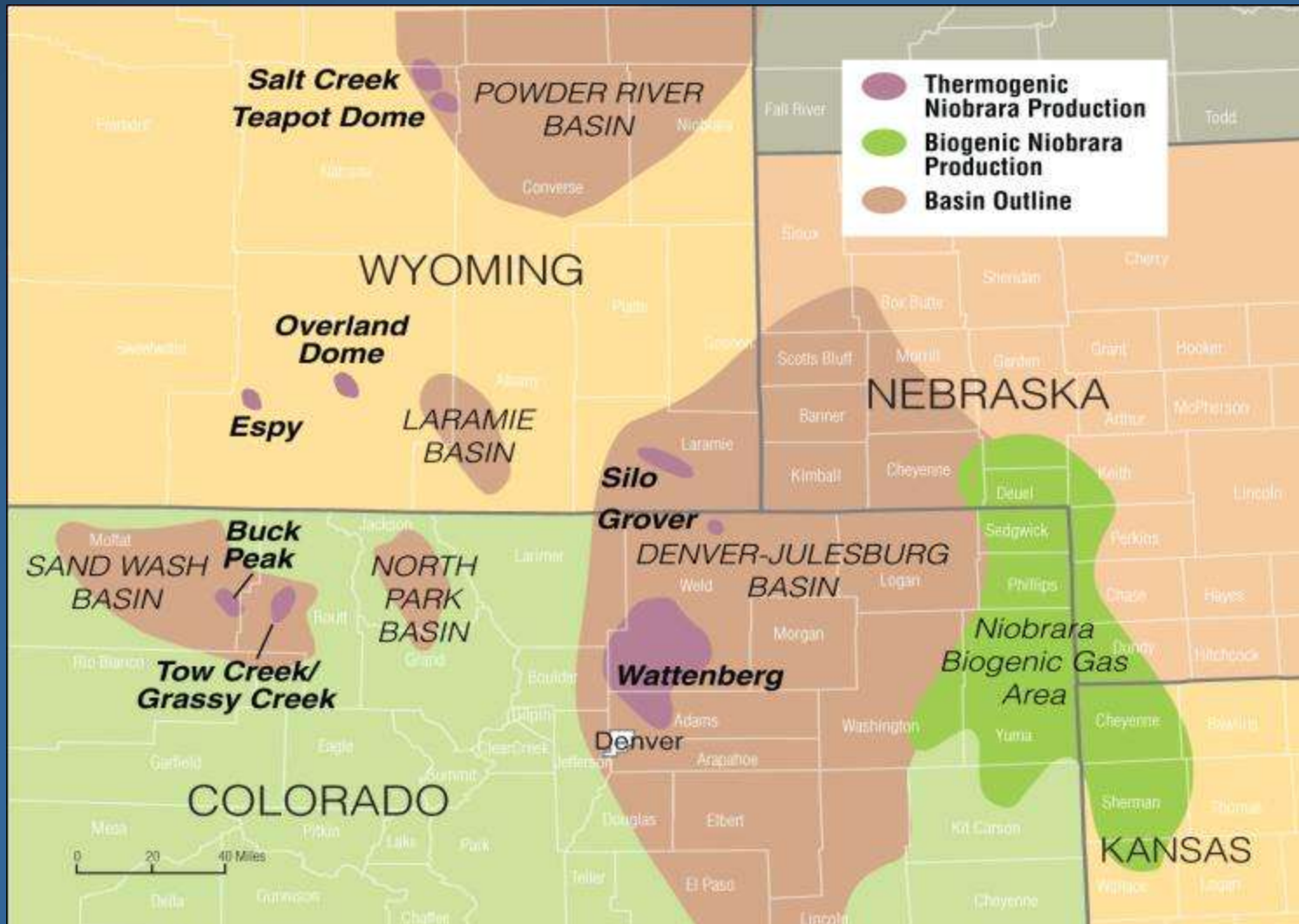


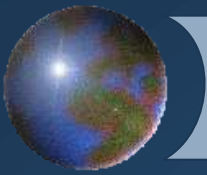
A Formation of Many Faces

- ❖ Produces biogenic gas in NE CO
- ❖ Produces thermogenic gas and condensate in Wattenberg Field, Weld Co., CO
- ❖ Produces oil from fractured areas, such as Silo Field, Laramie Co., WY

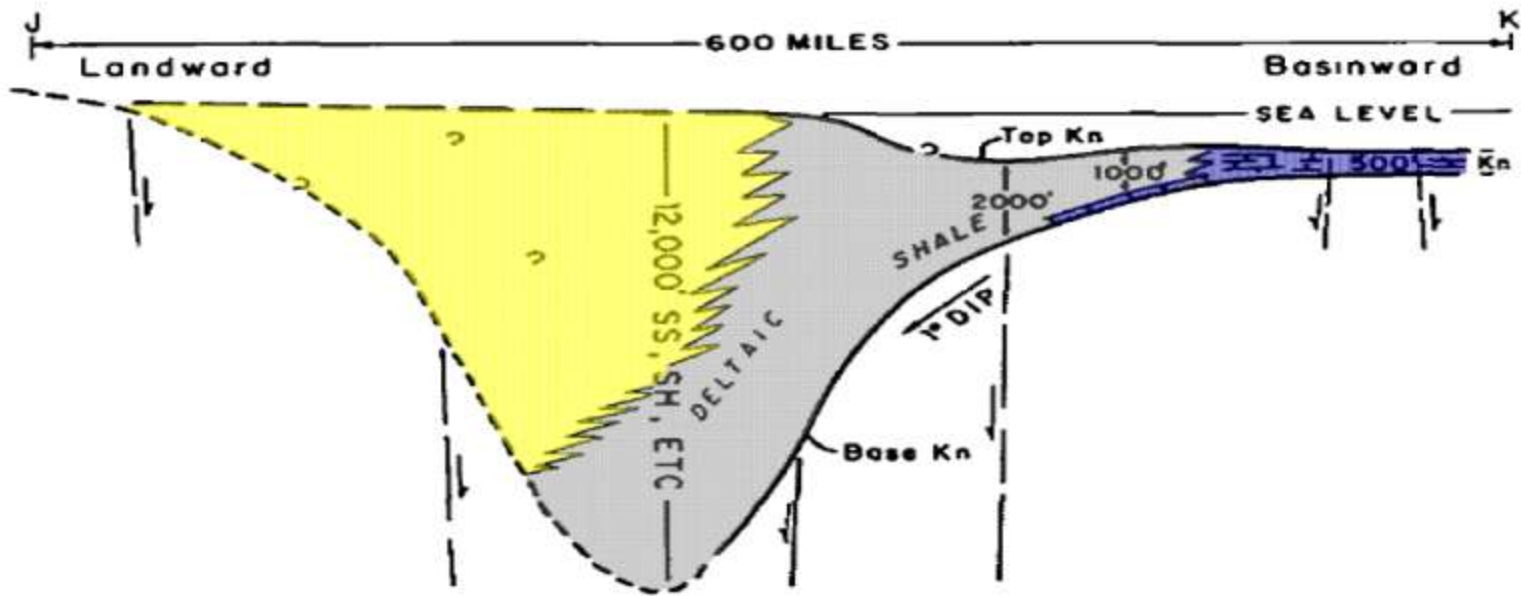


Where: Eastern Rockies Basins



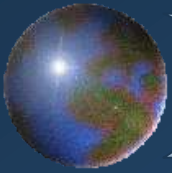


Mancos-Niobrara Relationship



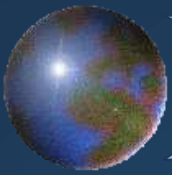
Generalized west-east cross section restored to top Niobrara, showing facies changes in Niobrara and equivalent strata.

from Weimer, 1978



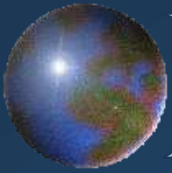
Early Exploration

- ❊ Rangely Field in NW CO.
 - ❊ Discovered in 1901; produced in excess of 4.5 million bo from Mancos at depths of 500 to 1,700 ft. Fractures were created by bending and arching of Rangely Anticline.
- ❊ Other Niobrara producing fields include Teapot Dome, Salt Creek Field, Buck Peak Field, Silo Field.



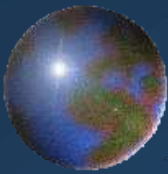
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Noble Energy is at work fracturing its #37 Dillard USX AB, a vertical Codell/Niobrara well in Wattenberg Field. Colorado's Front Range juts up in the distance.

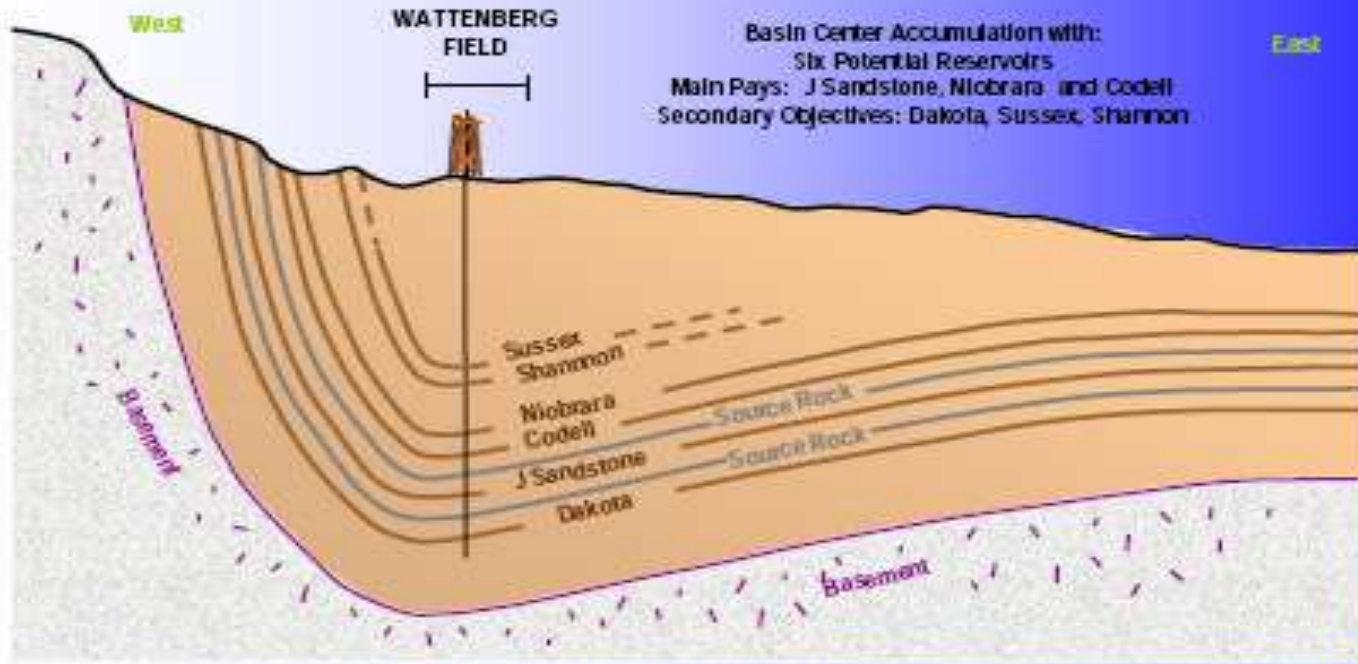


Wattenberg Field

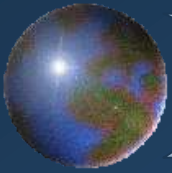
- Field production 4.2 Tcfe cumulative
- More than 10,000 wells penetrate Niobrara
- Most Niobrara production has been from comingled wells with Codell
- Typical vertical Codell/Niobrara well costs \$650,000 and recovers 40,000 Boe (~60% gas)



Wattenberg Field Structure

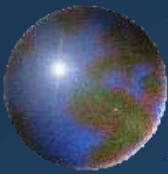


Source: Encana Corp.



Unique Thermal History

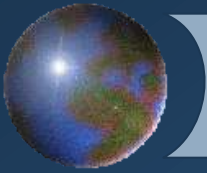
- ❖ Wattenberg is located where Colorado Mineral Belt intersects the basin
- ❖ Niobrara GORs are 20,000 to 30,000 cu. ft./bbl. in Wattenberg
- ❖ GORs are 1,000 cu. ft./bbl. north of Wattenberg



Rig hands make a connection on Noble Energy's #13-99Hz Gallegos well, drilled in the promising Grover Field area.

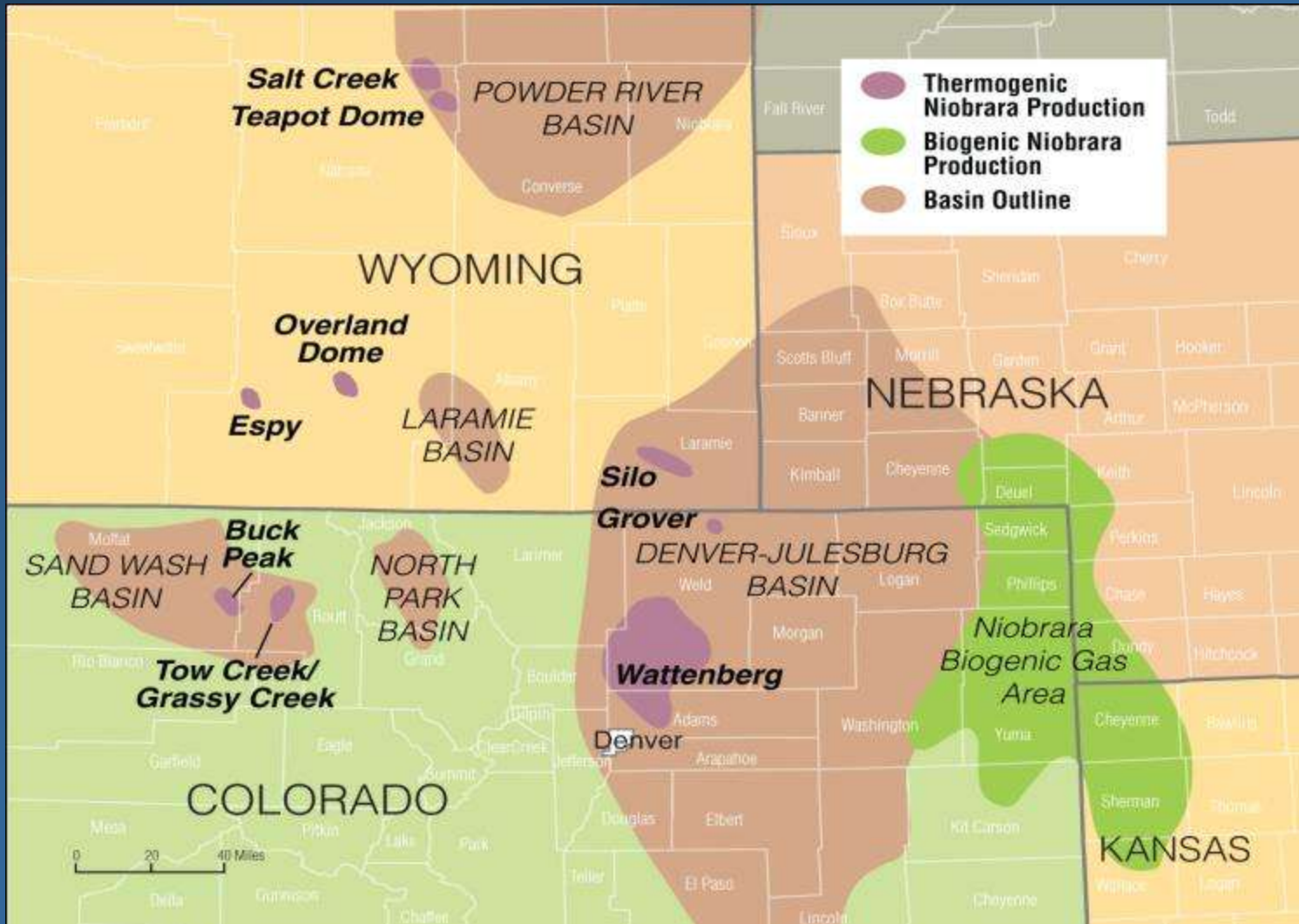
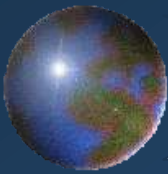


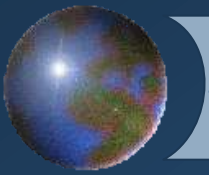
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Wells That Sparked the Play

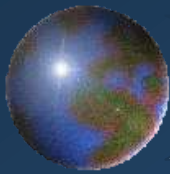
- ❖ EOG Resources: #2-01H Jake, Weld Co.
 - ❖ 3Q 2009; Max rate to sales 1,558 Bopd
 - ❖ 3,800-ft. lateral, TMD 11,838 ft.
 - ❖ Made 50,000 Bo in 1st 90 days on line
- ❖ Noble Energy: #1-99H Gemini K, Weld Co.
 - ❖ Made 60,000 Boe in 1st 60 days on line
 - ❖ EUR = 500,000 Boe
 - ❖ Best well in Wattenberg
- ❖ SM Energy: #1-H Atlas, Laramie Co., WY
 - ❖ Produced 1,700 bo per day 1st week on line



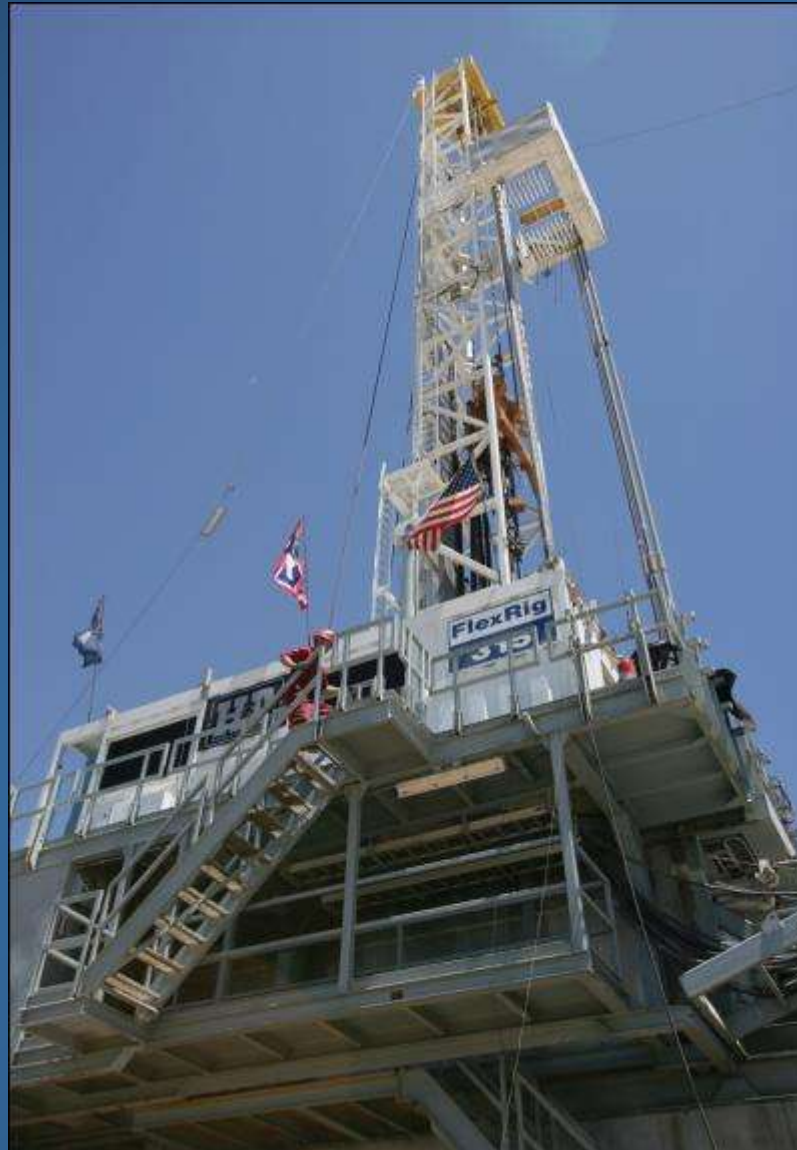


EOG Wells Drilled to Date: Weld Co.

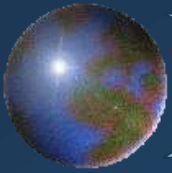
- #20-03H Critter Creek: Producing 570 boepd on restricted rate
- #04-09H Critter Creek: Producing 600 boepd on restricted rate
- #08-31H Elmer: Peak rate of 730 boepd
- #10-16H Red Poll: Unstimulated completion; Peak rate of 1,100 boepd



HP Flex
Rig #315 is
tripping pipe on
Noble Energy
Inc.'s #13-99Hz
Gallegos PC in
Weld County,
Colorado.

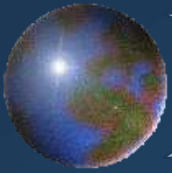


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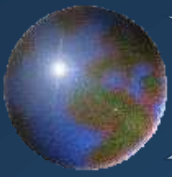
Permitting Activity

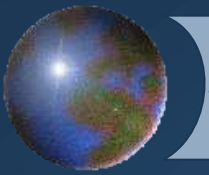
- ~160 permits already issued for horizontal wells with likely Niobrara targets
- Permits are in Campbell, Converse, Platte, Goshen and Laramie counties, WY, and Weld and Larimer counties, CO
- Currently, 8 hz rigs at work in DJ. Industry expects 12 to 18 rigs by year-end



Economics: Ave HZ Niobrara Well

- Canaccord Genuity's base-case type curve assumes an IP rate of approximately 450 boepd
- Gross EUR/well of 400,000 boe; Well cost \$3.5 million
- Average 80% NRI; NYMEX prices of \$80 per bbl and \$5.25 per Mcf
- IRR of 66% and after-tax PV-10 of \$3.1 million





Many thanks to Hart Energy Publishing
and to my colleagues Marc Conly and
Lowell Georgia for their contributions to
this talk.