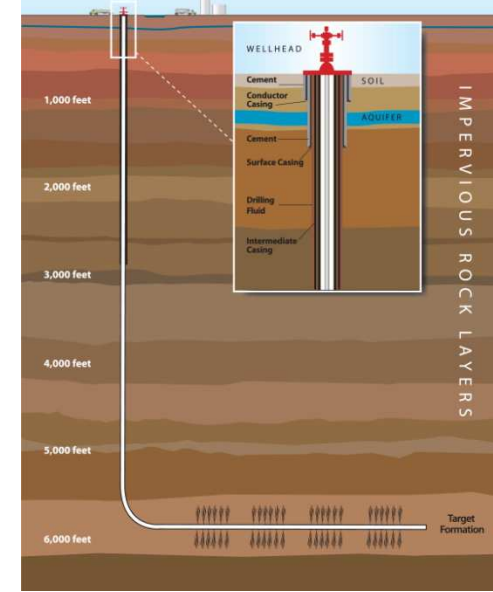


Groundwater Protection through Proper Well Construction

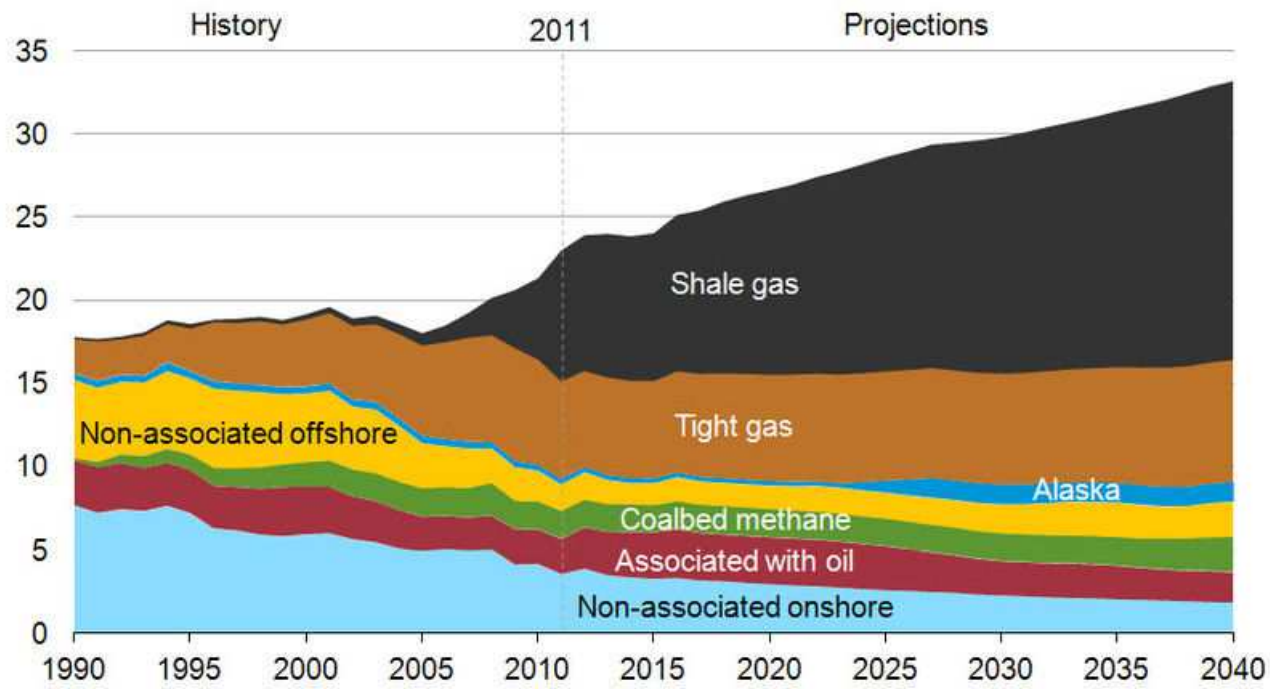


HYDRAULIC FRACTURING: *FIAT LUX*

J. Berton Fisher
Lithochimeia, LLC
111 West 5th St., Suite M100
Tulsa, OK 74103
bfisher@lithochim.com
(918) 527-2332

A SHINING FUTURE: THE GOLDEN AGE OF GAS

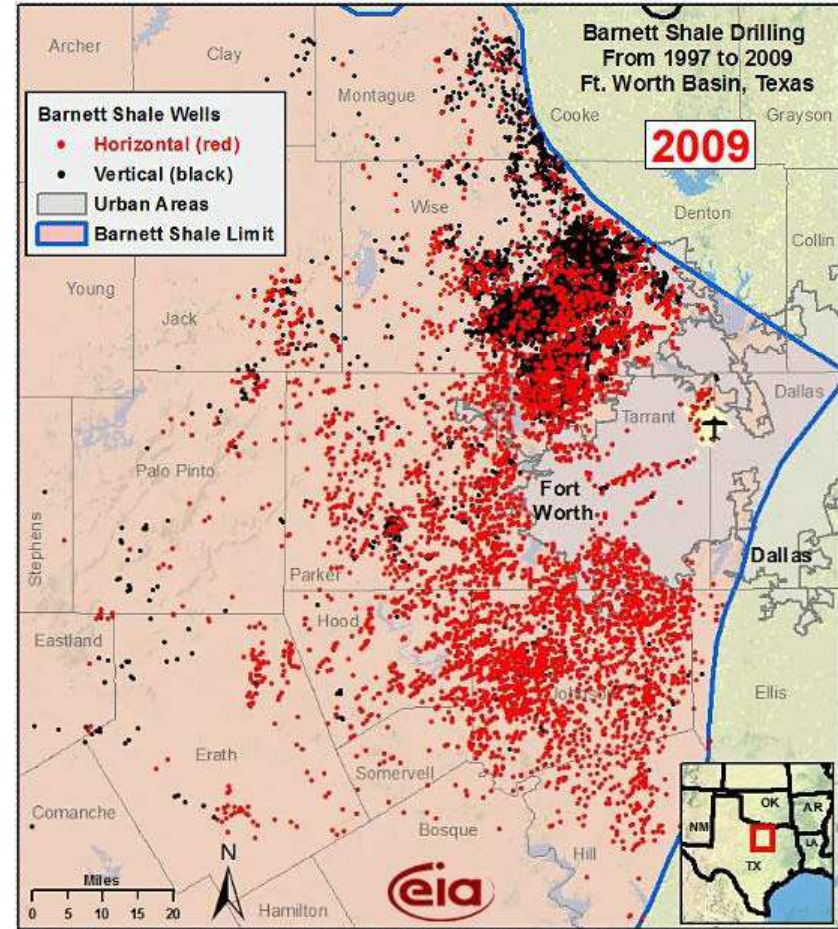
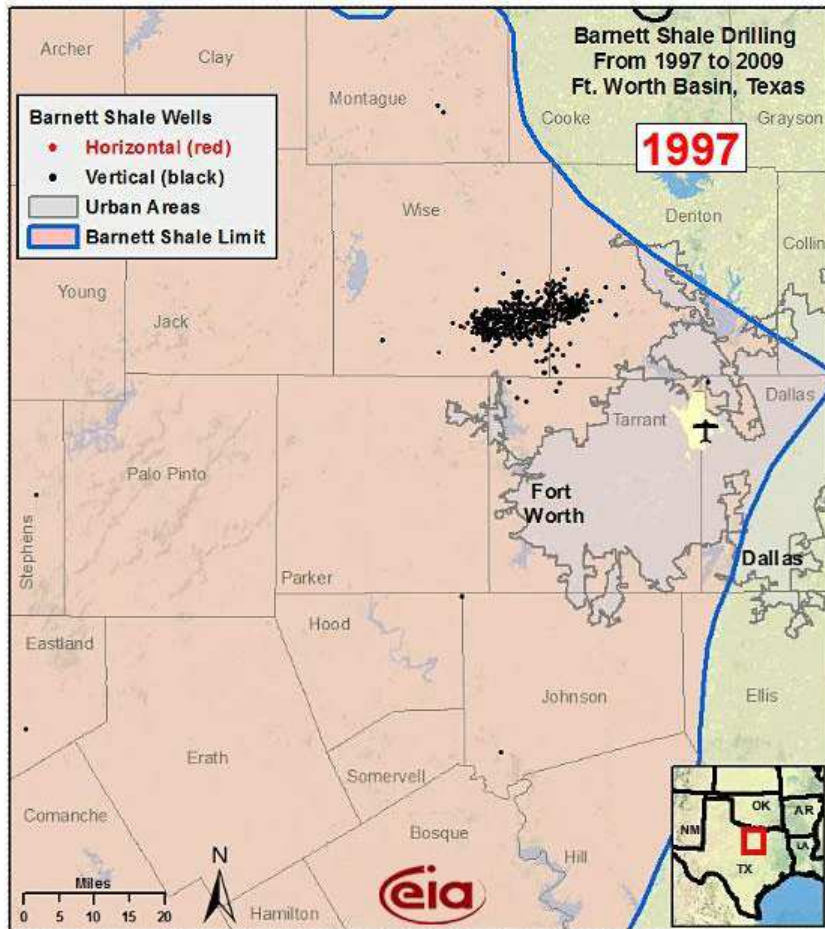
**U.S. dry natural gas production
trillion cubic feet**



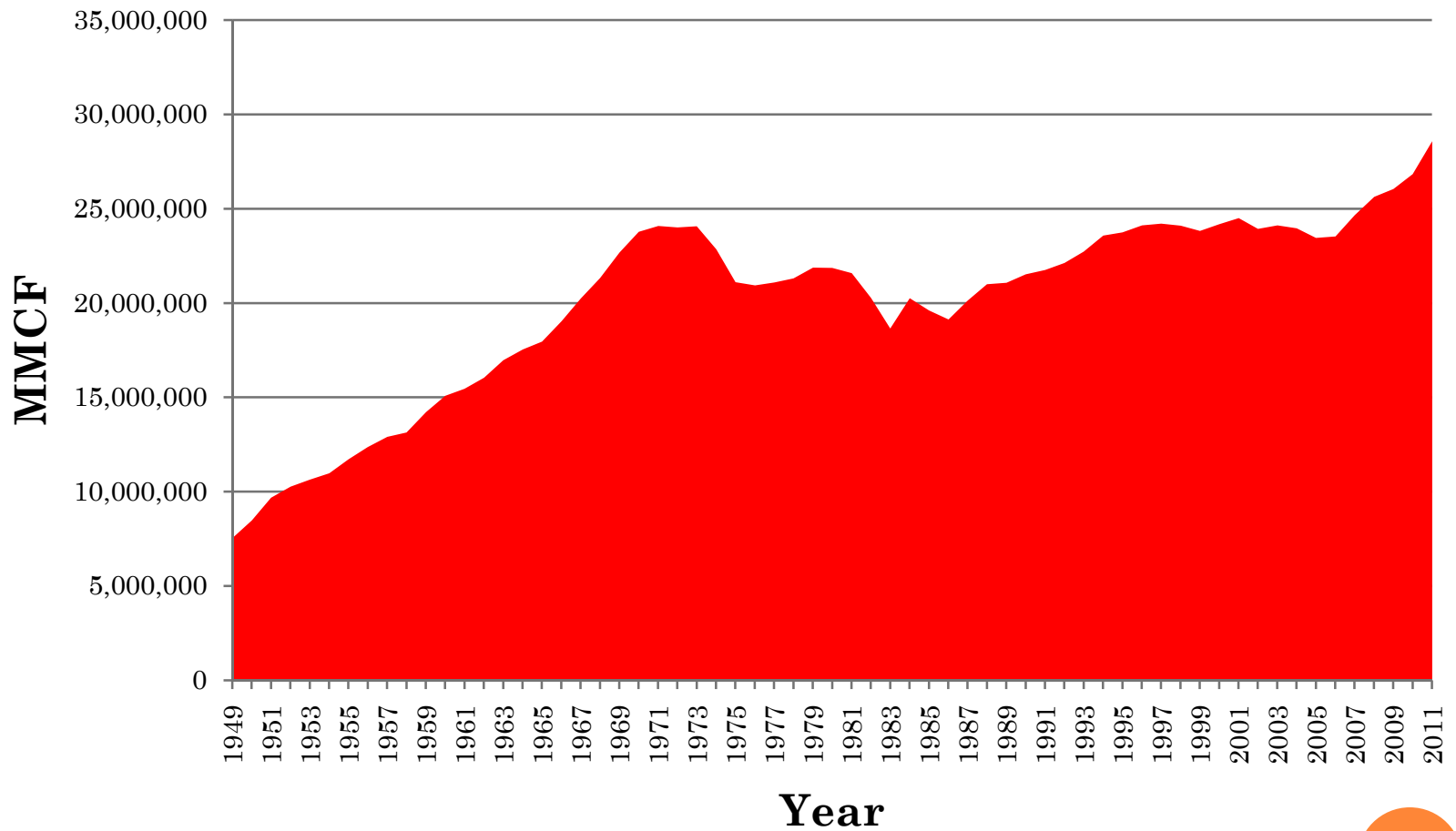
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2013 Early Release*



HOW THE WORLD CHANGED



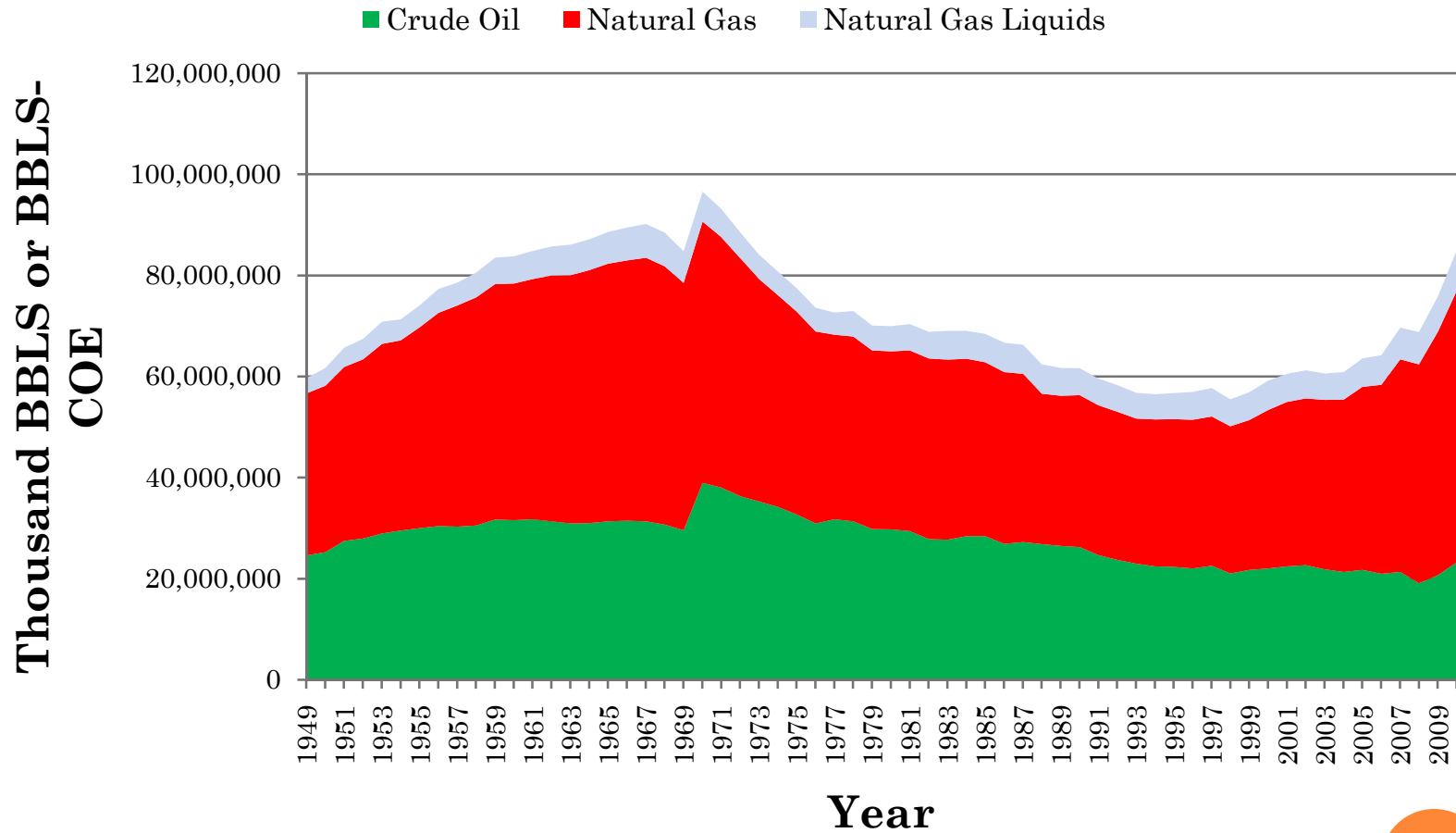
U.S. GAS PRODUCTION 1949-2011



Source: Energy Information Administration



U.S. RESERVES 1949-2010



Source: Energy Information Administration



J'ACCUSE!

- Gas Development
 - Environmentally Damaging
 - Hydraulic fracturing
 - Wastes water
 - Adverse groundwater impact
 - Toxic chemicals
 - Massive wastewater production
 - Induced Seismicity
 - Socially disruptive
 - Heavy truck traffic
 - Rent inflation
 - Infrastructure strained/damaged
 - Higher crime rate



Émile Zola 1840-1902



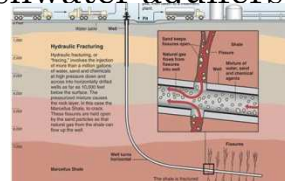
J'accuse: French for "I accuse;" used especially to condemn a major social injustice

THE FACTS ABOUT FRACTURING

- **One Million Hydraulic Fractures:** Hydraulic fracturing was first used in 1947 in an oil well in Grant County, Kansas, and by 2002, the practice had already been used approximately a million times in the United States.
- **Nearly all wells are hydraulically fractured:** Up to 95% of wells drilled today are hydraulically fractured, accounting for more than 43% of total U.S. oil production and 67% of natural gas production.
- **First concern about shallow freshwater formations:** The first known instance where hydraulic fracturing was raised and addressed as a technology of concern was when it was used in shallow coalbed methane formations that contained freshwater (Black Warrior Basin, Alabama, 1997).
- **Generally thousands of feet separate freshwater aquifers from shale resource rocks:** In areas with deep unconventional formations (such as the Marcellus areas in Appalachia), the shale gas under development is separated from freshwater aquifers by thousands of feet

National Petroleum Council, 2011. PRUDENT DEVELOPMENT: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources, available at

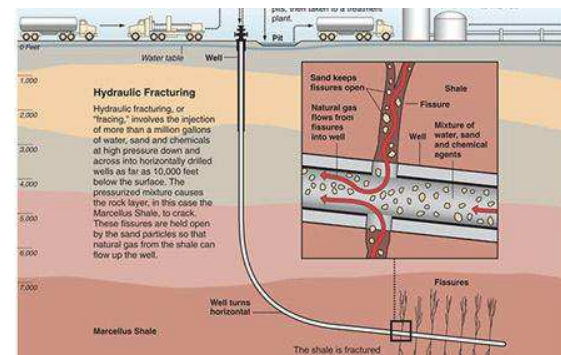
<http://www.npc.org/reports/NARD-ExecSummVol.pdf>



THE FACTS ABOUT FRACTURING

- Environmental viability affirmed by multiple studies
 - U.S. DOE and Ground Water Protection Council - 2009
 - U.S.EPA – 2004
 - Interstate Oil and Gas Compact Commission
- No verified cases of underground drinking water contamination from hydraulic fracturing

National Petroleum Council, 2011. PRUDENT DEVELOPMENT: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources, available at <http://www.npc.org/reports/NARD-ExecSummVol.pdf>



INVESTMENT SPILLOVER

- Perceived risk exists nonetheless
 - 10-K filing language
 - 3rd Party Investment Advice



CONTINENTAL RESOURCES, INC. 10-K

FILINGS



- First mentions business risks as a consequence of adverse legislation or regulatory action regarding hydraulic fracturing in 2010.
 - **“hydraulic fracturing” used 1 time**
- Detailed discussion of business concerns related to hydraulic fracturing related legislation and rulemaking in 2011.
 - **“hydraulic fracturing” used 28 times**

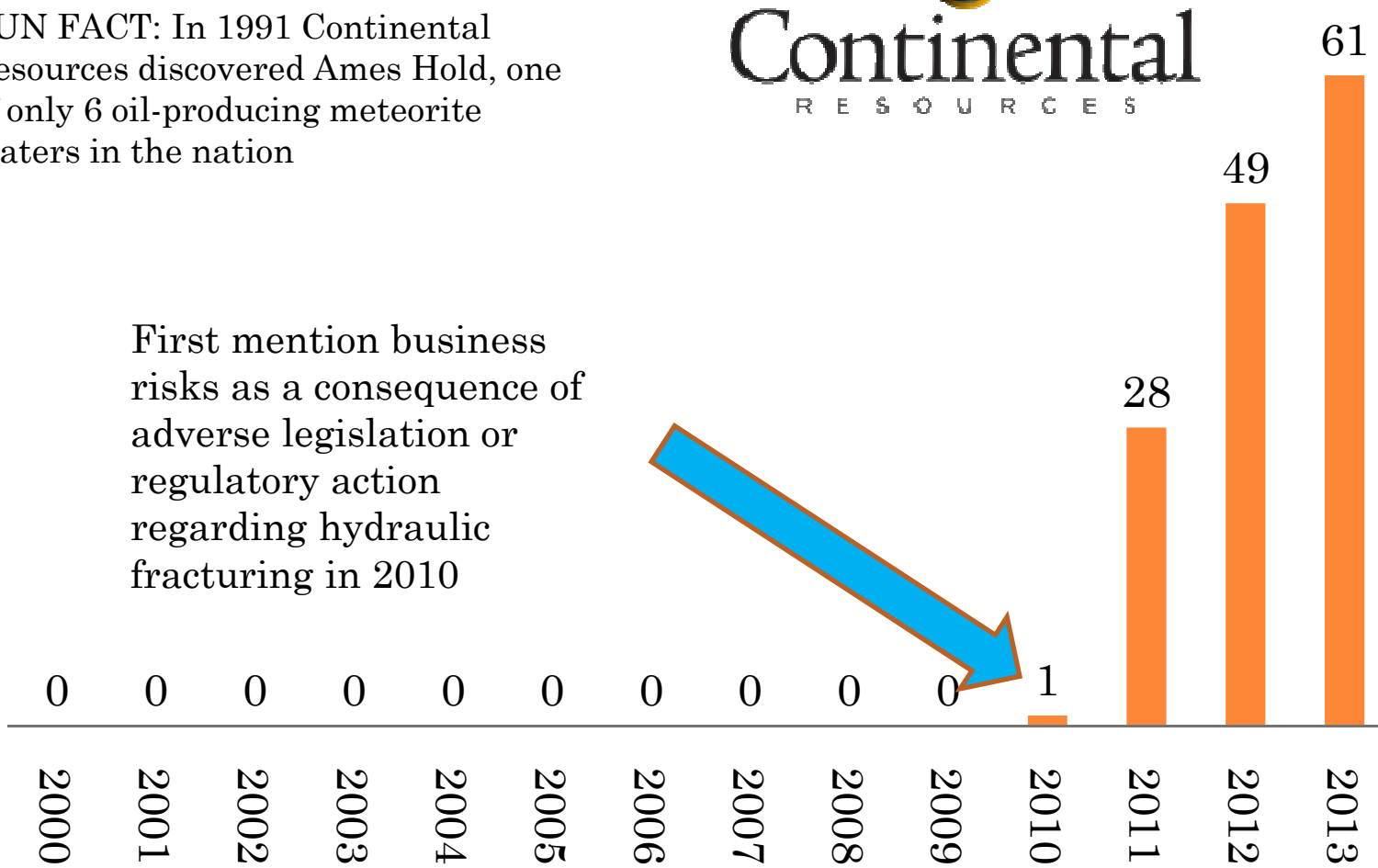


“HYDRAULIC FRACTURING” MENTIONS IN CONTINENTAL RESOURCES, INC.’S FORMS 10-K: 2000-2013



FUN FACT: In 1991 Continental Resources discovered Ames Hold, one of only 6 oil-producing meteorite craters in the nation

First mention business risks as a consequence of adverse legislation or regulatory action regarding hydraulic fracturing in 2010



CONTINENTAL RESOURCES, INC.

FORM 10-K FOR THE FISCAL YEAR ENDED  CONTINENTAL
RESOURCES

DECEMBER 31, 2012 (PAGE 37)

- **Federal and state legislation and regulatory initiatives relating to hydraulic fracturing could result in increased costs and additional operating restrictions or delays and inability to book future reserves.**
 - Activists have attempted to link hydraulic fracturing to various environmental problems
 - Adverse effects to drinking water supplies
 - Migration of methane and other hydrocarbons
 - Federal Agencies
 - Studying potential environmental risks
 - Evaluating restrictions



CONTINENTAL RESOURCES, INC.

FORM 10-K FOR THE FISCAL YEAR ENDED  CONTINENTAL
RESOURCES

DECEMBER 31, 2012 (PAGE 37)

- Proposed congressional legislation to amend the Safe Drinking Water Act
 - Establish additional FEDERAL level of regulation
 - Eliminate hydraulic fracturing exemption from definition of "underground injection"
 - Require O&G industry to obtain additional permits
 - Require disclosure of additives used



CONTINENTAL RESOURCES, INC.

FORM 10-K FOR THE FISCAL YEAR ENDED



Continental
RESOURCES

DECEMBER 31, 2012 (PAGE 37)

- Studies and Rulemaking
 - **White House Council on Environmental Quality** is coordinating an administration-wide review of hydraulic fracturing practices.
 - **EPA multi-year study** of potential environmental impacts of hydraulic fracturing--draft results anticipated in 2014.
 - **May 11, 2012: BLM issued proposed rule**
 - requiring public disclosure of chemicals used in hydraulic fracturing operations
 - impose other operational requirements
 - will issue a revised draft rule by March 31, 2013.

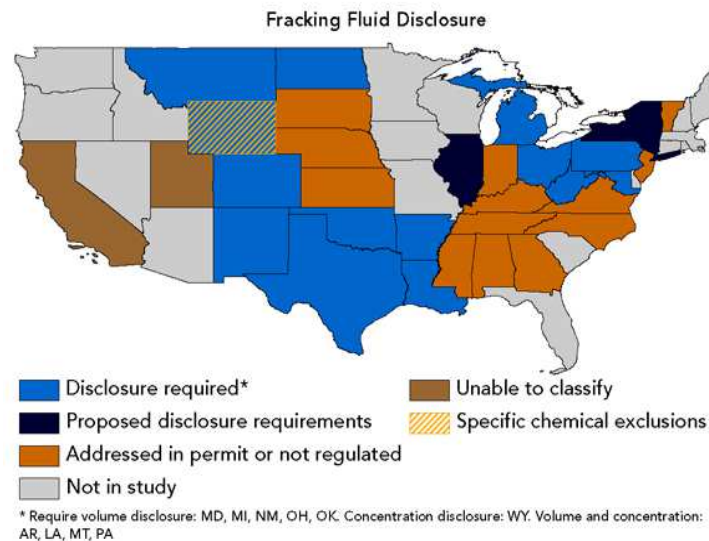


CONTINENTAL RESOURCES, INC.

FORM 10-K FOR THE FISCAL YEAR ENDED DECEMBER 31, 2012 (PAGE 37)



- Studies and Rulemaking (cont.)
 - Several state and local governments have moved to require disclosure of fracturing fluid components or to otherwise regulate their use more closely.
 - New drilling permits for hydraulic fracturing have been put on hold pending development of additional standards.



CONTINENTAL RESOURCES, INC.

FORM 10-K FOR THE FISCAL YEAR ENDED



Continental
RESOURCES

DECEMBER 31, 2012 (PAGE 37)

- Adoption of future federal, state or local law or regulation imposing permitting or reporting obligations on, or otherwise limiting hydraulic fracturing process, or the discovery of groundwater contamination or other adverse environmental effects directly connected to hydraulic fracturing, could
 - Make it more difficult and more expensive to complete hydrocarbon wells in low-permeability formations
 - Increase cost of compliance and doing business
 - Delay, prevent or prohibit development of natural resources from unconventional formations.



3RD PARTY INVESTMENT ADVICE

○ Richard Liroff

- Executive Director of the Investor Environmental Health Network
 - Managing about \$35 billion in assets
 - Encourages companies to reduce the volume and toxicity of chemicals in their products and supply chains.
 - Believes there's a strong business case for doing so
- Testified before the Committee on Energy Resources, Texas House of Representatives (June 26, 2012)



3RD PARTY INVESTMENT ADVICE

- ALL COMPANIES INVOLVED IN HYDRAULIC FRACTURING OPERATIONS FACE SIGNIFICANT RISKS
 - ENVIRONMENTAL IMPACTS CAN DIRECTLY IMPACT A COMPANY'S BOTTOM LINE
 - COMMUNITY CONCERNS ABOUT THE ENVIRONMENTAL AND SOCIAL IMPACTS OF FRACTURING OPERATIONS HAVE LED TO BANS AND MORATORIA
 - BANS AND MORATORIA ARE HAVING FINANCIAL IMPACTS
 - EXISTING DISCLOSURE ON ENVIRONMENTAL AND SOCIAL RISKS IS INSUFFICIENT
 - SHAREHOLDERS LACK THE INFORMATION NEEDED TO FULLY ASSESS RISK TO THE SECTOR AND DIFFERENTIATE AMONG INDIVIDUAL COMPANIES

Richard Liroff, Investor Environmental Health
Network, January, 2013



ENVIRONMENTAL IMPACTS CAN DIRECTLY IMPACT A COMPANY'S BOTTOM LINE

- December 2011: U.S. **Environmental Protection Agency (EPA)** found that chemicals in a groundwater aquifer in **Pavillion, Wyoming** are “likely associated” with natural gas production, including fracturing. **While the EPA’s findings are controversial, Legacy Reserves backed out** of a \$45 million deal to **buy Encana Corporation’s assets** in the region after the EPA released preliminary data from the report.
- May 2011: the **Pennsylvania** Department of Environmental Protection (DEP) **levied** a record-breaking \$1.1 million dollar **fine** on **Chesapeake Energy** for violations related to its fracturing operations.
- December 2010: **Cabot Oil & Gas** agreed in a **settlement** with **Pennsylvania DEP** to pay \$4.1 million to residents in **Dimock Pennsylvania** alleging that the company contaminated their water supply, and to **reimburse** the state \$500,000 for investigative expenses.



BANS AND MORATORIA

- A report of the **U.S. Department of Energy's Shale Gas Production Subcommittee**, found that “if action is not taken to **reduce the environmental impact** accompanying the very considerable expansion of shale gas production expected across the country...there is a real risk of **serious environmental consequences** causing a **loss of public confidence** that could delay or stop this activity.”
- **New York State** has been under a **de facto moratorium since 2008** while the NYS Dept. of Environmental Conservation (DEC) considers whether hydraulic fracturing can be done safely in the state. At the local level, **more than 70 cities, towns and counties** in New York have enacted various **rules and restrictions**, and in some cases **bans**.
- Currently, there is a **moratorium on drilling in the Delaware River Basin** portion of the Marcellus shale while regulations are revised.
- The Province of **Quebec**, Canada has imposed a lengthy **moratorium** on hydraulic fracturing, and **France and Bulgaria** have enacted **national bans** on the practice. **Chevron's license to explore** for shale gas in Bulgaria was subsequently **suspended**.



BANS AND MORATORIA HAVE FINANCIAL IMPACT

- **Norse Energy Corporation USA** filed for **Chapter 11 bankruptcy** in December 2012 as a result of the 4 year moratorium in New York State, which idled seven of the company's wells in the area.
- **Talisman Energy** booked an **impairment charge** of \$109 million on its assets in Quebec in 2012 because of Quebec's continued moratorium on fracking.
- **Royal Dutch Shell** has estimated 40% of its New York **acreage could be off-limits** because of potential state rules.



EXISTING DISCLOSURE INSUFFICIENT

- **Need more quantitative measures:** The Department of Energy Secretary's shale gas advisory panel recommended in November 2011 that companies “adopt a more visible commitment to using quantitative measures as a means of achieving best practice and demonstrating to the public that there is continuous improvement in reducing the environmental impact of shale gas production”.
- **Need full transparency:** The International Energy Agency (IEA), in its 2012 report, “Golden Rules for a Golden Age of Gas” addressed the need of the energy industry to maintain or earn its social license to operate, stating that “full transparency, measuring and monitoring of environmental impacts and engagement with local communities are critical to addressing public concerns.” IEA continued, “Operators need to explain openly and honestly their production practices, the environmental, safety, and health risks and how they are addressed.”

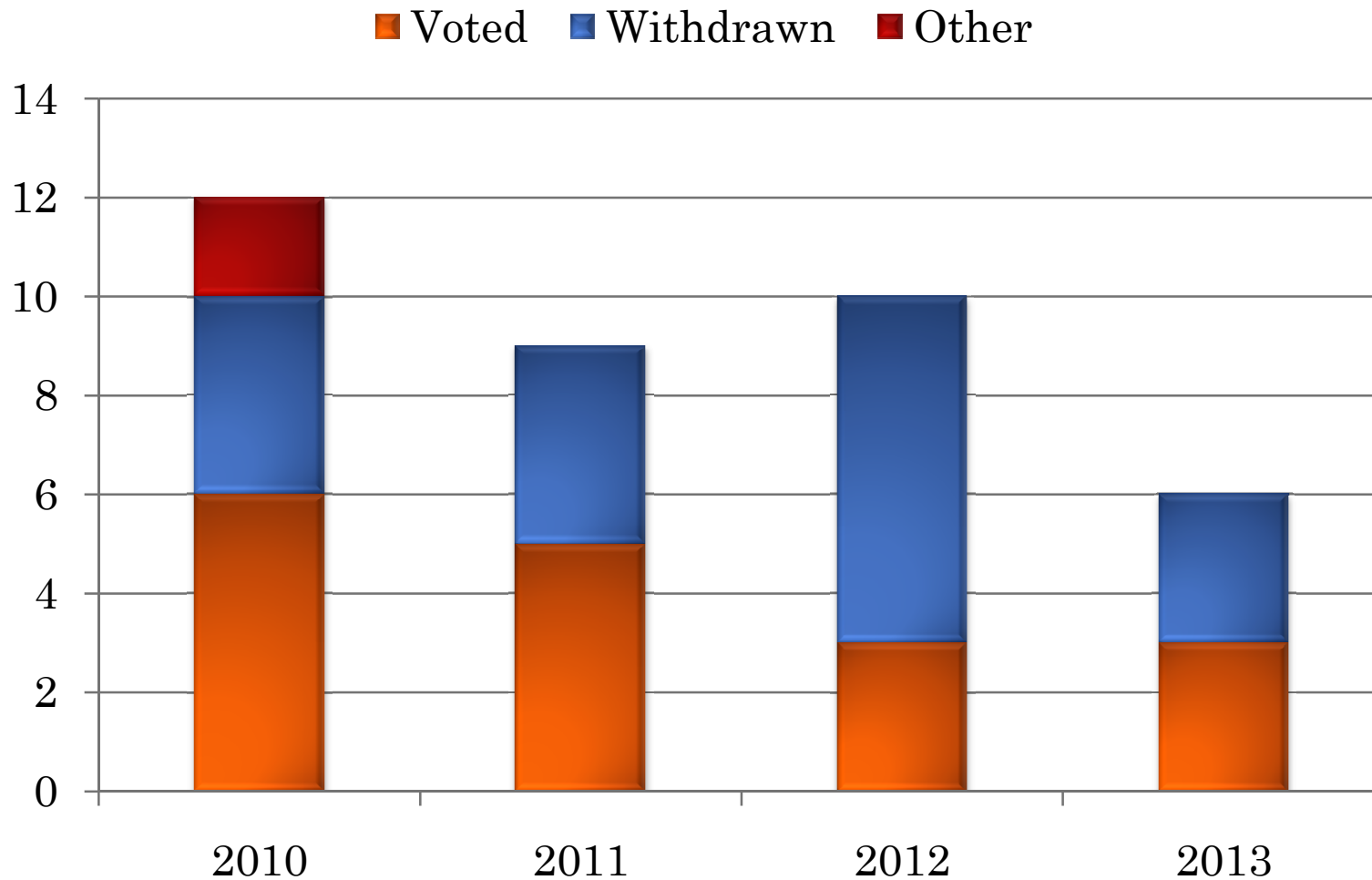


SHAREHOLDERS LACK INFORMATION TO FULLY ASSESS RISK

- **Investment value** may be **undermined** by company decision-making and policies that lag public and regulatory expectations for environmental protection.
- In the absence of meaningful disclosure, **investors cannot differentiate risks** and rewards at various companies.
- **Investors** must be **assured** that company **managers** are **reducing business risks** by addressing operational hazards and are capturing the genuine, measurable business rewards flowing from environmental management practices that have the potential to lower costs, increase profits and enhance community acceptance.
- Investors **require relevant, reliable, and comparable information** about companies' natural gas operations to make investment judgments based on a robust assessment of companies' environmental, social, and governance policies, practices and performance.



SHAREHOLDER RESOLUTIONS REGARDING HYDRAULIC FRACTURING RISK MANAGEMENT PRACTICE DISCLOSURE



MUST MANAGE REALITY AND PERCEPTION

- Manage the reality and/or perception of environmental and social impacts or lose public confidence – the “social license” to operate
 - Increased costs
 - Community/Shareholder opposition
 - Lost opportunities



IS THIS SOME NEW WORLD ORDER MANDATE?

- For all you conspiracy theorists out there – the next part of this talk
 - Was not found in an abandoned box labeled Agenda 21
 - Does not involve relocating rural residents to six-story apartment buildings located next to high speed rail lines.
 - Was not provided to be my a representative of the shadow World Government
 - Has nothing to do with the Affordable Care Act



SO, WHAT TO DO?

- International Energy Agency's May 2012 "Golden Rules for a Golden Age of Gas" -- paving the way towards the golden age of gas.
 - Full transparency, measuring and monitoring of environmental impacts and engagement with local communities are critical to addressing public concerns.
 - Operators need to explain openly and honestly their production practices, the environmental, safety, and health risks and how they are addressed.



Available at: http://www.worldenergyoutlook.org/media/weoweb site/2012/goldenrules/WEO2012_GoldenRulesReport.pdf



GOLDEN RULES FOR A GOLDEN AGE OF GAS

- Measure, disclose and engage
- Watch where you drill
- Isolate wells and prevent leaks
- Treat water responsibly
- Eliminate venting, minimize flaring and other emissions
- Be ready to think big
- Ensure a consistently high level of environmental performance



Available at: http://www.worldenergyoutlook.org/media/weoweb site/2012/goldenrules/WE02012_GoldenRulesReport.pdf



EXTRACTING THE FACTS: AN INVESTOR GUIDE TO DISCLOSING RISKS FROM HYDRAULIC FRACTURING OPERATIONS

- Manage risks transparently and at Board level
- Reduce surface footprint
- Assure well integrity
- Reduce and disclose all toxic chemicals
- Protect water quality by rigorous monitoring
- Minimize fresh water use
- Prevent contamination from waste water
- Minimize and disclose air emissions
- Prevent contamination from solid waste and sludge residuals
- Assure best in class contractor performance
- Secure community consent
- Disclose fines, penalties and litigation



Interfaith Center on Corporate Responsibility

Available at: <http://www.iehn.org/documents/frackguidance.pdf>



SHELL ONSHORE TIGHT SAND OR SHALE OIL AND GAS OPERATING PRINCIPLES

1. Shell designs, constructs and operates wells and facilities in a safe and responsible way.
2. Shell conducts its operations in a manner that protects groundwater and reduces potable water use as reasonably practicable.
3. Shell conducts its operations in a manner that protects air quality and controls fugitive emissions as reasonably practicable.
4. Shell works to reduce its operational footprint.
5. Shell engages with local communities regarding socio-economic impacts that may arise from its operations.



BG GROUP: PUBLIC POSITION ON UNCONVENTIONAL GAS

- Working in the community
- Well design and engineering
- Testing and monitoring
- Chemicals disclosure
- Responsible chemical use
- Managing water responsibly
- Minimizing emissions
- Communicating and working with stakeholders



TALISMAN ENERGY: SHALE OPERATING PRINCIPLES

- RESPONSIBLE OPERATIONS
- MUTUAL BENEFIT
- TRANSPARENCY AND COLLABORATION



Available at: http://www.talisman-energy.com/upload/media_element/20120910172345/Talisman_ShaleGasPrinciples-English.pdf



APPALACHIAN SHALE RECOMMENDED PRACTICES GROUP

- Anadarko Petroleum Corp.
- Shell Oil Company
- Cabot Oil & Gas Corp.
- Southwestern Energy Co.
- Chesapeake Energy Corp.
- Talisman Energy Corp.
- Chevron
- WPX Energy, Inc.
- EQT Corp.
- XTO Energy, Inc.
- Seneca Resources Corp.
- Responsible Standards and Practices for Exploring for Natural Gas and Oil from Appalachian Shales
 - Pre-Operational Planning
 - Site Selection & Assessment
 - Site Design and Construction
 - Drilling Operations
 - Completion/Stimulation Operations
 - Flow Back
 - Production Operations
 - Measurement and Metrics
 - Landowner Relations



A FEW FINAL THOUGHTS

- ***Massive*** uptick in unconventional hydrocarbon E&P
 - Assumptions about inexorable (and more importantly, near-term) descent into scarcity overturned (threatened)
 - Traditional & Non-traditional E&P areas involved
 - Some societal elements have publically stated that a boost in domestic oil-and-gas extraction is good for the country is a “backward 20th Century belief”.



A FEW FINAL THOUGHTS

- Calls for transparency initially fought/ignored
- Lots of waste generated (fluids and solids)
- Predictable “bitter harvest” as normal public ennui transitioned toward an erosion of public confidence
- “Push from without” led to a “push from within” – money talks
- Industry is in a much better place today than in 2010

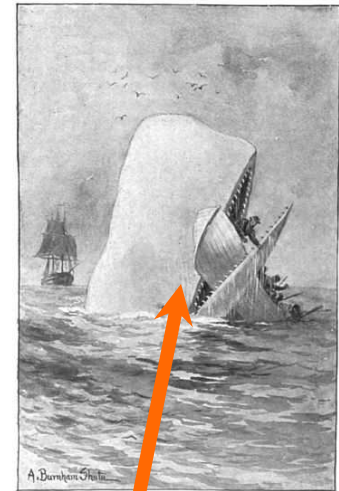


THIS ISN'T OVER

“And this is what ye have shipped for, men! to chase that white whale on both sides of land, and over all sides of earth, till he spouts black blood and rolls fin out. What say ye, men, will ye splice hands on it, now? I think ye do look brave.”

Ahab, admitting that his pursuit of Moby Dick is purely a rational business matter.

Metaphorically Ahab?



A. Barnheim Shute
“Both jaws, like enormous shears, bit the craft completely in twain.”
—Page 510.

?

