

HYDRAULIC FRACTURING 101

WHAT IT IS;
WHY IT IS USED;
WHY ALL THE FUSS?
IS IT USED IN INDIANA?



Herschel McDivitt, Director

Indiana Division of Oil and Gas

Mission Statement: *The Indiana Division of Oil and Gas is committed to encouraging the responsible development of Indiana's oil and gas resources in a manner that will: prevent waste, encourage the greatest economic recovery of oil and gas, protect the correlative rights of owners, protect human health and safety, and protect the environment.*

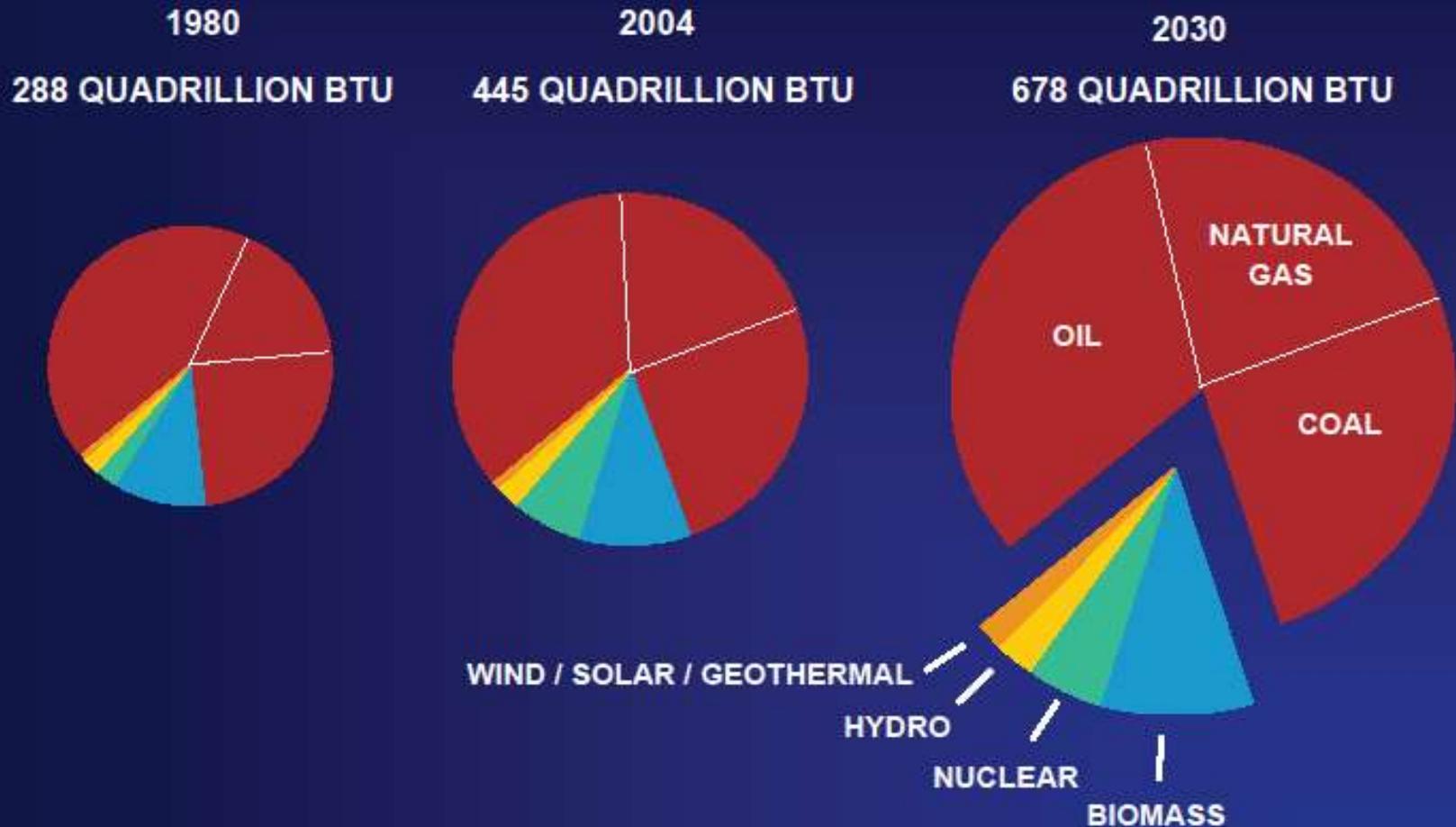
Our Commitment: To be **Firm** where we need to be; **Flexible** where we can; and **Fair** in everything we do.

This presentation was updated 10/15/2014

Things to Ponder

- Can we ever stop using fossil fuels for energy needs?
- The U.S. is poised to become worlds largest producer of crude oil in 2015.
- U.S. natural gas production recently surpassed Russia to become largest producer of natural gas.
- Within the last 5 years, U.S. has abandoned the construction of LNG import facilities and begun converting them to LNG export facilities.
- Most of this growth is the result of increased use of:
 - ▣ horizontal drilling; and
 - ▣ high-volume, multi-stage hydraulic fracturing; mostly in shale formations and on private lands.
- Is “Peak Oil” a myth?

Coal, Oil, and Natural Gas Will Remain Indispensable



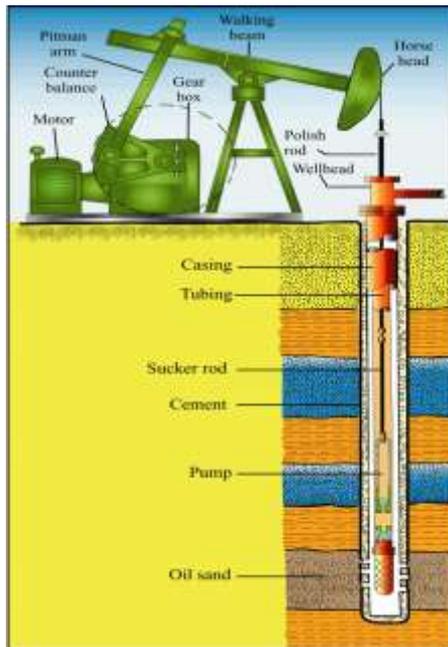
Source: IEA REFERENCE CASE

NPC

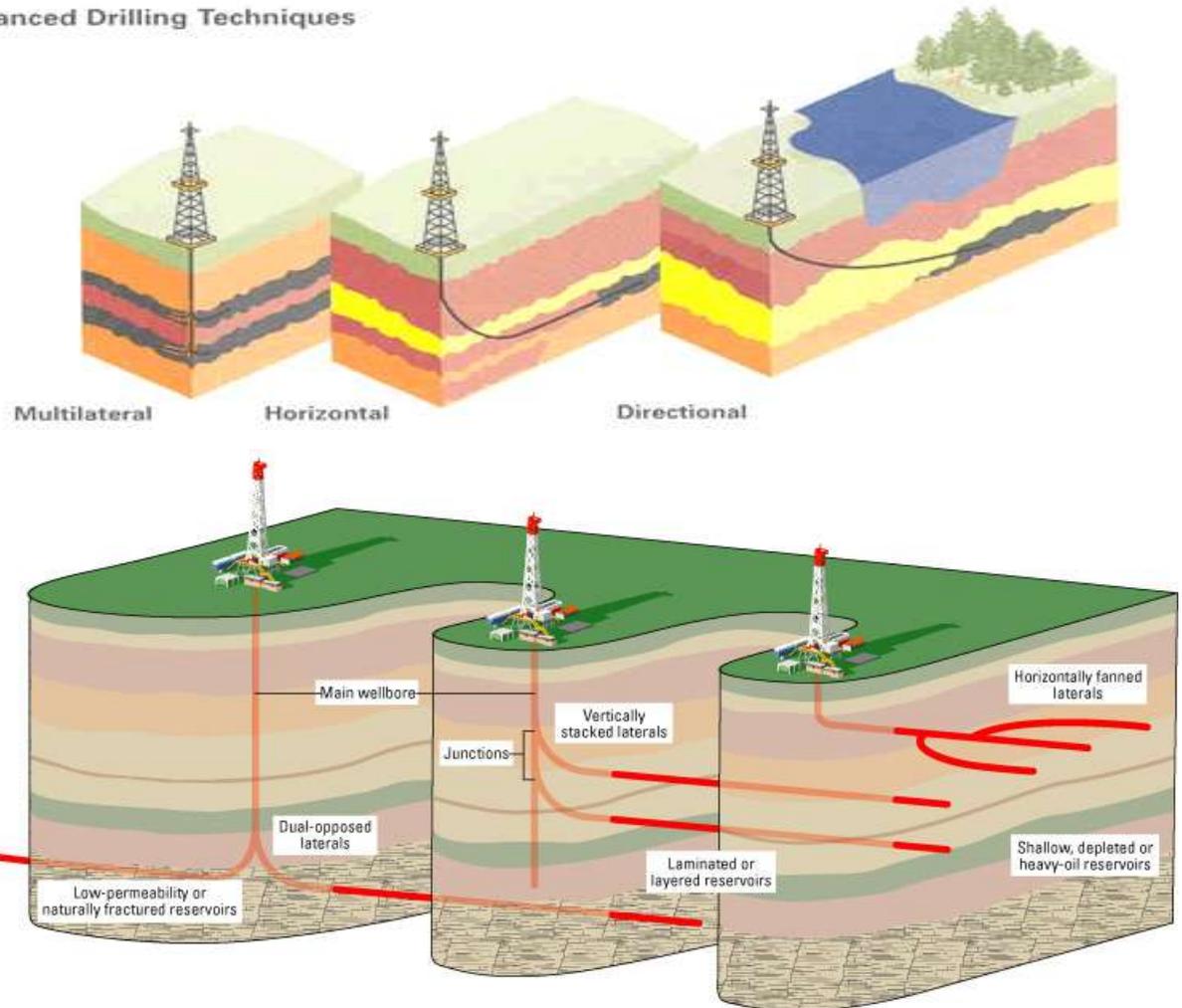
Global Oil and Gas Study

Well Drilling Methods

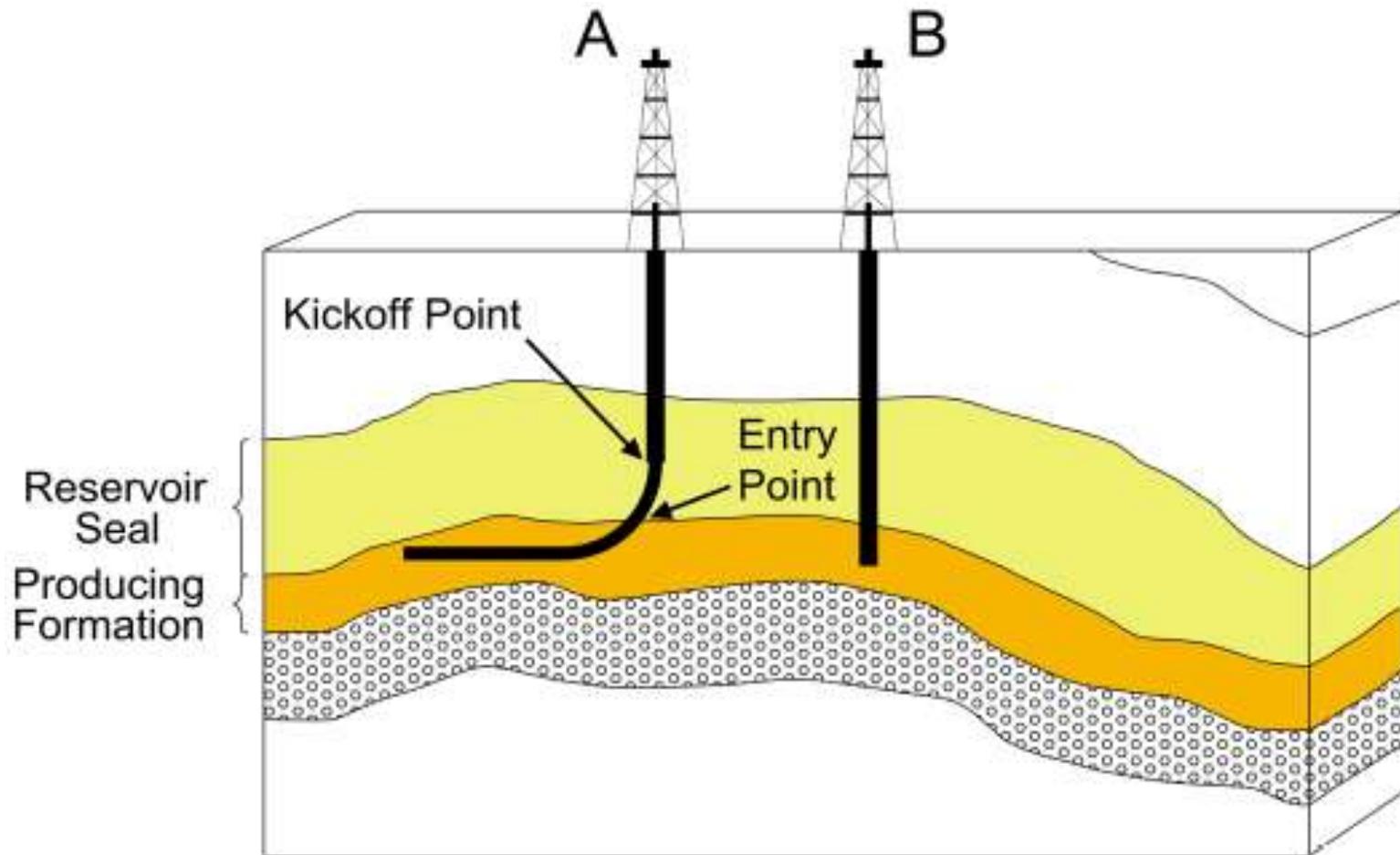
- Vertical
- Directional
- Horizontal (steerable bits)



Advanced Drilling Techniques



Horizontal vs. Vertical Well



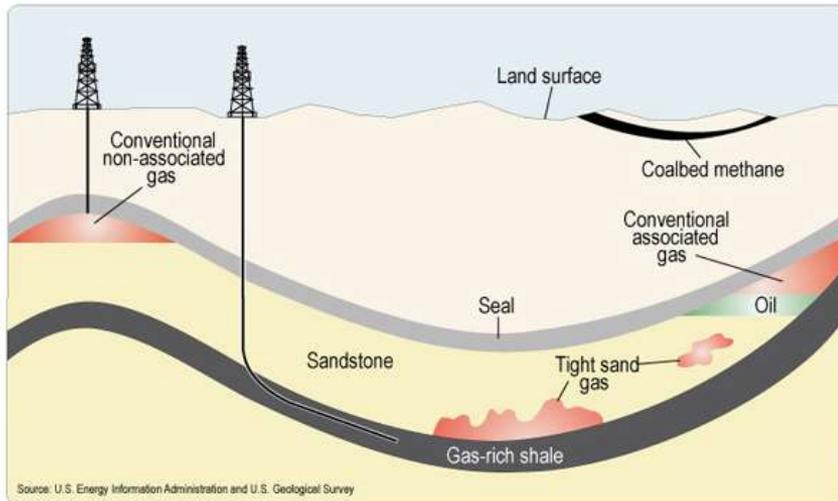
Conventional vs. Non-Conventional Resources

Conventional reservoirs:

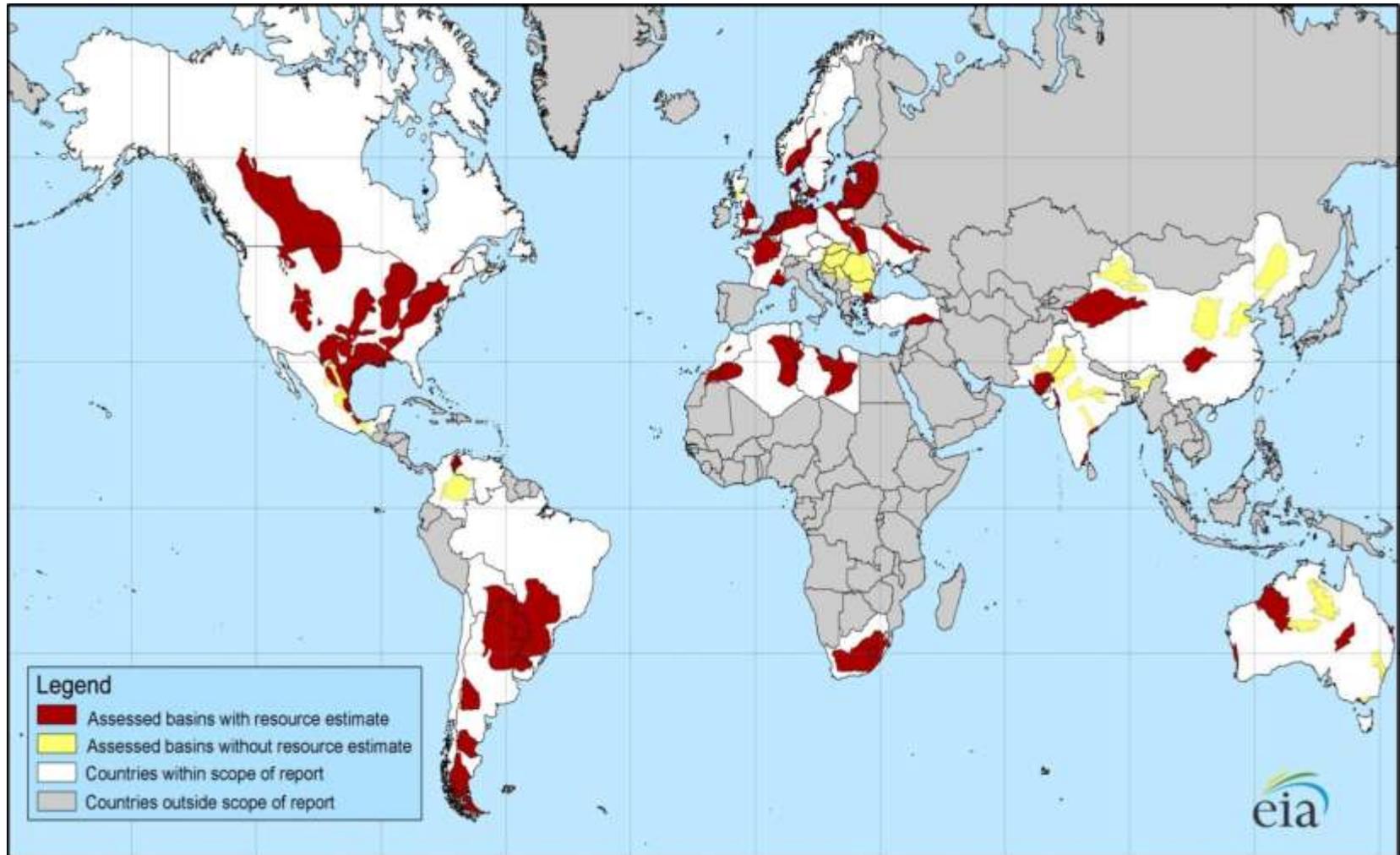
- Younger, fractured sandstones and carbonates with higher permeabilities (100 to 1,000 millidarcy)
- Initial production usually “driven” by natural reservoir pressure

Non-conventional reservoirs:

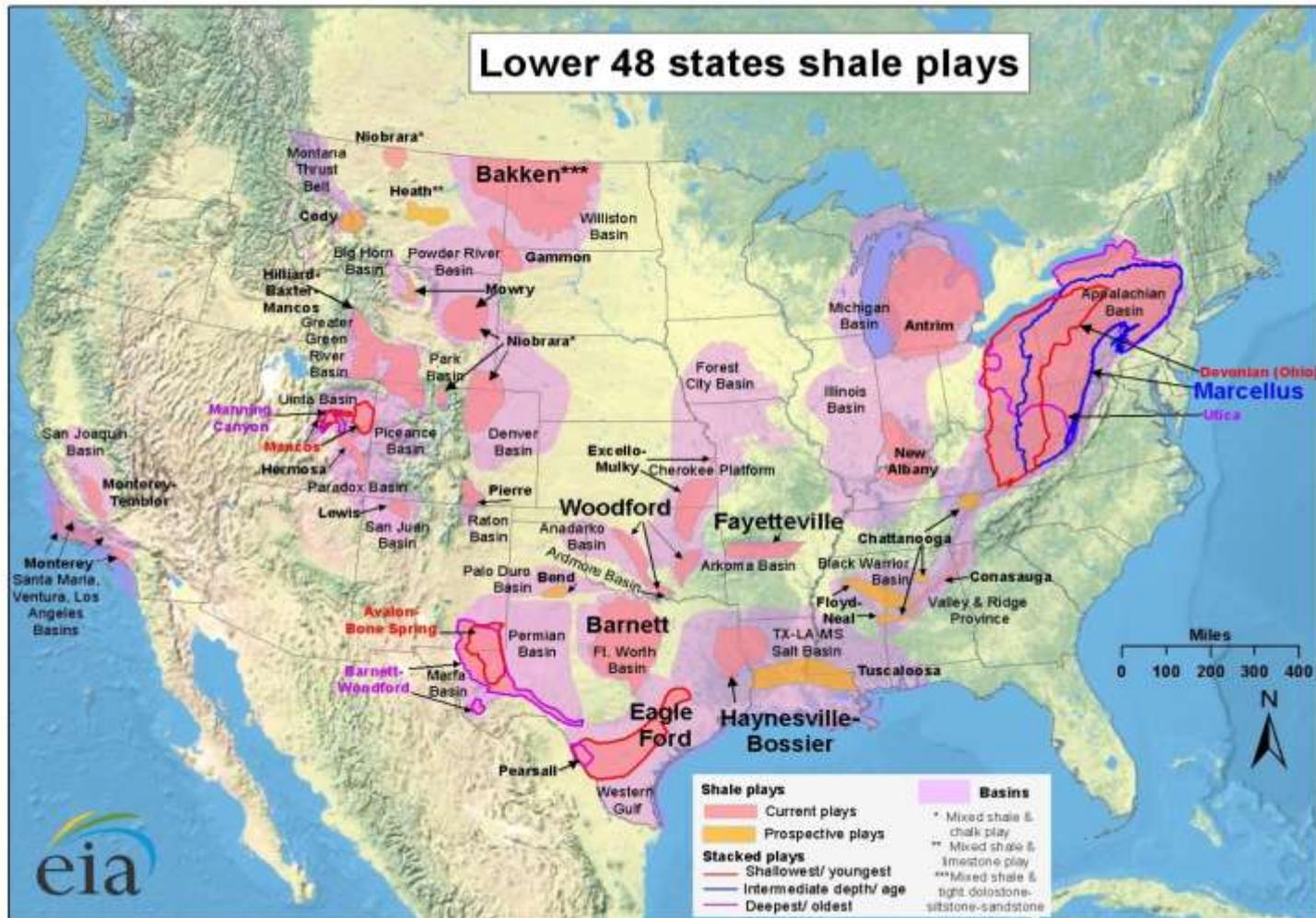
- Typically older, compacted non-fractured formations having undergone cementation/ recrystallization with very low permeabilities (microdarcies to 3 millidarcy)
- Shale gas and shale oil formations
- Coal bed methane



Major Shale Basins Worldwide

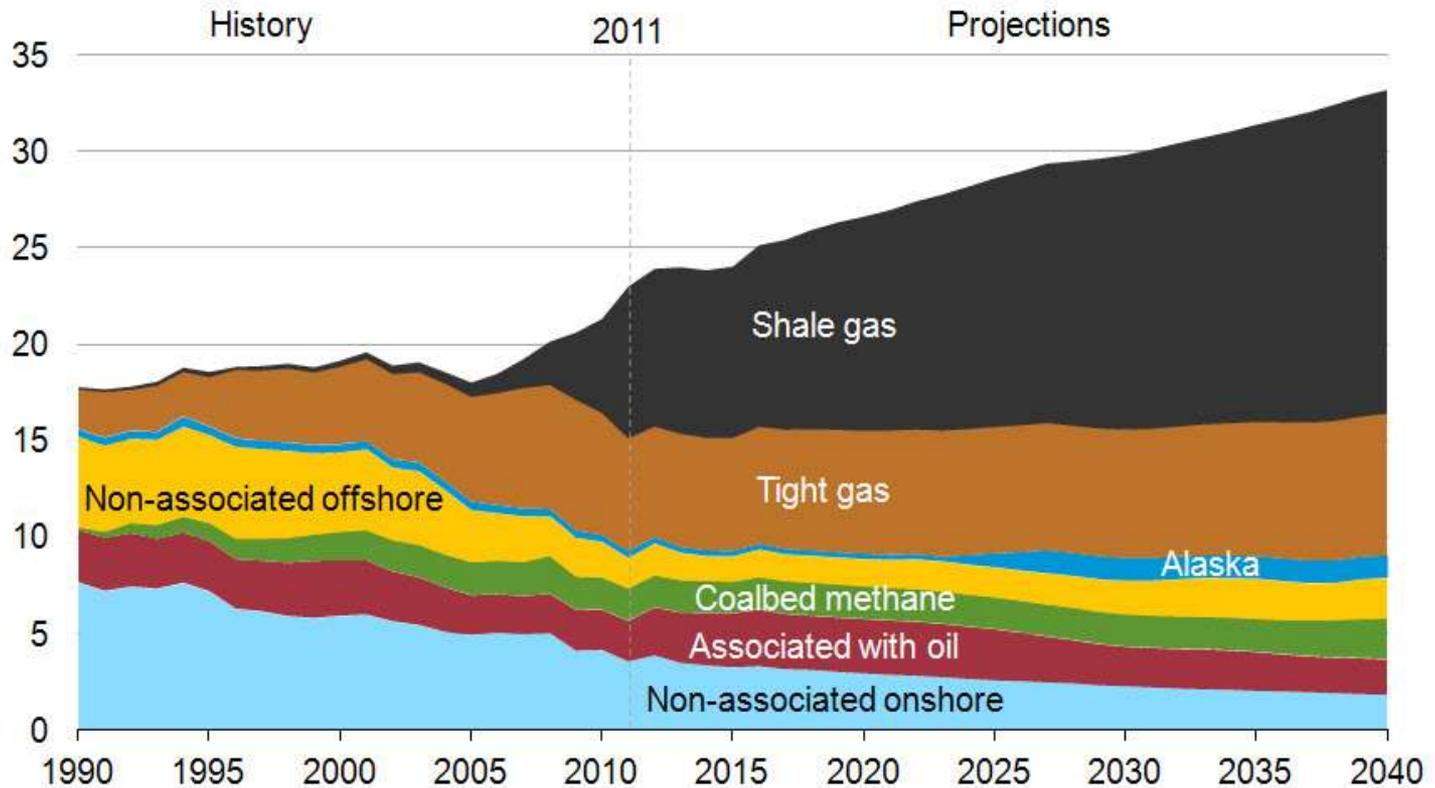


Major U.S. Shale Plays



Natural Gas Production Trends

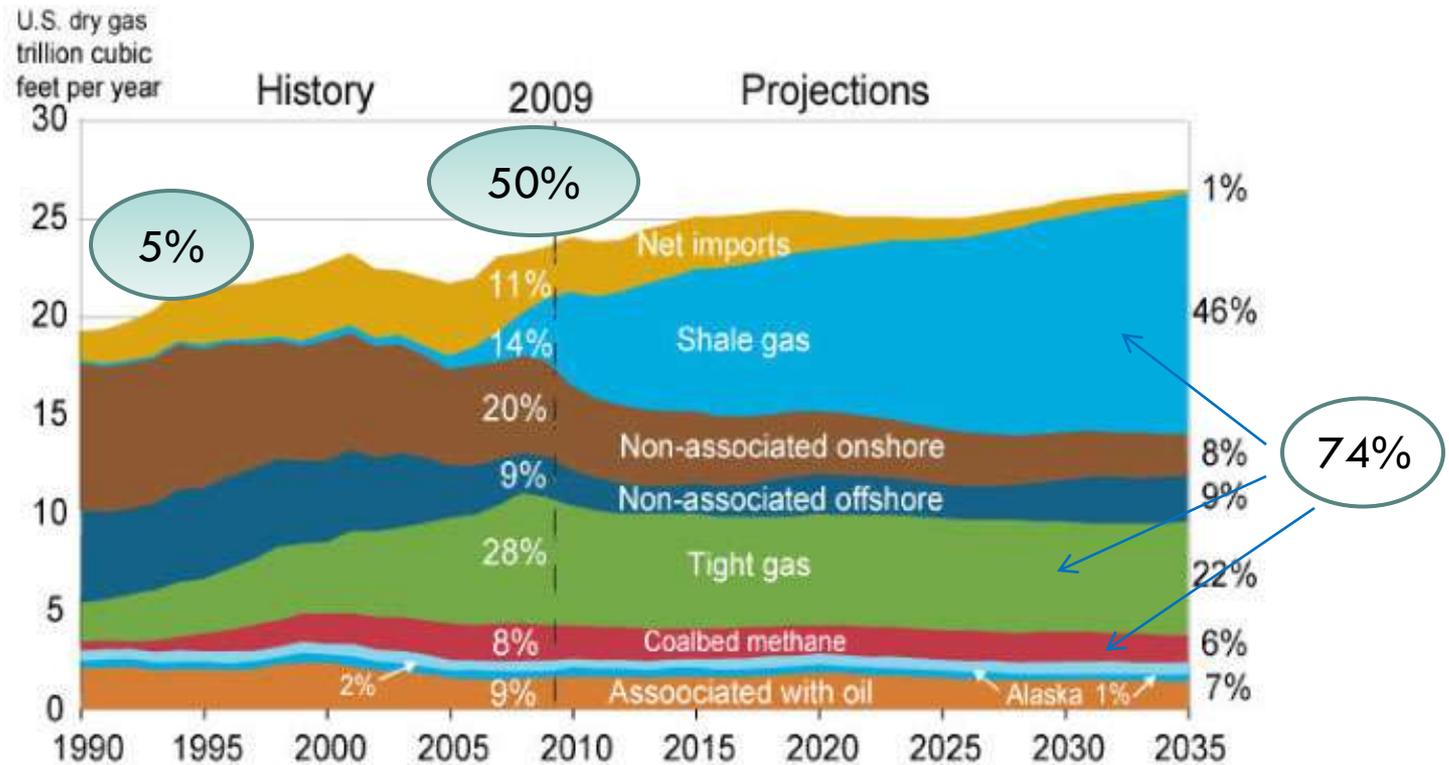
**U.S. dry natural gas production
trillion cubic feet**



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

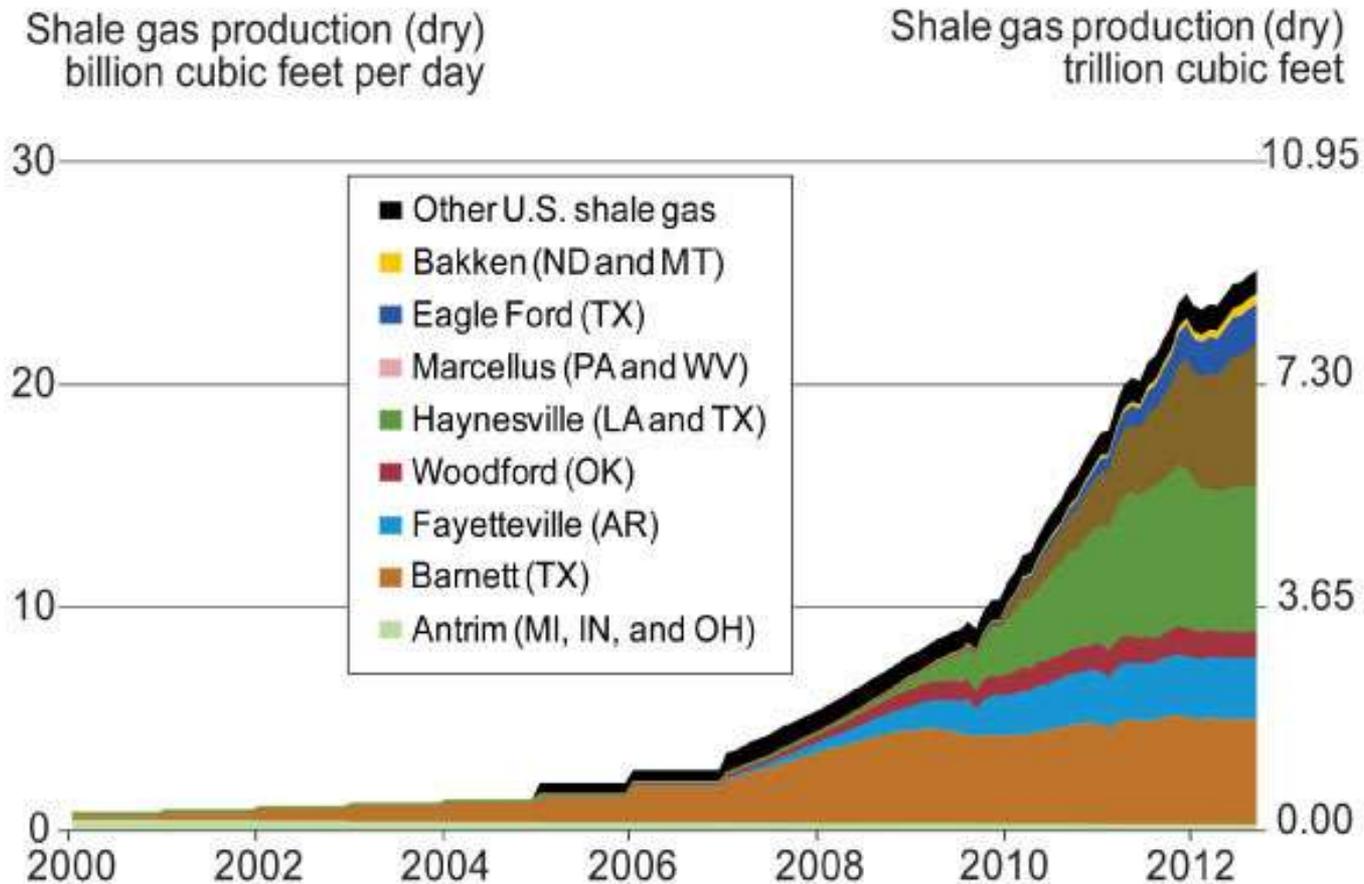
Natural Gas Supply Trends

U.S. Natural Gas Supply, 1990-2035



Source: EIA, *Annual Energy Outlook 2011*

Gas Production Trends by Basin



Sources: LCI Energy Insight gross withdrawal estimates as of September 2012 that are converted to dry production estimates with EIA-calculated average gross-to-dry shrinkage factors by state and/or shale play.

Two Primary Factors Influencing Shale Gas Development (and some types of oil)

- *Horizontal drilling technology*
 - ▣ Horizontal laterals extending 4,000' to 10,000'
 - ▣ Often perpendicular to natural vertical fracture orientation
- *High volume, multi-stage hydraulic fracturing operations*
 - ▣ 6 to 12 frac “stages”
 - ▣ Cumulative frac fluid volume per well can be greater than 8 million gallons of water

The goal is to maximize reservoir contact by exposing vast quantities of surface area within the shale target by creating/interconnecting hydraulic and natural fractures.

History of Well Fracturing

- 1860's – Fracturing can be traced to the 1860's when nitroglycerin was first used to stimulate shallow wells in Pennsylvania, New York, Kentucky, and West Virginia.
- 1947 - Stanolind Oil performed the first experimental treatment to “Hydrafrac” a well in Grant County, Kansas.
- 1949 – A patent was issued and an exclusive license was granted to HOWCO (Halliburton Oil Well Cementing Company) to pump the new Hydrafrac process.
- Early fracturing operations used approx. 750 gallons of fluid (gelled crude oil or kerosene) and 400 lbs of sand. Early fracturing employed only 10 to 15 hydraulic horsepower.
- 1950's – water increasingly became the primary fluid used.
- Hydraulic fracturing routinely used in oil and gas well completions since the mid-1950's in Indiana and virtually every other oil and gas producing state.
- Modern fracturing operations utilize >1,500 hydraulic horsepower and pump rates of more than 100 bbl/minute.
- Specialized additives have been continuously developed to improve the effectiveness of the hydraulic fracturing operation.

What is HF and Why is it Used?

- Creates numerous “pathways” or “conduits” through the producing formation to enhance the flow of oil or gas into the wellbore.
- Usually performed initially when the well is completed and equipped for initial production.
- ***It increases the production of oil and gas from a well.***
Hydraulic fracturing has increased U.S. recoverable reserves of oil by at least 30% and of gas by 90%.

Fractured vs. Non-fractured well

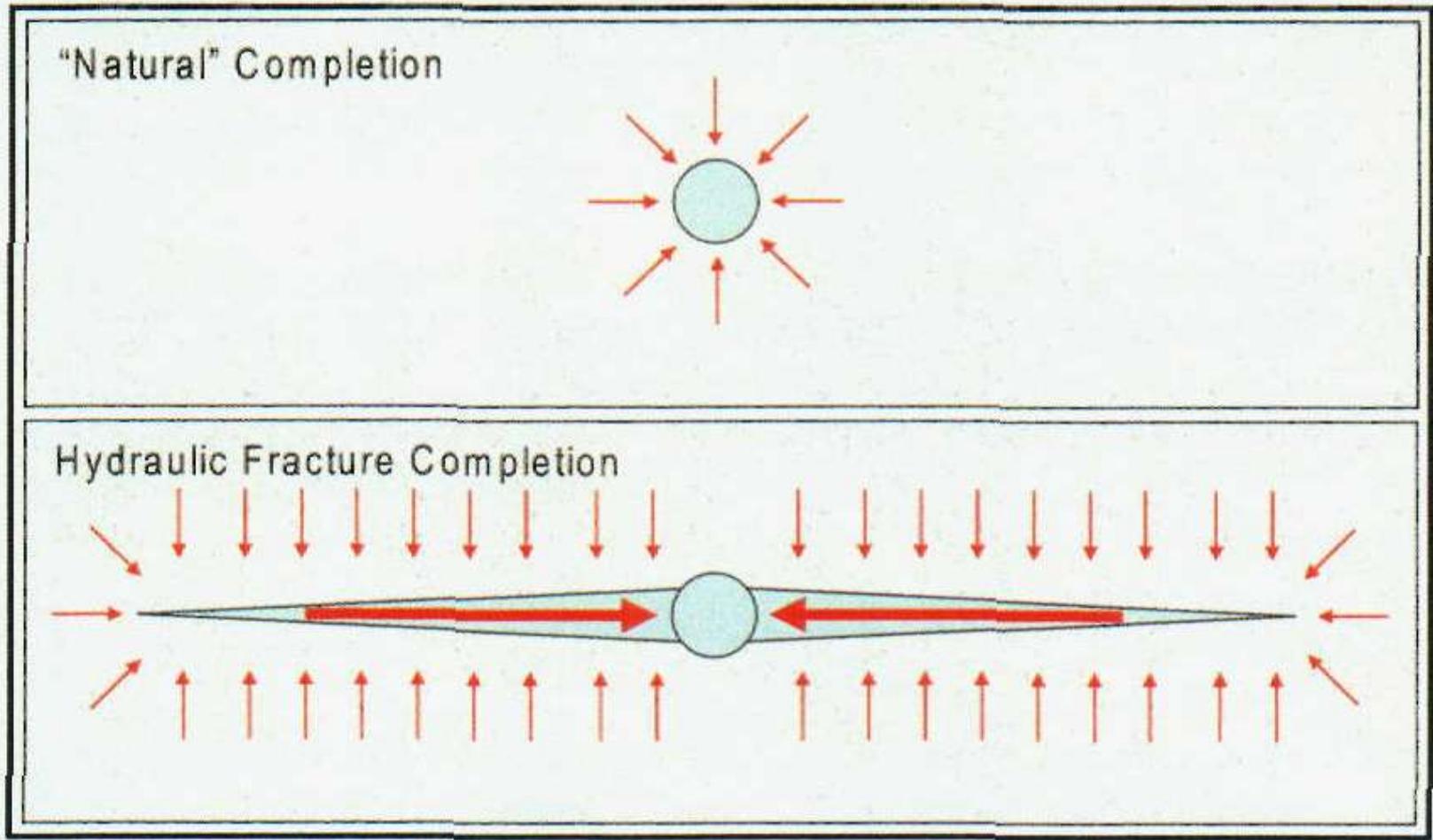
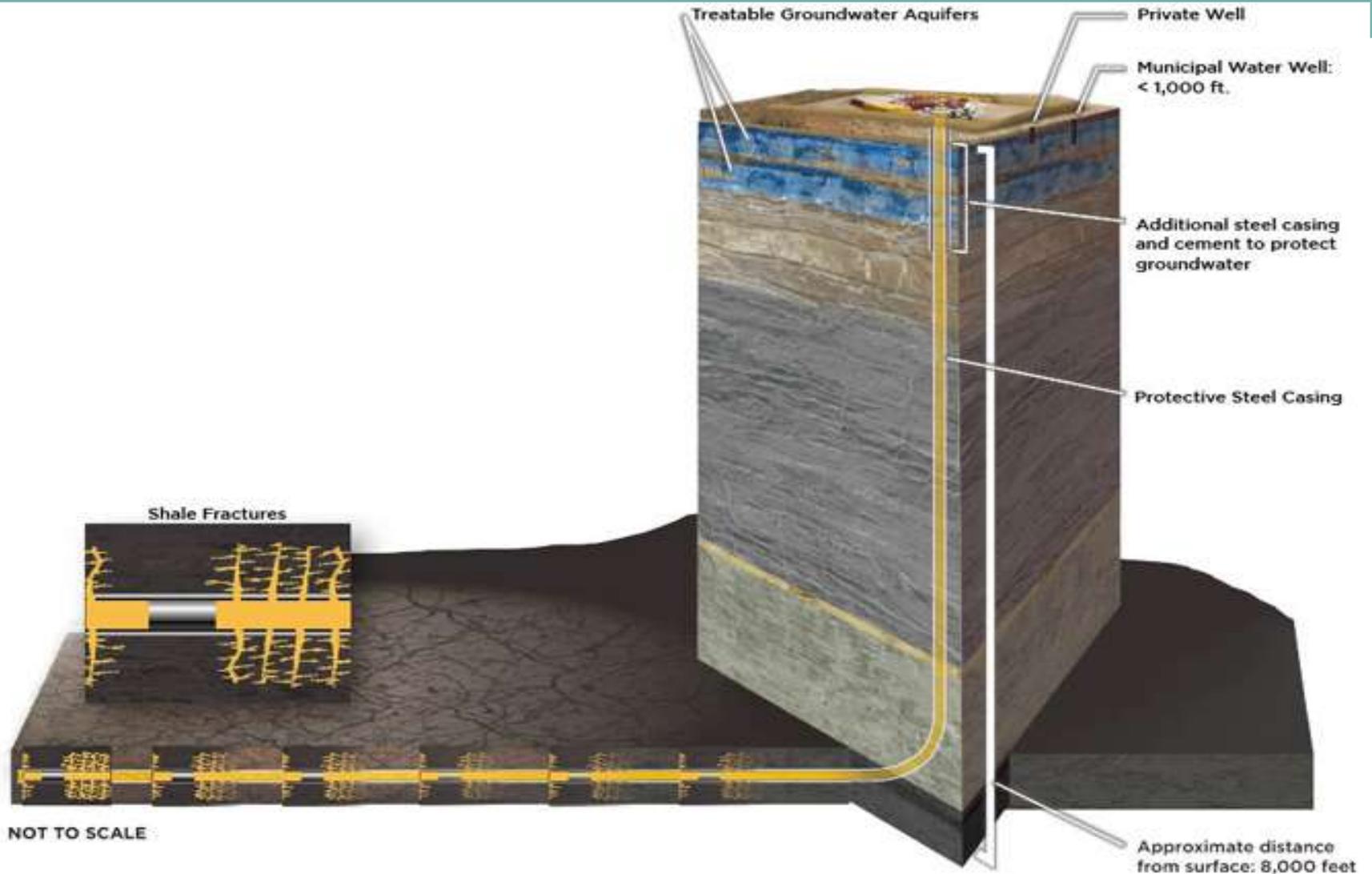


Figure 5—Illustration of a Fractured and a Nonfractured Well

High Volume Multi-Stage Frac



Horizontal Shale Gas Wells and “Multi-Stage” Fracs



What's all the fuss?



The Movie: GASLAND



Mark Raffalo & Pete Seeger
address lawmakers at NYS capital
regarding moratorium, July 2010



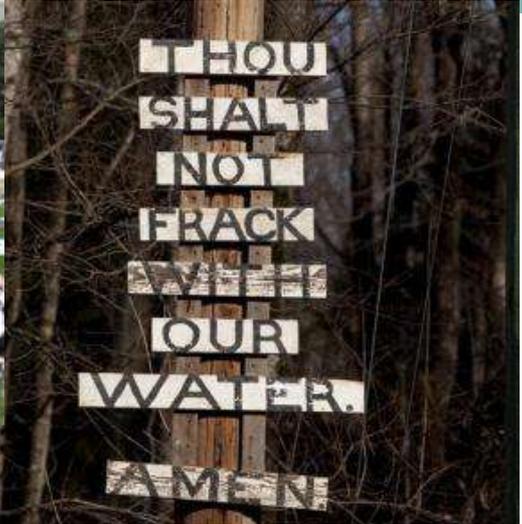
Quebec protester "Shale gas a moratorium now" 8/30/10



NY EPA Scoping Meeting 9/13/10

More Movies Since GasLand: TruthLand, Promised Land, Fracknation

People bring passion to this issue!



Typical Frac Additives

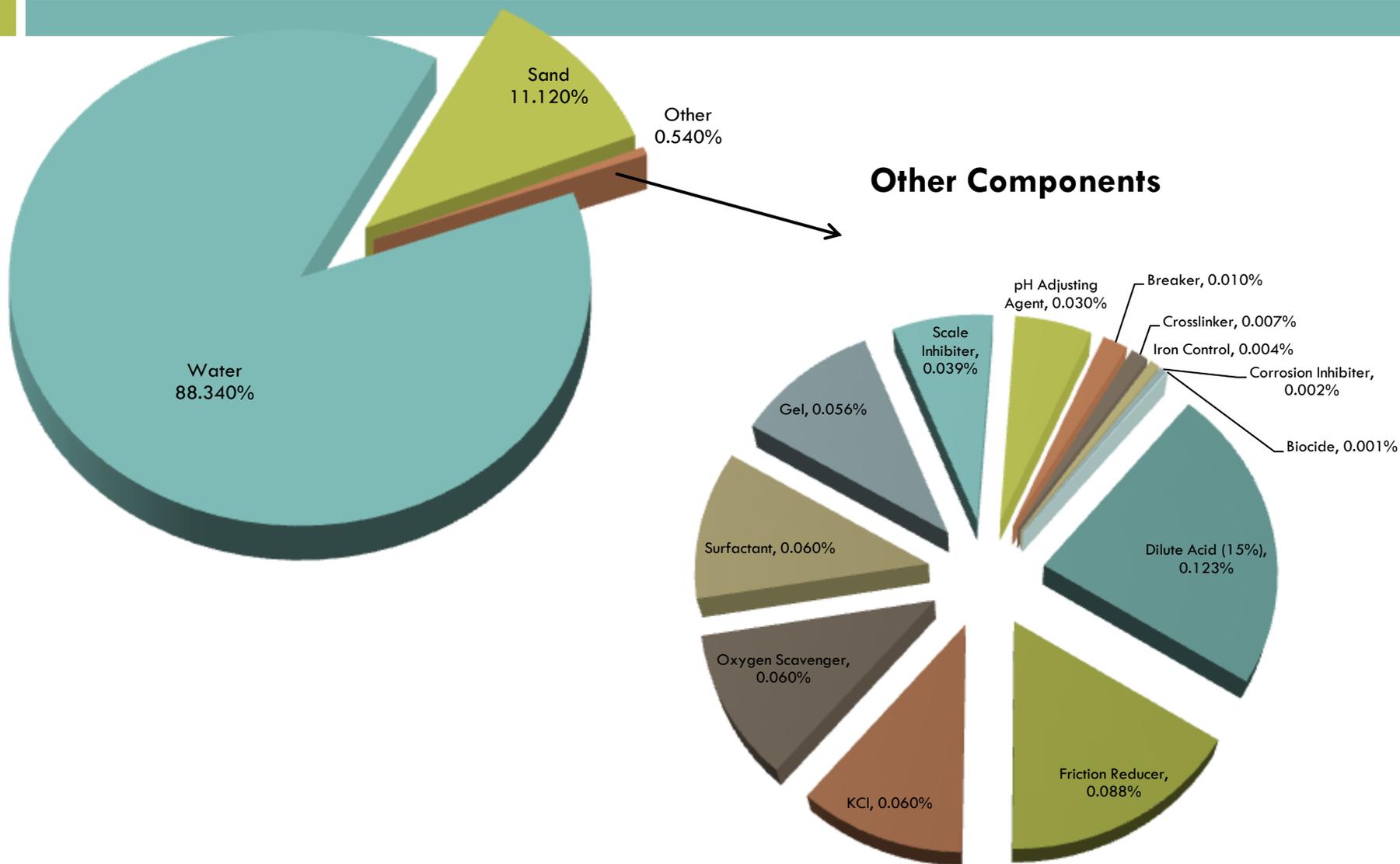
Always



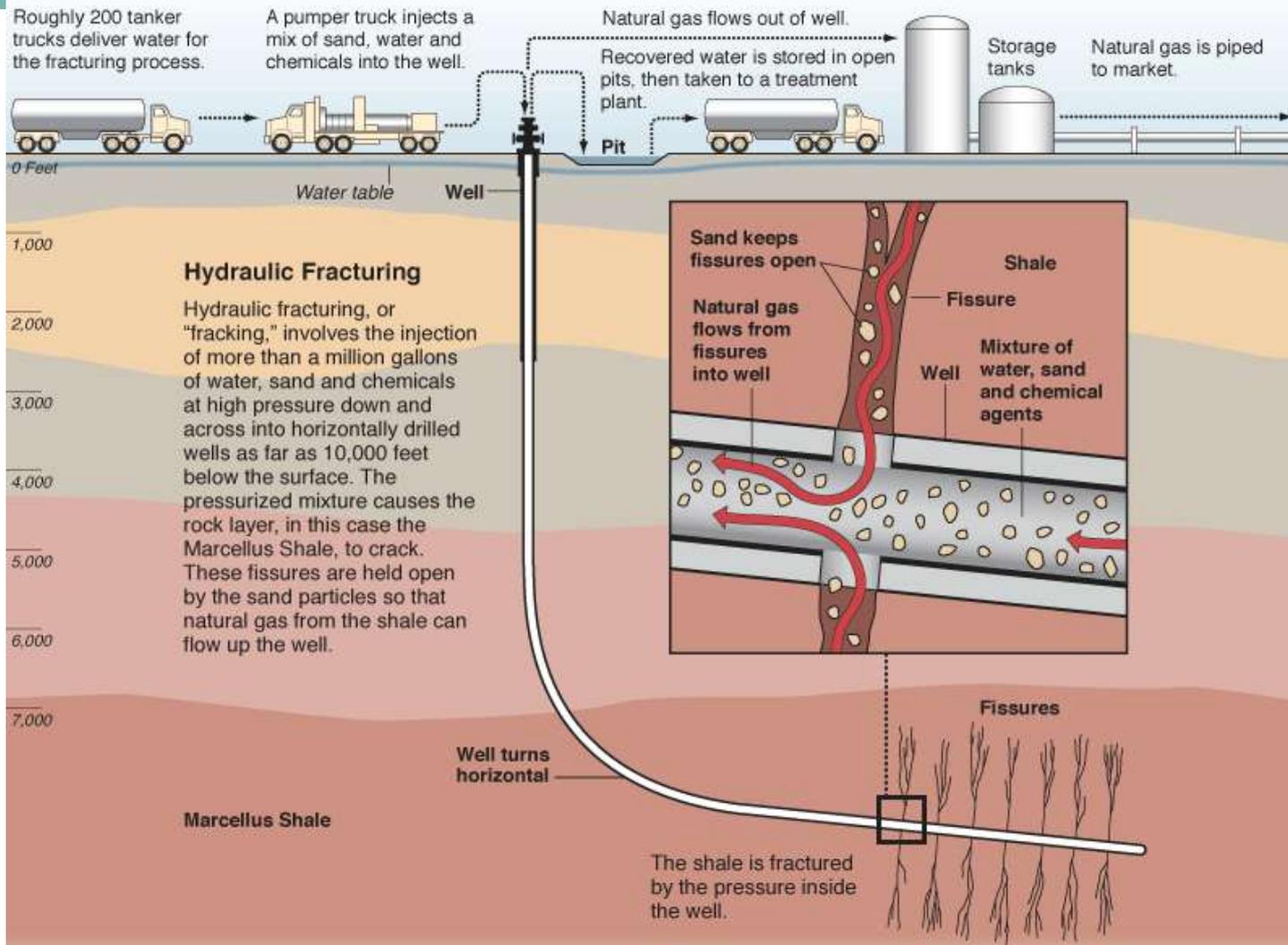
Additive Type	Description of Purpose	Examples of Chemicals ²⁶
Proppant Most important additive after water	"Props" open fractures and allows gas / fluids to flow more freely to the well bore.	Sand [Sintered bauxite; zirconium oxide; ceramic beads]
Acid	Cleans up perforation intervals of cement and drilling mud prior to fracturing fluid injection, and provides accessible path to formation.	Hydrochloric acid (HCl, 3% to 28%)
Breaker	Reduces the viscosity of the fluid in order to release proppant into fractures and enhance the recovery of the fracturing fluid.	Peroxydisulfates
Bactericide / Biocide	Inhibits growth of organisms that could produce gases (particularly hydrogen sulfide) that could contaminate methane gas. Also prevents the growth of bacteria which can reduce the ability of the fluid to carry proppant into the fractures.	Gluteraldehyde; 2-Bromo-2-nitro-1,2-propanediol
Clay Stabilizer / Control	Prevents swelling and migration of formation clays which could block pore spaces thereby reducing permeability.	Salts (e.g., tetramethyl ammonium chloride) [Potassium chloride (KCl)]
Corrosion Inhibitor	Reduces rust formation on steel tubing, well casings, tools, and tanks (used only in fracturing fluids that contain acid).	Methanol
Crosslinker	The fluid viscosity is increased using phosphate esters combined with metals. The metals are referred to as crosslinking agents. The increased fracturing fluid viscosity allows	Potassium hydroxide
	the fluid to carry more proppant into the fractures.	
Friction Reducer	Allows fracture fluids to be injected at optimum rates and pressures by minimizing friction.	Sodium acrylate-acrylamide copolymer; polyacrylamide (PAM)
Gelling Agent	Increases fracturing fluid viscosity, allowing the fluid to carry more proppant into the fractures.	Guar gum
Iron Control	Prevents the precipitation of metal oxides which could plug off the formation.	Citric acid; thioglycolic acid
Scale Inhibitor	Prevents the precipitation of carbonates and sulfates (calcium carbonate, calcium sulfate, barium sulfate) which could plug off the formation.	Ammonium chloride; ethylene glycol; polyacrylate
Surfactant	Reduces fracturing fluid surface tension thereby aiding fluid recovery.	Methanol; isopropanol



Typical Composition of Hydraulic Fracturing Fluid



Schematic of Horizontal Well & HF



Again, "What's all the fuss?"



Quebec protester "Shale gas a moratorium now" 8/30/10



NY EPA Scoping Meeting 9/13/10

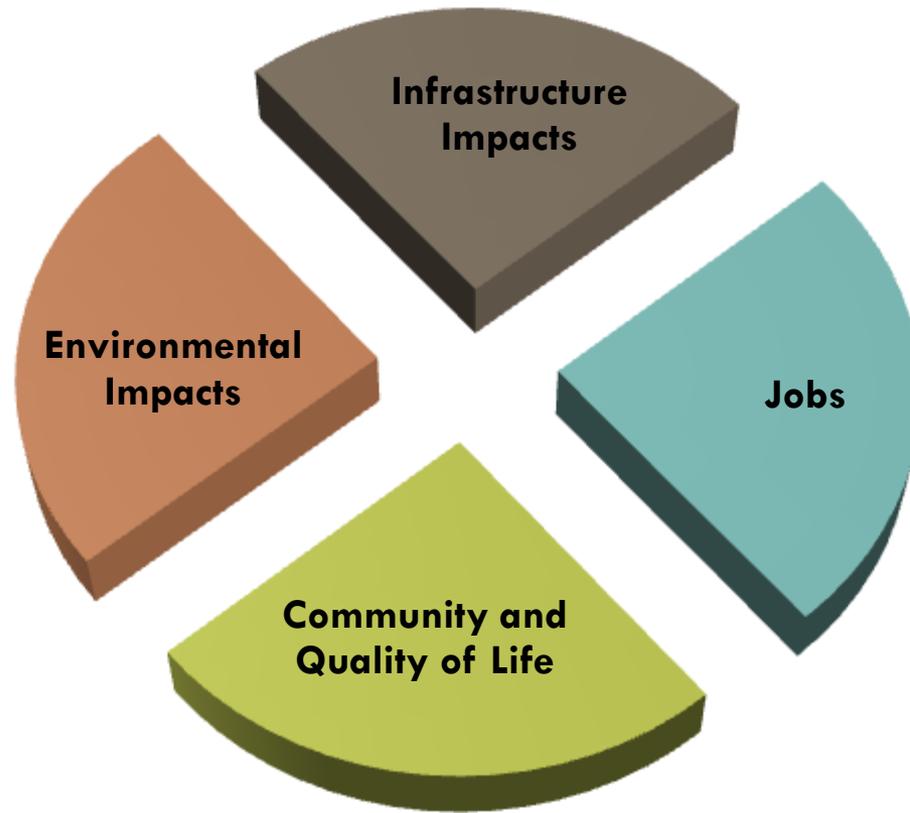


Mark Raffalo & Pete Seeger address lawmakers at NYS capital regarding moratorium, July 2010

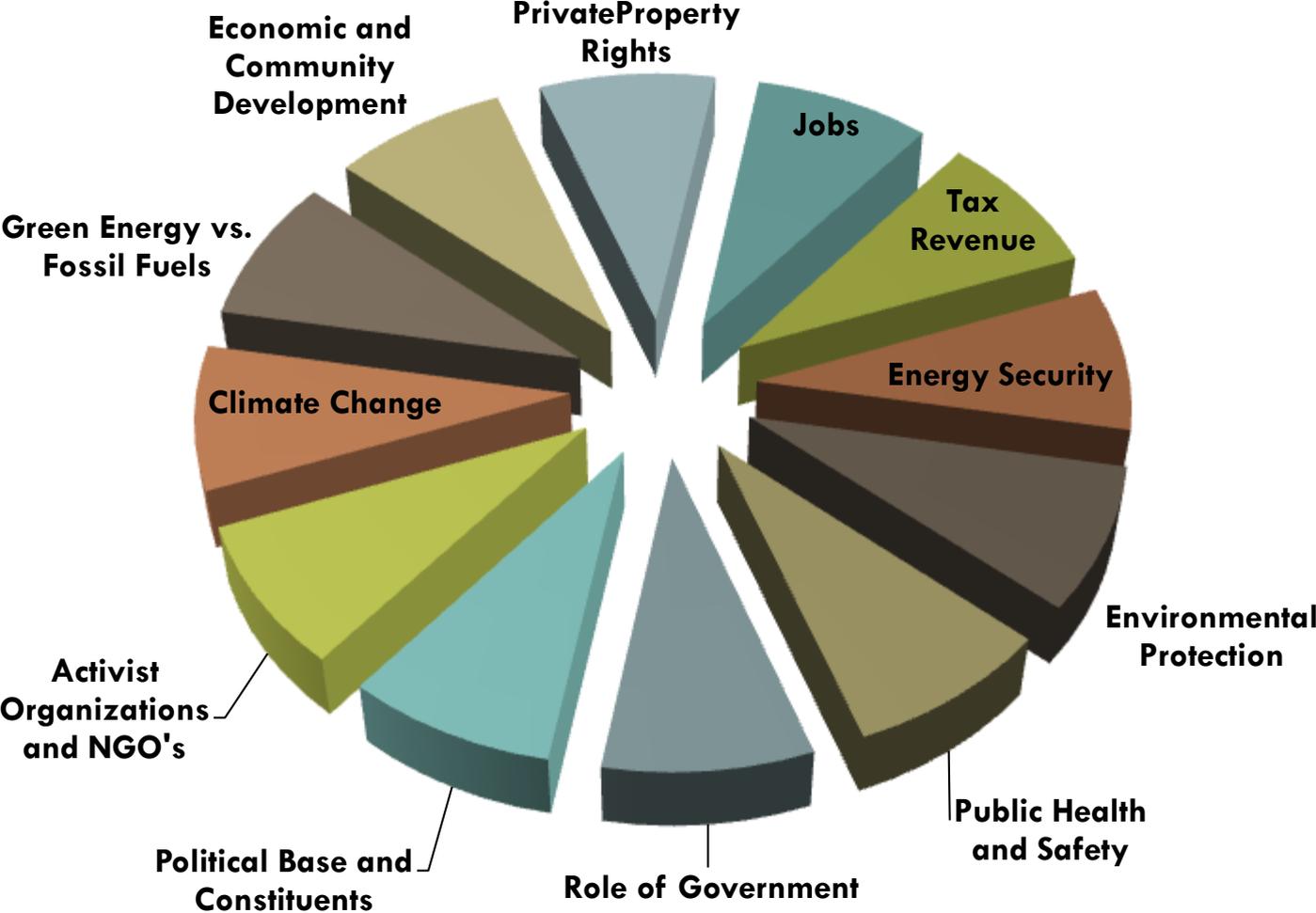
Are we obsessed with HF?

- Our Obsession with HF, the new bellwether?
 - CSI Las Vegas vilifying hydraulic fracturing (Episode 8 of Season 11)?
 - Can you say Frac Daddy (2014 Kentucky Derby)?
- There's a battle raging out there and everybody is weighing in. Very questionable management of the facts.
- The truth is that it isn't all about HF, but it's the convergence of issues involving competing interests and agendas.
- HF is the moniker that seems to have stuck.
- To resolve the issues, it's important to understand some of those competing interests and the varying issues brought to the debate.

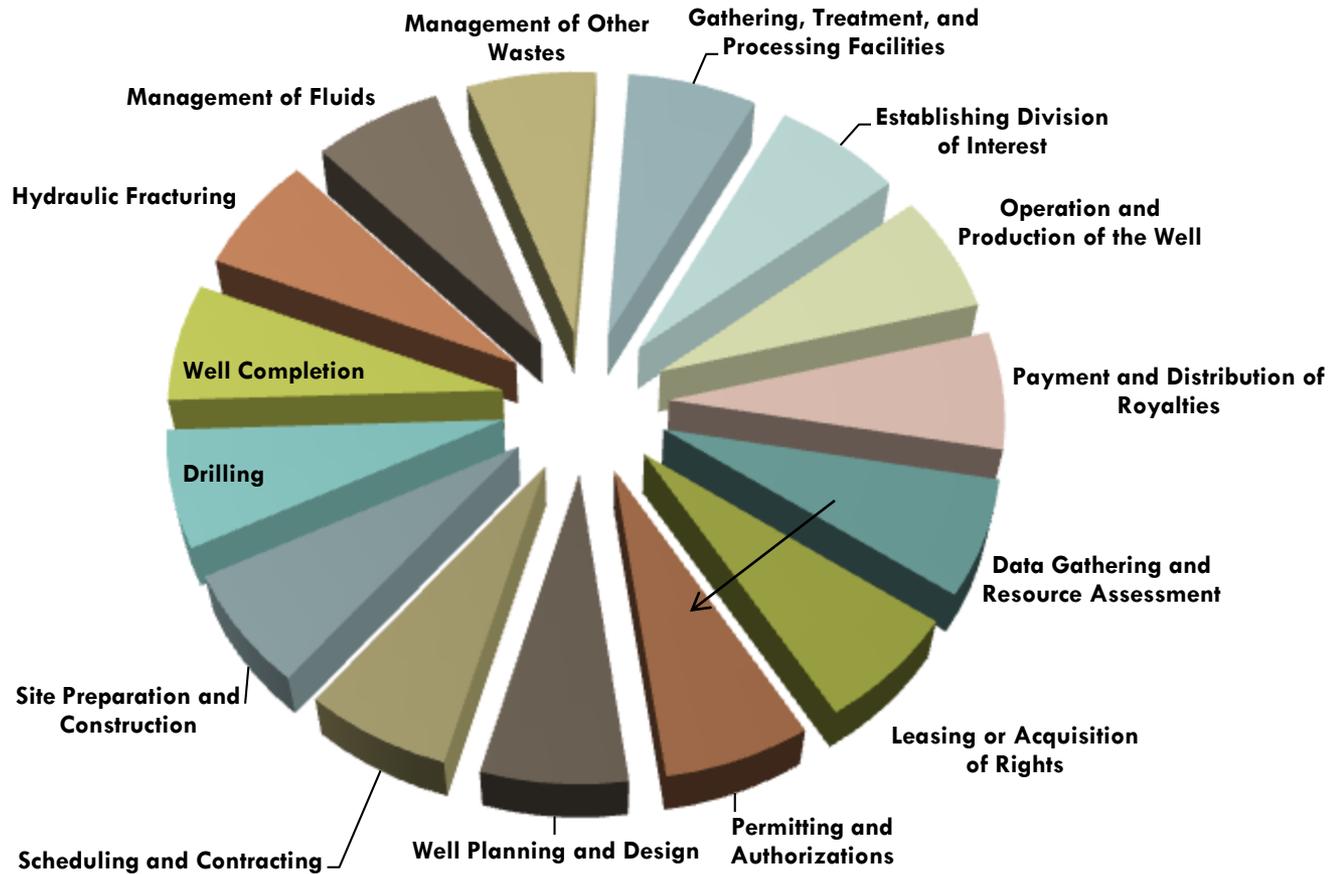
Common Issues – Local Communities



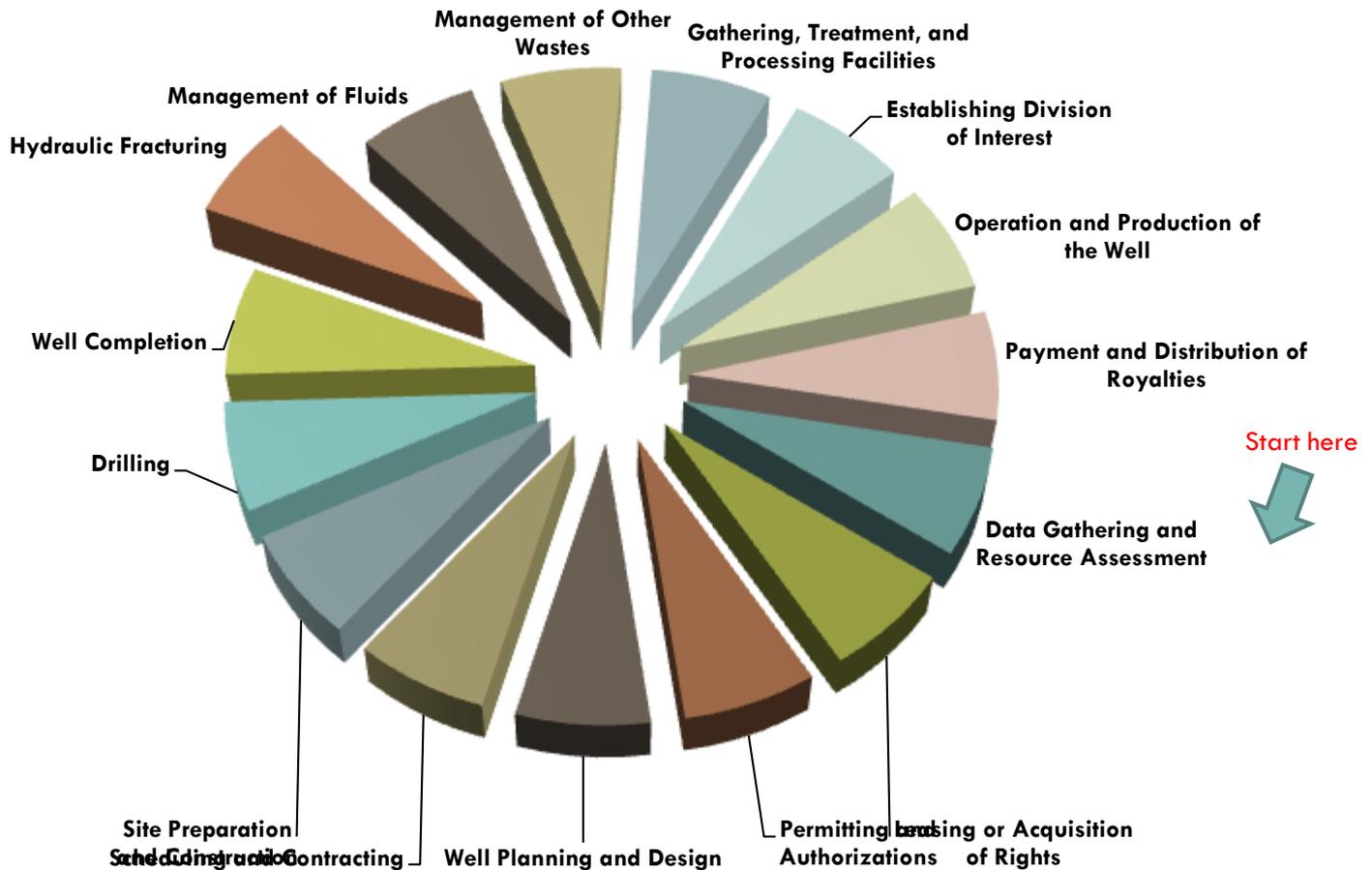
Broader Social/Political Issues



Steps in Operating a Well

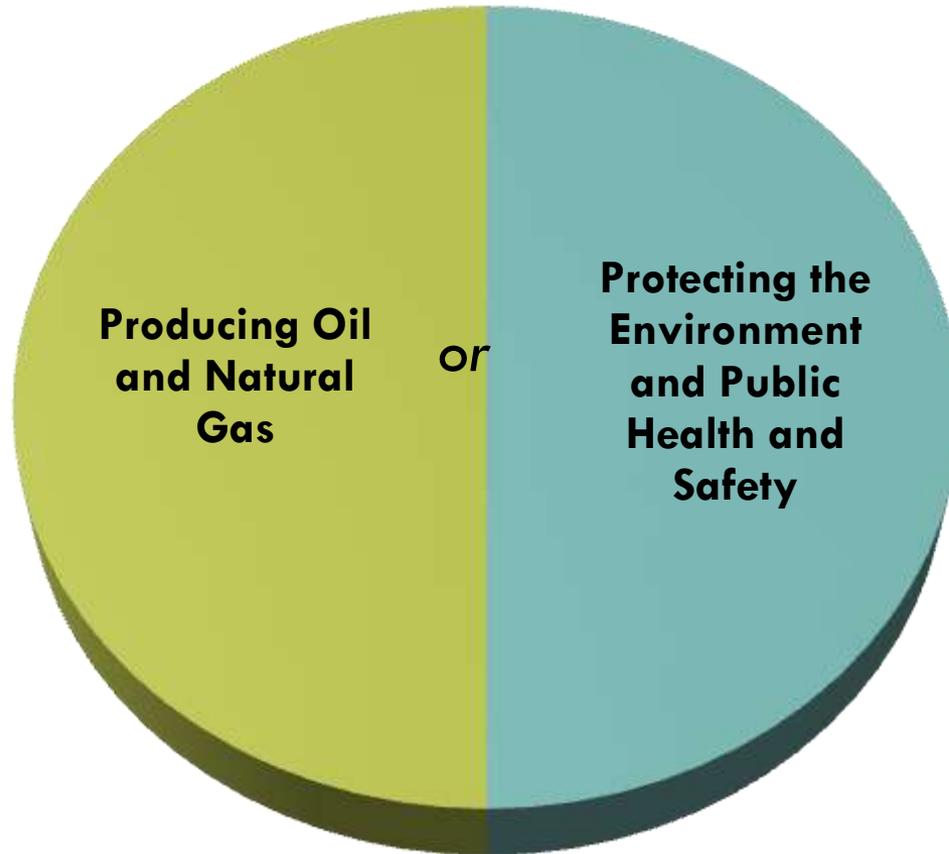


It's Not Just About Hydraulic Fracturing



There are numerous steps in planning for and developing an oil or gas well. Any one of these steps could arouse concerns.

It's Not Either/Or



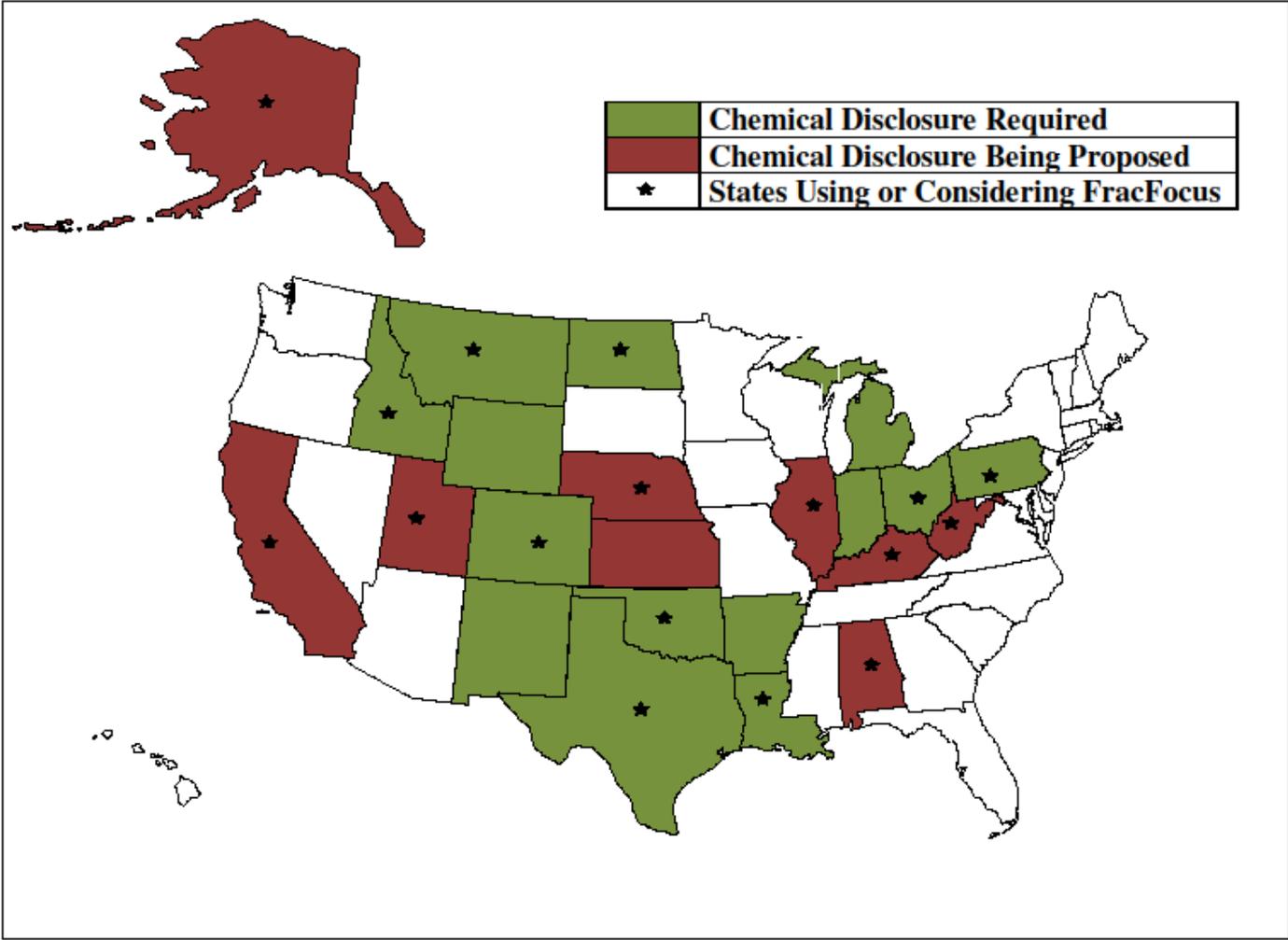
Obstacles (Challenges or Opportunities)

- Our “sound bite” culture and shallow understanding of the issues.
- No Accountability in the world of Blogs, Facebook posts, and Tweets.
- It takes hard work to wade through the “fog” and get to the center of the issues.
- Passion is OK, but those who bring sound, factual information to the table are more effective.

How Is Hydraulic Fracturing Regulated?

- **State Oil and Gas Conservation Laws have always regulated hydraulic fracturing.**
- **Most laws became effective in 1940's.**
- **Hydraulic fracturing developed in the late 1940's and gained popularity in 1950's.**
- **Specific requirements can vary by state but all require detailed reporting of hydraulic fracturing operations such as volumes and types of fluids used and the nature and amounts of proppants.**
- **Information is reported on the Well Completion Report and made a part of the permanent well record.**
- **Not regulated under Safe Drinking Water Act (UIC Program) or any other federal regulatory program unless diesel fuel is used (extremely rare).**
- **States are responding to the new technology and public concerns over transparency by updating their requirements for reporting chemical additive information and making this information available to the public.**

Chemical Disclosure Requirements

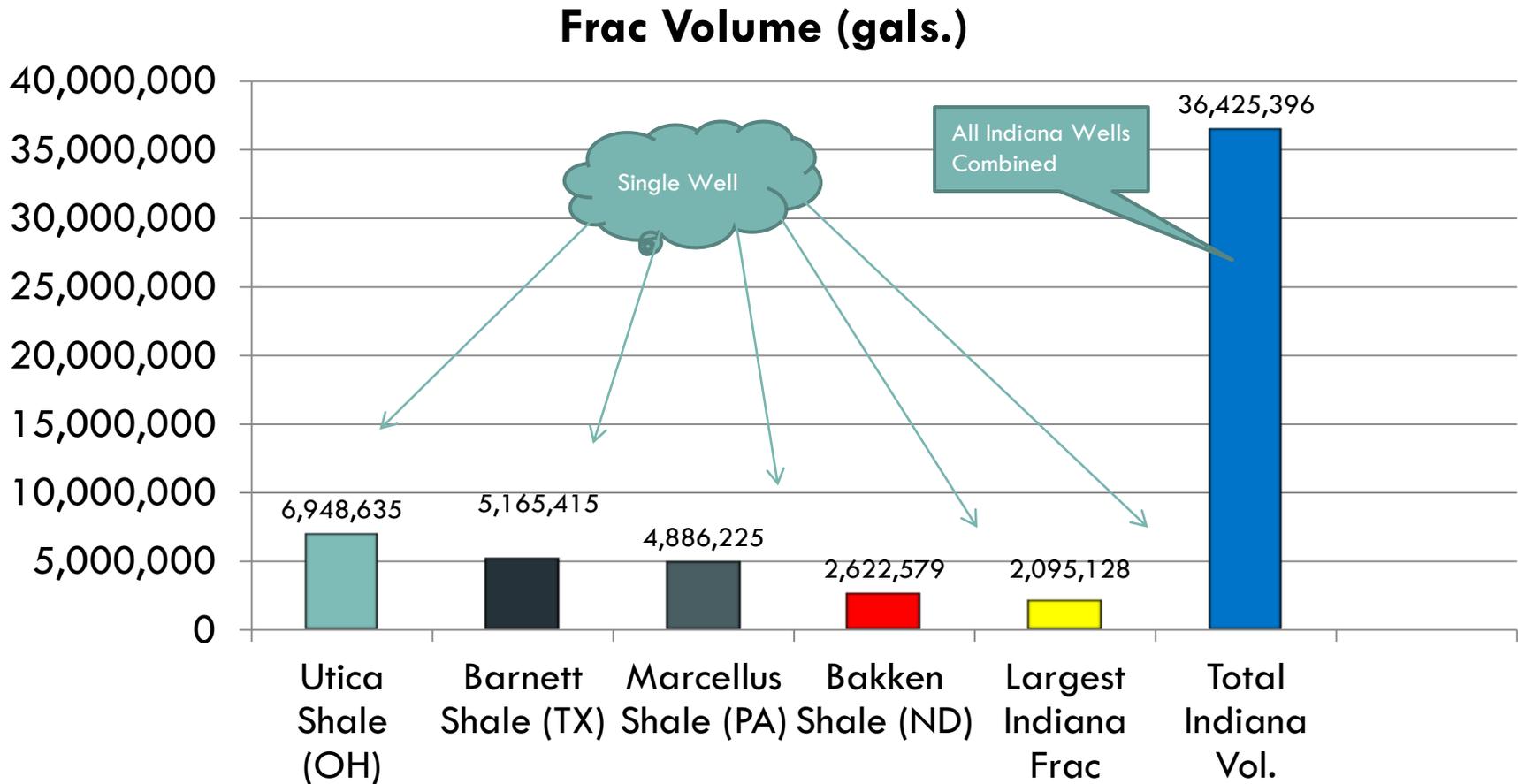


HF in Indiana

- Hydraulic fracturing is indeed relevant to Indiana and has been since it began to be used in the early 1950's.
 - Indiana oil and gas operators continue to utilize hydraulic fracturing to complete wells when they believe the method will increase the productivity of a well. However, not every well is completed using this method.
 - Historically, on average, only about 24% of new oil wells are completed with the use of hydraulic fracturing. Recently we have seen an increase in the use of HF on certain types of oil wells.
 - Percentages for other well types are: 60% of coal bed methane wells, 9% of gas wells, and about 10% of enhanced recovery or disposal wells.
 - As a whole, only 16% of all wells completed in Indiana receive hydraulic fracturing treatments, but the trend is upward in some areas (100% in some limited cases).
- The volumes of fluid used typically in Indiana are substantially less than those volumes reported for horizontal wells in other basins in the U.S.
 - Historically, the average volume of a HF treatment in Indiana has been between 7,000 to less than 20,000 gallons. Other basins are seeing HF operations which utilize more than 10 million gallons per treatment.
 - High volume, multi-stage hydraulic fracturing operations have not been widely used yet in Indiana because they have not been shown to increase the productivity of most wells.
 - A few operators have begun using higher volume fracture treatments in some oil wells in extreme southwestern Indiana. These treatments have resulted in increased productivity and are likely to continue so long as these increases are seen.
 - Volumes of 150,000 to 2,000,000 gallons of water per well are being used with some success.

Comparison of Hydraulic Fracturing Fluid Volumes 2005 to 2013

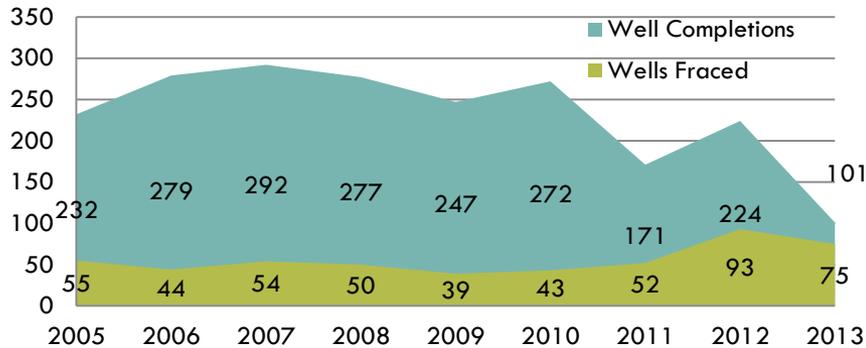
Indiana Wells vs. Other Shale Wells*



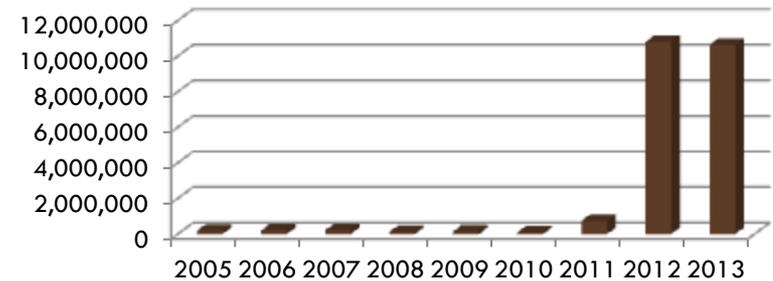
Frac volumes for other shale wells reflect calculations of the average volume data obtained from FracFocus by a random sampling of horizontal wells completed in these basins in 2013. (www.fracfocus.org)

Indiana Hydraulic Fracturing Trends

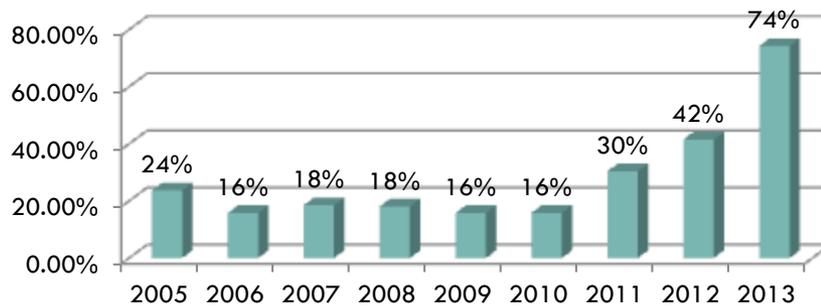
Well Completions and Wells Fraced By Year



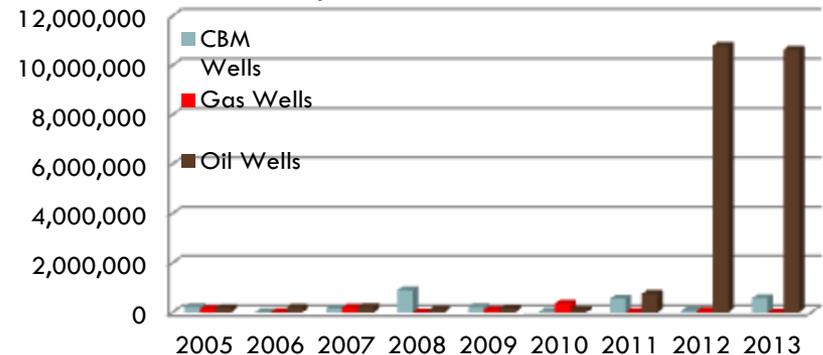
Annual Total Frac Volumes - Oil Wells



Percent of Wells Fraced By Year

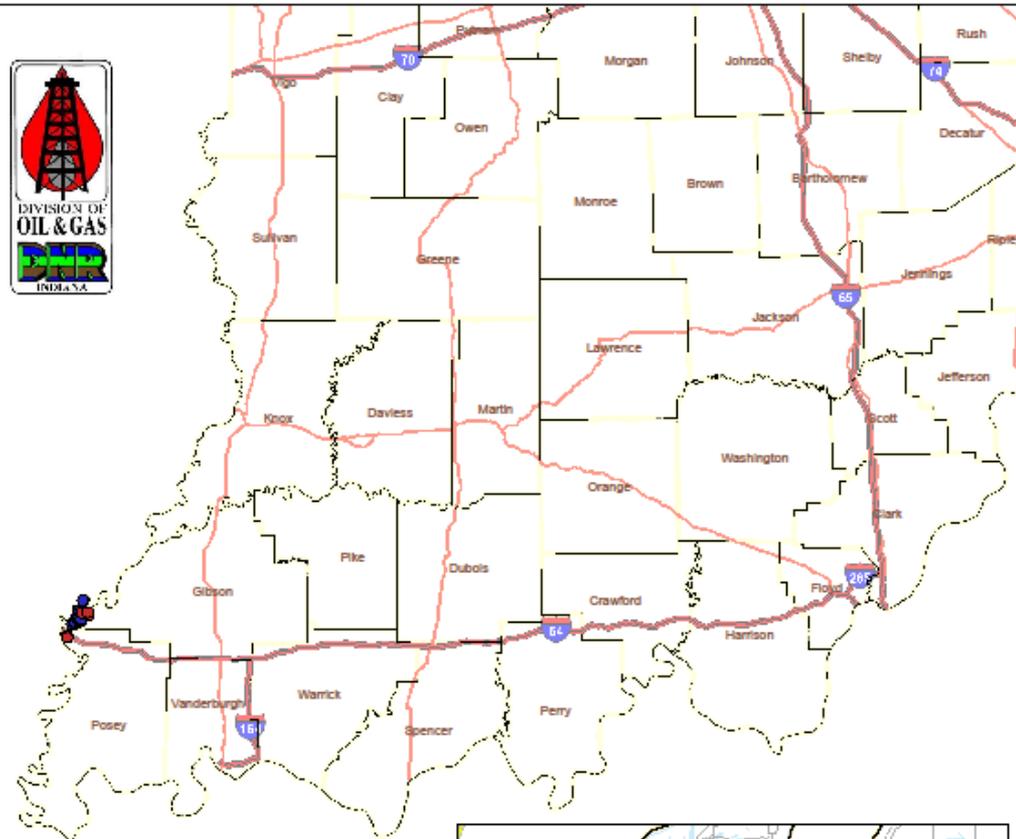


Annual Total Frac Volumes - Gas, CBM, and Oil Wells



Location of Higher Volume Hydraulic Fracturing Operations

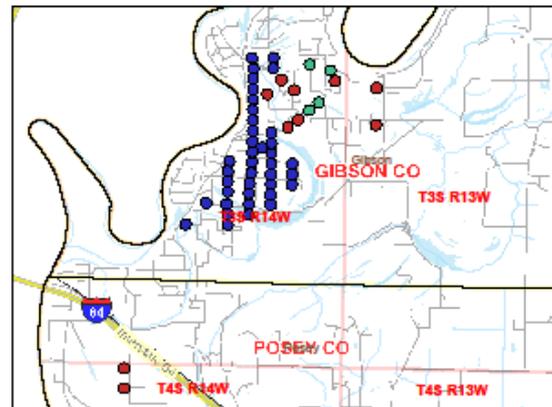
Individual stage volumes >80,000 gals. or total volume >300,000 gals. per well



Legend

High Volume HF Well Locations OPERATOR_NAME

- Becker Oil, Inc.
- Citation Oil & Gas Corp.
- Rex Energy Operating Corp.



DNR Website: DOG Home Page

The screenshot shows the Indiana Department of Natural Resources (DNR) website, specifically the Division of Oil and Gas. The browser is Internet Explorer, and the address bar shows <http://www.in.gov/dnr/dnrol/>. The page layout includes a top navigation bar with links for various state departments, a search bar, and a profile for Governor Mike Pence. The main content area is divided into several sections:

- Left Sidebar:** Contains a 'DNR Home' link, 'Oil & Gas' section, and various utility links like 'About Oil & Gas', 'Contact Oil & Gas', 'FAQs', and 'Permits'.
- Main Content Area:** Features a large banner for 'Indiana Oil and Gas Wells Webmap' with a 'Learn more' button. Below this is a 'Featured Topics' section with four tiles: 'Pending CBM Permits', 'Search Scanned Well Records', 'Frac Fluid MSDS Sheets', and 'Monthly Reports of Activity'.
- Right Sidebar:** Includes 'Online Services FIRST IN LINE EVERY TIME' with a list of services such as 'Checkin game online', 'Sport License QR Certificates', and 'Reserved Hunt Registration'. It also has a 'Stay Connected' section with social media links for YouTube, RSS Feeds, Twitter, and Facebook.
- Bottom Section:** Contains a 'Latest News from Division of Oil and Gas' section with a link to a new brochure about methane hazards in water wells.

At the bottom of the browser window, there is an 'Error on page.' message and a taskbar showing the Start button, several open applications (Inbox - Microsoft Outlook, DNR: Oil & Gas - Wind..., Dogpaws Field - [frm_Ma...]), and the system tray with the time 9:43 AM and 75% zoom level.

DNR Website: Scanned Records Results Table

DNR: Well Records Search - Windows Internet Explorer provided by Microsoft

http://www.in.gov/dnr/dnroll/5447.htm

Search

DNR: Well Records Search

GOVERNOR MIKE PENCE
Visit his Home Page

Indiana Department of Natural Resources **DNR**

Oil & Gas > Permits > Records Scanning Project > Well Records Search

Well Records Search

NOTE: If the "Scan Count" is 0, this file has not yet been scanned. If you are interested in receiving this information, please e-mail ghoffert@dnr.in.gov with your name /company name and attach this form (Excel form) to the email so that we may process your request in a timely manner.

Clicking on the "View Files" hyperlink allows you to view the well and its information. Once there, you will see a list of all available documents for that specific well.

[Download Data](#)

IGS ID	Permit #	County	Twp	Rng	Land Type	Land #	Operator Name	Lease Name	Well #	Status	Scan Count	
130051	042002	Gibson	2S	14W	Section	36	Continental Oil Co.	Amanta Maier	114	Plugged & Abandoned	11	View Files
132102	032246	Gibson	3S	14W	Section	11	Continental Oil Co.	Amanta Maier	72	Plugged & Abandoned	11	View Files
132145	032006	Gibson	3S	14W	Section	12	Continental Oil Co.	Amanta Maier	94	Plugged & Abandoned	11	View Files
132375	033372	Gibson	3S	14W	Section	23	Continental Oil Co.	Bozeman Land Co.	93	Plugged & Abandoned	11	View Files
132386	023731	Gibson	3S	14W	Section	24	Continental Oil Co.	Bozeman Land Co.	106	Plugged & Abandoned	11	View Files
131949	019441	Gibson	3S	13W	Section	16	Continental Oil Co.	F. A. Thrash	8	Plugged & Abandoned	10	View Files
132140	032005	Gibson	3S	14W	Section	12	Continental Oil Co.	D.M. Cooper	9	Plugged & Abandoned	10	View Files
132335	019375	Gibson	3S	14W	Section	23	Continental Oil Co.	Bozeman Land Co.	20	Plugged & Abandoned	10	View Files
132486	024851	Gibson	3S	14W	Section	26	Continental Oil Co.	Bozeman Land Co.	115	Plugged & Abandoned	10	View Files

start | Dogpaws Field - [frm... | VZAccess Manager | DNR: Well Records S... | McDivitt, Herschel - O... | Desktop | 75% | 11:44 AM

HF Product MSDS Sheets

DNR: Material Safety Data Sheets (MSDS) for Hydraulic Fracturing Treatment Additives - Windows Internet Explorer

http://www.in.gov/dnr/dnroll/6599.htm

File Edit View Favorites Tools Help

Favorites Support Free Hotmail Web Slice Gallery alcohol content calculator Microsoft Websites

DNR: Material Safety Dat... Bracketology - NCAA College... broyer - Outlook Web App

IN.gov About Indiana Agriculture & Environment Business & Employment Education & Training Family & Health Law & Justice Public Safety Taxes & Finance Tourism & Transportation

DNR

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Indiana Department of Natural Resources **DNR**

Oil & Gas > Oil and Gas Activity in Indiana > Material Safety Data Sheets (MSDS) for Hydraulic Fracturing Treatment Additives

Material Safety Data Sheets (MSDS) for Hydraulic Fracturing Treatment Additives

IC 14-37, the Oil and Gas Act, requires well operators to disclose the types and amounts of all fluids and products used whenever hydraulic fracturing operations are conducted on any oil or gas well in Indiana.

This table displays information for each product reported to the Indiana Division of Oil and Gas since July 1, 2011, when these reporting requirements became effective. Clicking on a column heading will sort the information in the table by that value. To download and view the MSDS for a specific product, click on the hyperlink highlighted in the column to the far right.

Contact the Division of Oil and Gas (317)-232-4055 with any questions regarding this table or hydraulic fracturing operations in Indiana.

Product Name	Manufacturer Name	Revision Date	Received Date	Product Use	URL
ALPHA 3385	Cleanwater International L.L.C.	3/4/2010		Corrosion Inhibitor	View MSDS for this product
ASP-364	ONDEO Nalco Energy Services L.P.	1/25/2006		Iron Sequestrant	View MSDS for this product
ASP-600	Nalco Company	6/8/2011	9/6/2012	Friction Reducer	View MSDS for this product
BIO CLEAR 1000	Cleanwater International L.L.C.	3/4/2009		Biocide	View MSDS for this product
BioBrom C-103L	WST, Inc.	9/16/2011		Biocide	View MSDS for this product
BXL 8.5C	Cleanwater International L.L.C.	1/22/2009		CrossLinker	View MSDS for this product
BXL A	Cleanwater International L.L.C.	9/19/2006		Gel Breaker	View MSDS for this product
CC-120	Cleanwater International L.L.C.	1/1/2006		Clay Stabilizer	View MSDS for this product
CS11-35	CESI Chemical	1/6/2006	11/27/2012	Clay Stabilizer	View MSDS for this product
DCF-480	WST, Inc.	12/2/2011	9/6/2012	Clay Control	View MSDS for this product
EC0312A	ONDEO Nalco Energy Services L.P.	4/23/2001		Hydrocarbon Solvent	View MSDS for this product
EC6116A	Nalco Company	10/21/2010	3/6/2012	Biocide	View MSDS for this product
EC9041A	ONDEO Nalco Energy Services L.P.	10/26/2006		Solids Dispersant	View MSDS for this product
FRP-121	Cleanwater International L.L.C.		3/6/2012	Friction Reducer	View MSDS for this product
GA-40V	CESI Chemical	2/2/2006	11/26/2012	Gum Gum	View MSDS for this product
Hydrochloric acid, 17 to 37%	Jones-Hamilton Co.	1/1/2003		Acidizing	View MSDS for this product
LEB 10K	Cleanwater International L.L.C.	1/1/2006		Gel Breaker	View MSDS for this product
LEB-4	CESI Chemical	2/3/2006	11/26/2012	Breaker	View MSDS for this product

Sign up to receive e-mail and wireless updates from DNR

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15 Informal Hearing Schedule and Final Orders >>

WEEKLY PERMITS LIST

Scanned well records

Error on page.

Trusted sites 75%

Start Inboxes - Microsoft Outlook pics more - Message (HT... DNR: Material Safety ... Dogpaws Field - [frm_Ma... Search Desktop 9:46 AM

Division of Oil and Gas Web map

Windows Internet Explorer browser window displaying the "DNR Oil and Gas Well Records" map. The address bar shows the URL: <http://gis.in.gov/apps/dnr/oilgaswells/>.

The map displays the state of Indiana, showing a dense distribution of wells. A legend on the right side of the map indicates the following layers:

- Hydraulically Fractured Wells
- Oil and Gas Wells
- Underground Coal Mine Permits
- Water Wells
- Water Withdraw Facilities
- Federal Lands, Open
- State Lands

The map shows a high concentration of red and green markers, primarily in the central and southern regions of Indiana. Major cities like Indianapolis, Bloomington, and Louisville are visible. The map includes a scale bar (0 to 100 km) and a DNR logo in the bottom left corner.

Windows taskbar at the bottom shows the Start button, taskbar icons for Microsoft Outlook, IDNR Oil and Gas Well..., Dogpaws Field - [frm_se..., and Document1 - Microsoft..., and the system tray with the time 10:07 AM.

Indiana Geological Survey - PDMS

The screenshot shows a web browser window displaying the Indiana Geological Survey (IGS) website. The browser's address bar shows the URL <http://igs.indiana.edu/IGS/PDMS/Search/IGS>. The website header includes the IGS logo and the text "Indiana Geological Survey A research institute of the OVPR". Below the header is a navigation menu with links for "HOME", "General Geology", "Energy & Mineral Resources", "Water and Environment", "Geological Hazards", "Maps and Data", "Educational Resources", and "Research".

The main content area is titled "PDMS - Search Well Record Tables". It features a search form with the following fields and options:

- IGS ID:** Text input field
- Permit Number:** Text input field
- Operator Name:** Text input field
- Lease Name:** Text input field
- Well No.:** Text input field
- County:** Dropdown menu with a list of counties: Adams, Allen, Bartholomew, Benton.
- Township:** Number and Direction dropdowns.
- Range:** Number and Direction dropdowns.
- Meridian:** Radio buttons for 1st and 2nd.
- Land Number:** Text input field
- Land Unit:** Dropdown menu with "All" selected.
- Land Unit Name:** "Pick Land Unit" button.
- Posted TD:** From and To text input fields.
- TD Formation:** From and To dropdown menus with "Surface" and "Ard. Deeper" selected.
- Completion Date:** From and To date pickers.
- Completion Formation:** Dropdown menu with "All" selected.
- Report Type:** Dropdown menu with "All" selected.
- Petroleum Field:** Dropdown menu with "All" selected.
- Former Field Name:** Dropdown menu with "All" selected.
- Well Type:** Radio buttons for All, Oil, Gas, Gas Storage, Service, Strip Test, and Dry.

On the left side of the page, there is a sidebar with the following sections:

- PDMS**
 - PDMS Home
 - PDMS Help
 - Subscription Packages
 - Frequently Asked Questions
- PDMS Tools**
 - Well Record Tables
 - Map Viewer
 - Fields and Production
- More IGS Resources**
 - Related Bookstore Items

The browser's taskbar at the bottom shows the "Downloads" folder and a file named "log.Methane100". The system tray in the bottom right corner shows "100%" and "Clear".

Indiana Geological Survey - PDMS

The screenshot displays the Indiana Geological Survey's Petroleum Database Management System (PDMS) web interface. The browser window shows the URL <http://www.igs.in.gov>. The page header includes the Indiana University logo and the text "IGSMap Petroleum Database Management System". A navigation menu on the left is titled "Select Layers" and is divided into "Free" and "Premium" sections. The "Free" section includes "Petroleum Wells and Labels" with sub-options for "Oil", "Gas", "Gas Storage", "Service Wells", "Well Symbols", "3D Labels", "YD Labels", and "TD Formation Labels". The "Premium" section includes "Play Zones By Formation", "Color-Coded Play Zones", and "Color-Coded Shows (Incomplete)". The main map area shows a map of Indiana with county boundaries and numerous red and green dots representing petroleum wells. The map is overlaid on a grid of latitude and longitude coordinates. The bottom of the page contains contact information for the Indiana Geological Survey, including the address "111 W. Walnut Grove Ave., Bloomington, IN 47406-2218", phone number "812-855-7476", email "igs@igs.indiana.edu", and copyright notice "Copyright © 2011 The Trustees of Indiana University. All rights reserved. | Disclaimer | Privacy Policy".

Select Layers

Free

- ▶ Petroleum Wells and Labels
 - Oil
 - Gas
 - Gas Storage
 - Service Wells
 - Well Symbols
 - 3D Labels
 - YD Labels
 - TD Formation Labels
- ▶ Petroleum Fields
- ▶ Specific Well Data
- ▶ Reference Features

Premium

- ▶ Play Zones By Formation
- ▶ Color-Coded Play Zones
- ▶ Color-Coded Shows (Incomplete)

UTM: 507237, 4619451
Scale: 1:2500000

1:2500000
0 20 40mi

Indiana Geological Survey
111 W. Walnut Grove Ave., Bloomington, IN 47406-2218 | phone: 812-855-7476 email: igs@igs.indiana.edu | status
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Site Design by: Michael Jan Soren, Soren

The path forward

- Dialogue should continue in order to inform those who are interested in a better understanding of the issues and to shape reasonable policy on the use of hydraulic fracturing.
- Getting the right people around the right tables and engaging in the sharing of accurate, reliable information and avoiding hidden agendas.
- Remember that drilling is drilling, well construction is well construction, surface spills are surface spills, producing is producing, and fracking is fracking, each with their own unique characteristics, risks, and solutions.
- Identifying the most effective means of guarding against adverse impacts to public health and safety and to the environment and whether those should be at local, state, or federal level.
- **Ensuring the protection and preservation of private property rights.**
- **Promoting the responsible development of oil and natural gas.**
- Fix what needs fixed and **avoid one-size fits all solutions** - outcomes can and should vary by state and region and must reflect those issues that are relevant considering state and local variables.
- **States are in the best position to address the regulation of the actual practice of hydraulic fracturing and its related processes given their role (and responsibility) as primary regulators of oil and gas drilling and production and their familiarity of the geology and hydrology within their state.**
- Be transparent and remain flexible and ready to adapt to evolving technologies and management practices.

Key HVMSHF Issues

- **Things at the surface:**
 - Impacts upon water availability.
 - Storage of HF fluids and additives.
 - Storage of “flowback” fluids and solids.
 - Proper management and disposal of HF wastes.
 - Impacts of disposal practices.
- **Things going on underground:**
 - Protection of groundwater and other underground resources.
 - Well design, construction, and integrity.
 - Potential fluid migration pathways.
 - Physical isolation and containment of fluids.
- **Matters of oversight, accountability, and management systems:**
 - The rule of law and differing roles of government jurisdictions.
 - Degree and nature of regulatory oversight, inspections, and reporting of activities.
 - Transparency, “right to know”, and information/education.
 - Permanent records retention and public availability.
 - Monitoring systems to detect failures or compromises to integrity.
 - Contingency plans including protective and remedial measures to be taken when failures occur.
 - Encourage reduction, reuse, and recycling.

. . . Just Saying

President Barack Obama



“ We should strengthen our position as the top natural gas producer ... [I]t not only can provide safe, cheap power, but it can also help reduce our carbon emissions.”

“ We produce more natural gas than ever before -- and nearly everyone's energy bill is lower because of it. [T]he natural gas boom has led to cleaner power and greater energy independence. We need to encourage that.”



“ There's nothing inherently dangerous in fracking that sound engineering practices can't accomplish.”

Gina McCarthy
Current EPA Administrator

“ I'm not aware of any proven case where the fracking process itself has affected water.”



Lisa Jackson
Former EPA Administrator



“ I still have not seen any evidence of fracking per se contaminating groundwater.”

“ I think the issues in terms of the environmental footprint of hydraulic fracturing are manageable.”

Ernest Moniz
Current Secretary of Energy

“ This [hydraulic fracturing] is something you can do in a safe way.”



Steven Chu
Former Secretary of Energy



“ Fracking has been done safely for many, many years.”

“ By using directional drilling and fracking, we have an opportunity to have a softer footprint on the land.”

Sally Jewell
Current Secretary of Interior

“ There's a lot of hysteria that takes place right now with respect to hydraulic fracking... My point of view, based on my own study of hydraulic fracking, is that it can be done safely and has been done safely hundreds of thousands of times.”



Ken Salazar
Former Secretary of Interior



Questions?

Indiana Division of Oil and Gas

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