

NACWA 2012 National Pretreatment and Pollution Prevention Workshop

What's the Fracking Problem?

Solutions for Hydraulic Fracturing Wastewater

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May 10, 2012,
Pensacola, Florida

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A Brief History of Hydraulic Fracturing

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Hydraulic Fracturing: A 60 Year History



In 1947, Stanolind Oil conducted the first experimental fracturing in the Hugoton field located in southwestern Kansas. The treatment utilized napalm (gelled gasoline) and sand from the Arkansas River. – Society of Petroleum Engineers

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Hydraulic Fracturing: A 60 Year History

1948

- The first recorded use of hydraulic fracturing was in 1948.
- Hydraulic fracturing has been in near continuous commercial use since 1949.

1997

- The first successful use of modern “slickwater” or “light sand” fracturing was in 1997 in the Barnett Shale of Texas.

2011

- Unconventional natural gas plays, i.e. hydraulic fracturing, represent 60% of the growth in technically recoverable domestic natural gas reserves.

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Hydraulic Fracturing: A 60 Year History

Why the boom of the past decade?

● **High natural gas prices** in the late 1990s and early 2000s spurred the boom.

● **Advancements in Horizontal Drilling.**

Six to eight horizontal wells = **sixteen** vertical wells. Horizontal drilling made unconventional plays economically feasible.

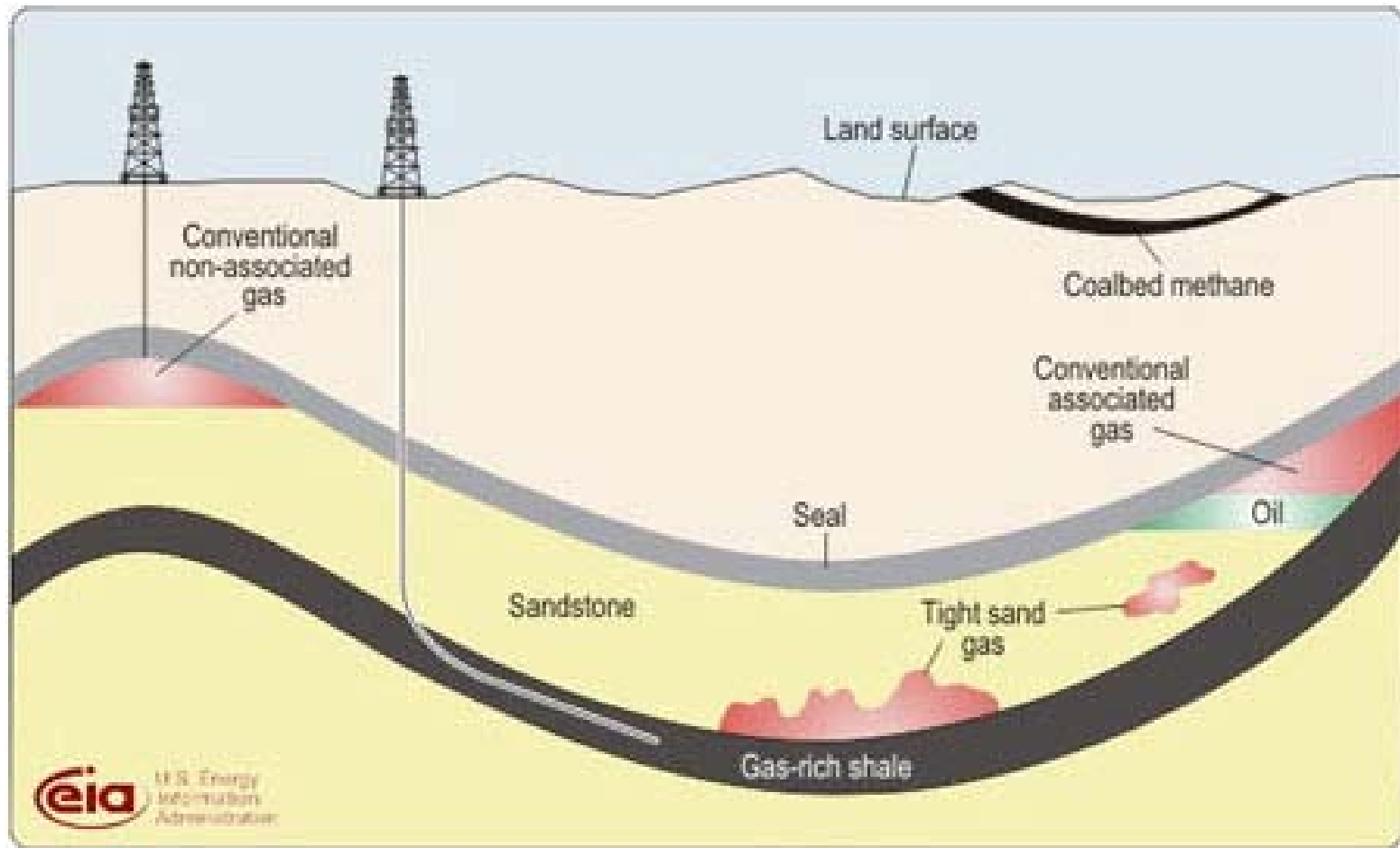
● **Advancements in Hydraulic Fracturing.**

This includes improvements to proprietary frack fluid formulas, including the refinement of “slickwater” or “light sand” fracking.

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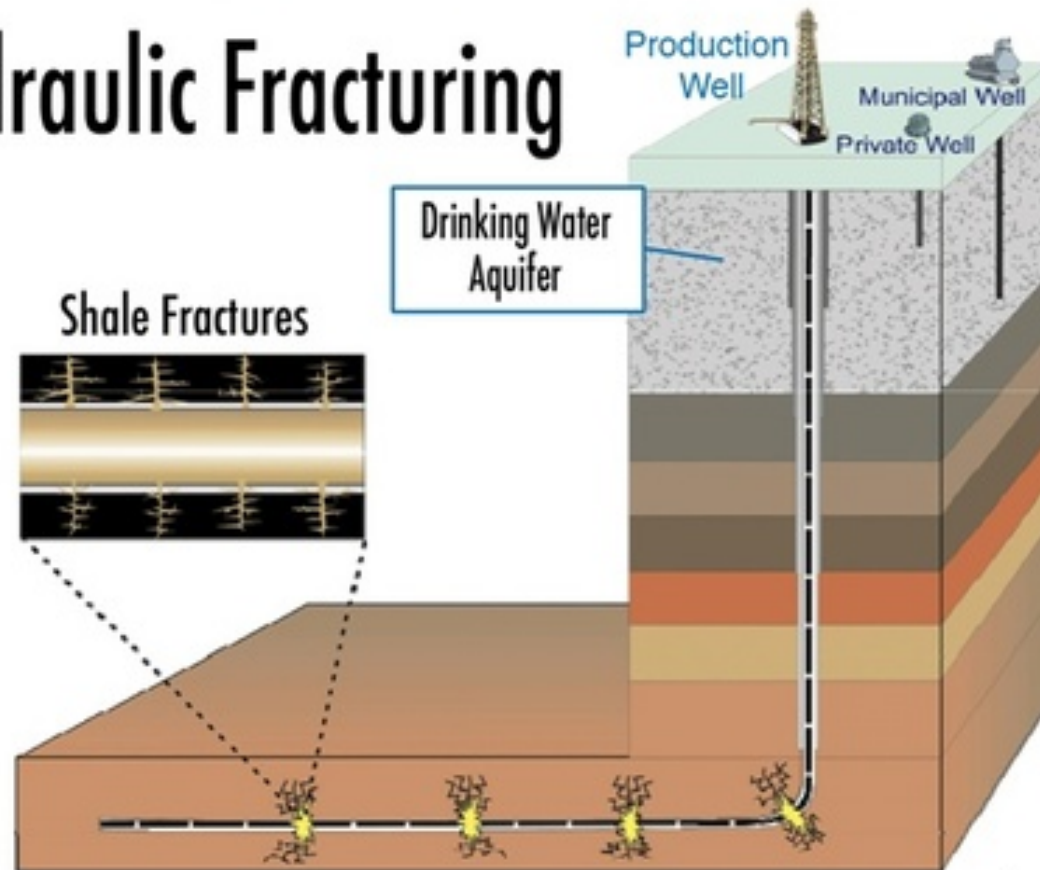
Basic Facts



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Hydraulic Fracturing



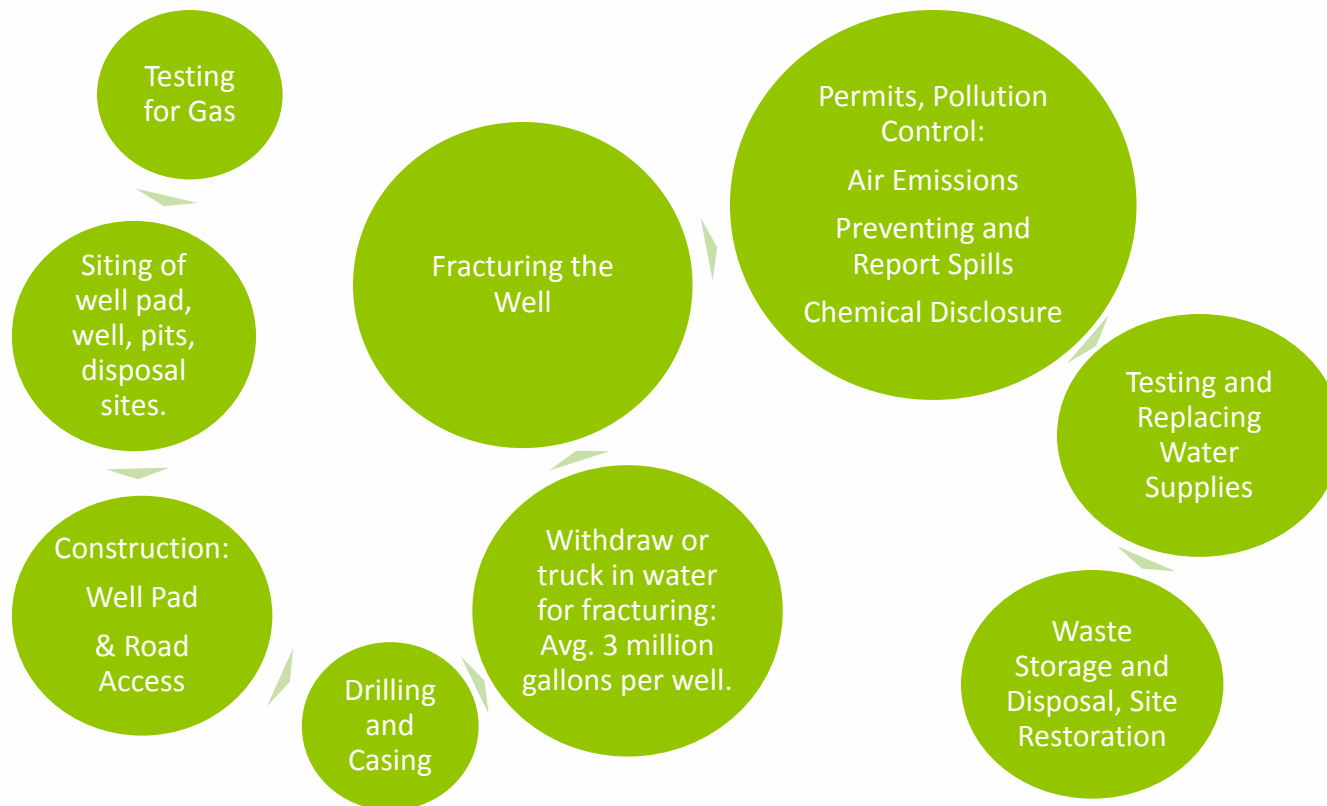
Source: EPA

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Hydraulic Fracturing: Technical Basics



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Economic and National Benefits

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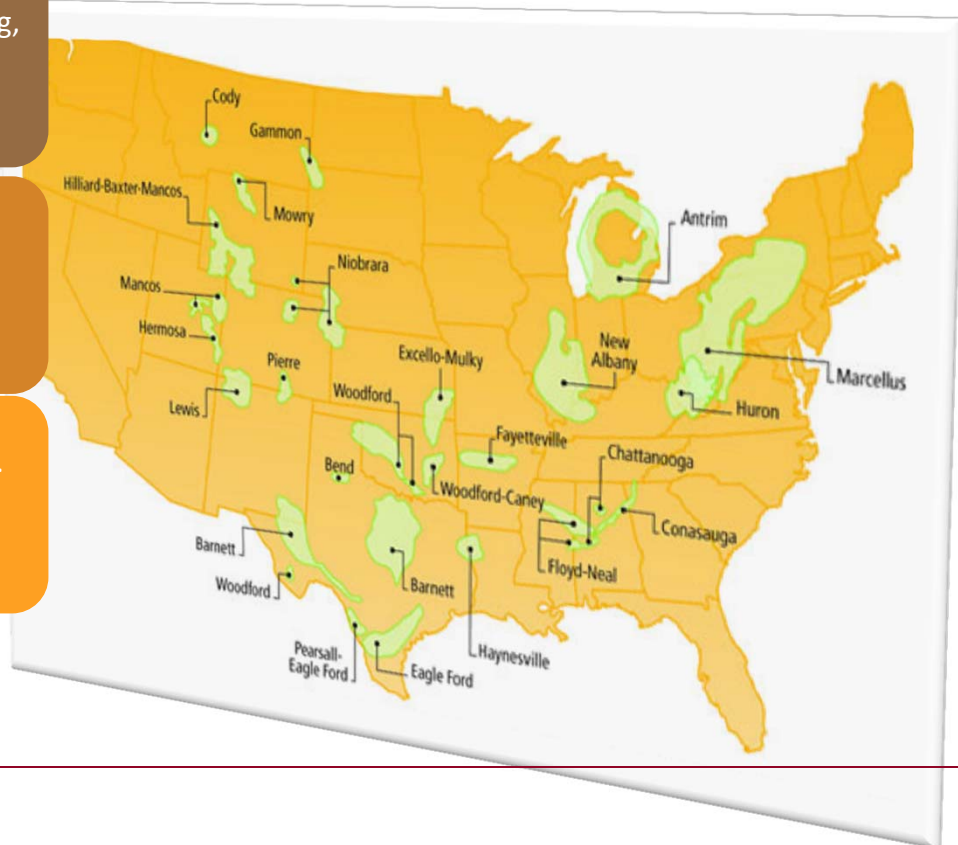


Hydraulic Fracturing: Economic and National Benefits

Cleaner Energy: Natural gas is cleaner burning, with fewer greenhouse gas emissions. It is a bridge fuel to a cleaner energy future.

Jobs: 1 in 20 US Jobs is supported by the oil and natural gas industry. Fracked gas was directly responsible for 600,000 jobs in 2010. Fracked natural gas supports an additional 1,000,000 jobs in non-energy sectors.

States: There are 19 shale gas plays in the US. 16 states were active shale gas or shale oil producers as of January 2012.



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Hydraulic Fracturing: Economic and National Benefits

“The US is the Saudi Arabia of
natural gas.”
T. Boones Pickens

In 2010, NG provided 21% of
America’s electricity needs.

Unconventional gas plays
represent 60% of technically
recoverable reserves.

2,214 trillion CF of technically recoverable NG nationwide as of 2010.
This is enough NG to meet American energy needs for a 100 years
177.9 Trillion CF of recoverable NG in the Marcellus Shale alone.

90% of US natural gas is
domestically produced. It plays a
critical role in energy security.

Fracking is responsible for 45% of current
domestic production of Natural Gas (NG).

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Water Issues and Challenges

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Hydraulic Fracturing: Water Issues and Challenges



Each fractured well requires an average of 2-4 million gallons of fresh water. Water is usually extracted on site from nearby streams or rivers.



For example, in 2009 projected total daily demand for fracking is 8 million gallons in the Marcellus region.



Also in 2009, water usage for electrical generation is 150 million gallons per day in the Susquehanna River Basin region, which includes Marcellus Shale states.



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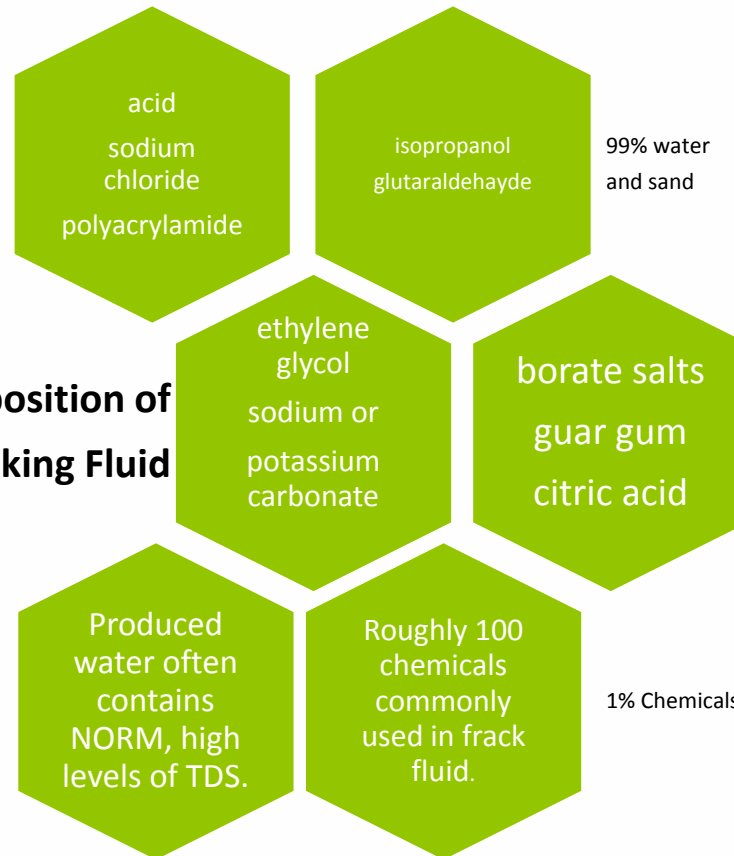
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Hydraulic Fracturing: Water Issues and Challenges



Composition of Fracking Fluid



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Hydraulic Fracturing: Water Issues and Challenges

Wastewater Management and Disposal: “Produced” or “Flowback” Water



Lined Pits,
Tanks –
Storage on site



Recycled –
Used to
fracture other
wells



Class II
Injection Wells
– a common
disposal
method

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Hydraulic Fracturing: Water Issues and Challenges

State Specific Wastewater Issues



Treatment and Discharge (PA) –

This practice has been discontinued following pressure from the EPA and concerns about the ability of POTWs to adequately treat produced water.

Land Application (OK) :
Oklahoma only, requires a permit.



Banned? (VT, NJ):

The VT and NJ State legislatures have both considered bans on the storage or treatment of fracking produced water in their state.

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Public Perception and EPA Backpedaling

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Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack



Ground and Drinking Water At Risk?
Highly Publicized EPA Investigations in Pennsylvania, Texas, and Wyoming.

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Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack



Protection of groundwater and underground sources of drinking water is required by state and federal law.

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Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack

Pavillion, Wyoming

US EPA Office of Research
and Development:

Groundwater Investigation
Report

EPA Office of Enforcement
and Compliance Assurance:

Multi-Media and CERCLA
Investigations

12/08/11 - Draft with
preliminary finding of
contamination

03/12/12 – Statement
noting need for additional
testing, decision to continue
to accept public comment
on the draft

06/01/12 – Final report
expected in June

Groundwater vs. drinking
contamination

Coalbed methane vs.
Shale gas

Congressional Research
Service limited the findings
– unconventional drilling,
outside of API standards,
geographic limit

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Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack

The Pavillion, Wyoming Draft Study Controversy

EPA found no evidence of oil & gas impacts and no connection to hydraulic fracturing in Pavillion residents' drinking water.

EPA drilled two deep monitoring wells into a known natural gas reservoir. It is therefore unsurprising that elements of natural gas were found.

EPA released preliminary findings without independent, qualified third-party review.

Due to in part to criticism of the draft study, EPA has since announced that it will conduct additional testing.

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Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack

Dimock, Pennsylvania

EPA Office of
Enforcement and
Compliance Assurance
CERCLA and
Multimedia
investigations

01/19/12 – Action
Letter

March and April 2012 –
EPA releases the
results well tests in
Dimock. All show that
that water is safe to
drink.

The center of fracking
publicity, controversy is
ongoing. Dimock was
featured in the anti-
fracking documentary,
Gasland.

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Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack

Eagle/Fort Worth, Texas – Range Resources

EPA Office of
Enforcement and
Compliance
Assurance

Safe Drinking Water
Act, Unilateral Order

EPA bypasses the Texas
Railroad Commission,
files unilateral order
alleging drinking water
contamination.

RR ordered to provide
water to residents.

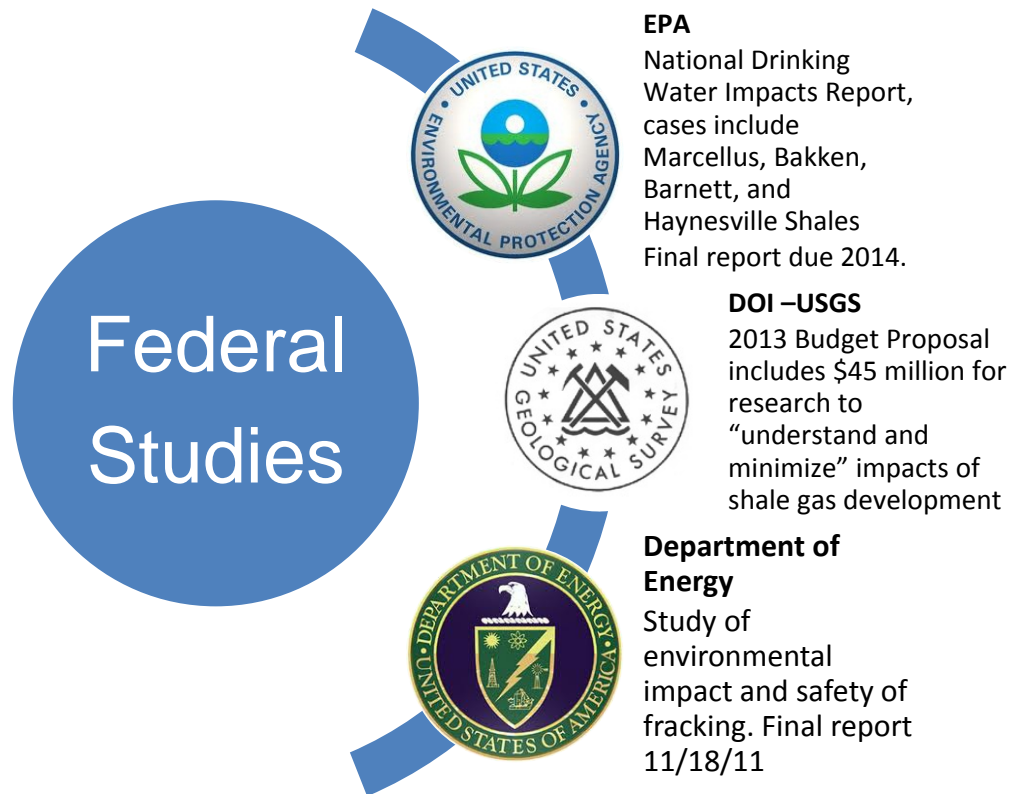
EPA filed an
enforcement order
in federal district
court.

RR sued EPA.

03/30/2012, EPA
withdrew its
enforcement order.



Hydraulic Fracturing: Public Perception and the Recent EPA Backtrack



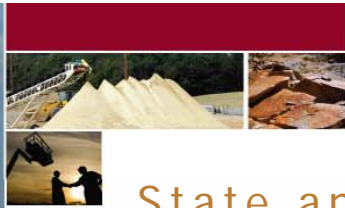
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State and Federal Regulation

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State and Federal Regulation

The Oil and Gas Industry is traditionally regulated at the state level, usually by state oil and gas boards.

All oil and gas states regulate natural gas exploration and production. States also oversee permits and programs required by the CAA, the CWA, etc., that oil and gas producers must also comply with.

Current hot topics in regulation at the state level include chemical disclosure, casing and pressure standards. One state, Vermont, recently banned fracking.

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State and Federal Regulation



The newly proposed DOI rule will be the first federal regulation specific to hydraulic fracturing – proposed rule published on 05/04/2012.



The new White House Inter-Agency Task for Hydraulic Fracturing may lead to comprehensive regulation.
API recently announced it would prefer any federal fracking regulations to be consolidated into one agency.



After 60 years, is the move for federal regulatory layer that will likely be duplicative of state regulations motivated by public perception, or by science and facts?

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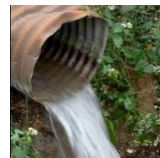


Hydraulic Fracturing:



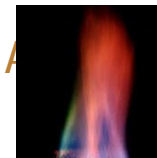
Agencies

- EPA
- Interior
- Energy
- USDA
- White House
- Labor
- River Basin Commissions



Examples of Legal Authority

- Executive Order
- CWA
- CAA
- TSCA
- RCRA
- SDWA
- UIC
- ESA
- NEPA



Examples

- Air emissions
- Effluent guidelines
- Moratoriums on oil & gas leasing or drilling on certain land
- Impact of fracking considered in ESA listing decisions
- Chemical disclosure
- Task force, working group, or study

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Challenges Ahead: Technical, Environmental, Regulatory & Economic

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Hydraulic Fracturing:

Water

Availability in time of drought
Reduced Instream Flows – impact to aquatic species, agriculture community
Impact of trucking in water in water-scarce shales
Impact on endangered species

Wastewater

Capacity for proper disposal
Spills, accidental exposure
Class II Wells and Earthquakes?
Pre-treatment requirements

Environmental Challenges

Noise

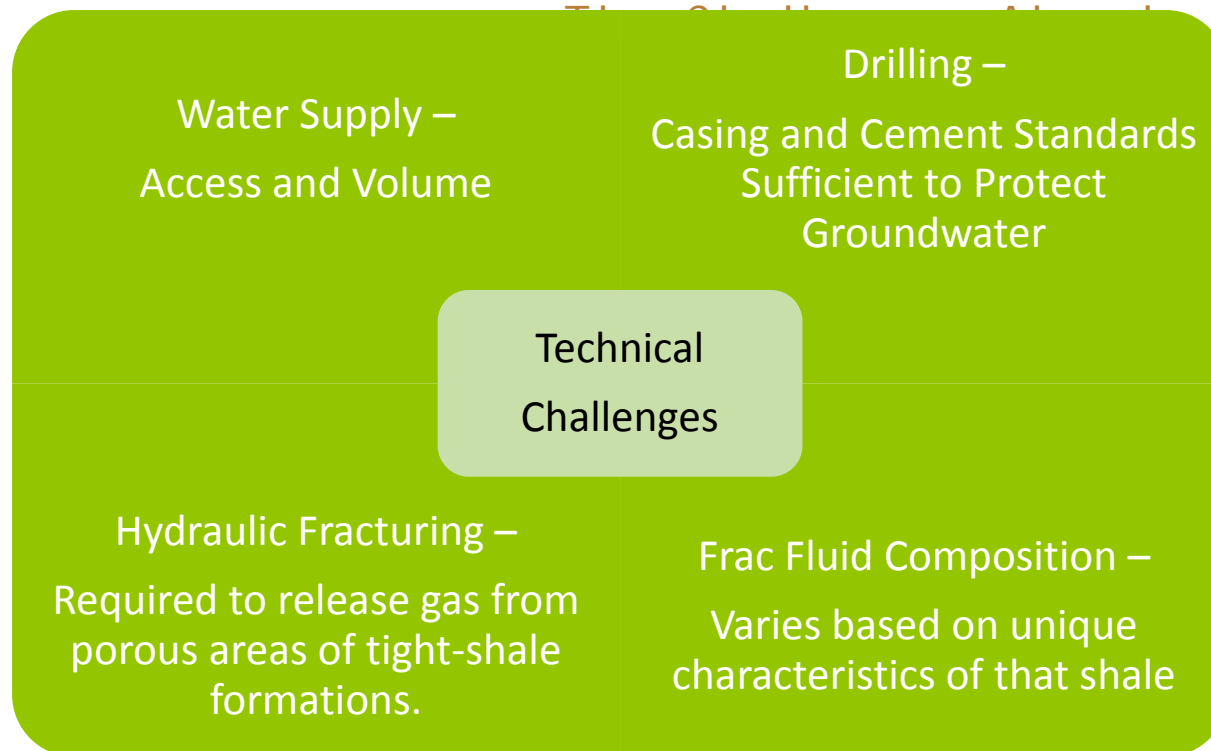
Wells often operate 24/7
Noise from compressors, pumping stations, vehicle traffic, flares
Urban wells require noise abatement
Noise from rural wells impacts wildlife

Air

Greenhouse Gasses
Benzene
Ozone
VOCs
Air aggregation controversy



Hydraulic Fracturing:



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Hydraulic Fracturing:

Regional Differences:

Geology, Topology, and Geography vary from shale to shale. What is appropriate in one shale may be reckless in another. Flexibility is required for effective regulation.

Clean Water Act:

POTW issues, particularly in PA.
High Salinity and TDS in produced water a particular concern for POTWs.
Oil & Gas producers must obtain permits to discharge – like everyone else.

Regulatory Challenges

Safe Drinking Water Act:

Excludes hydraulic fracturing unless diesel is used in frack fluid, but, likely a broad definition of diesel.
Authority for the order in the Range Resources Case.

Clean Air Act:

Brand New NESHAPS and New Source Standards for the Oil & Gas Industry
Air Aggregation/Single Source Determination Controversy

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Hydraulic Fracturing:

Pricing:

Significant drop in natural gas prices due to increased supply.

Cost of new regulations combined with low prices for NG will make some wells economically unfeasible.

Leases:

Thousands of leases signed over the last few years. 12%-20% royalties + lease price up to \$5,000/acre.

USDA has moratoriums on loans for properties with leases, wells in some states

Economic Challenges

Jobs: Natural gas production boom supports hundreds of thousands jobs. Bans on fracking or cost-prohibitive regulations will cost jobs.

Cost of Drilling:

\$3-\$5 million per well, much higher for very deep wells.
Water scarcity and new regulations may increase costs.

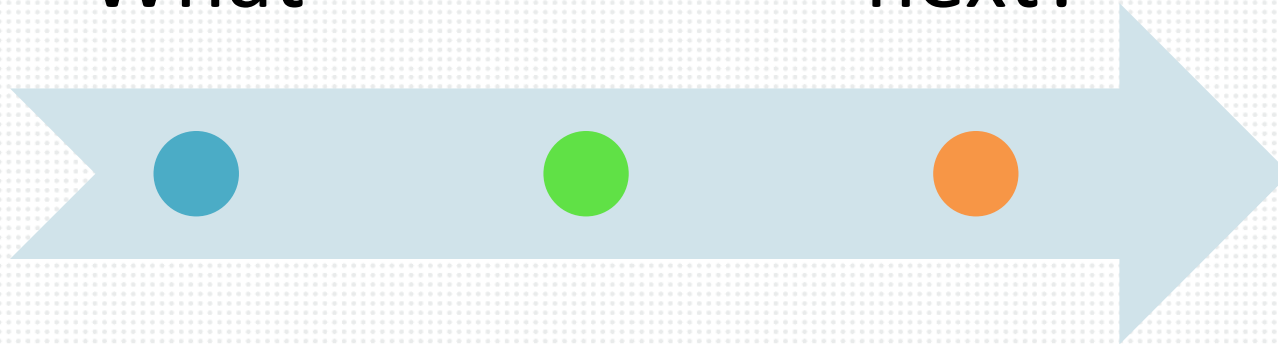
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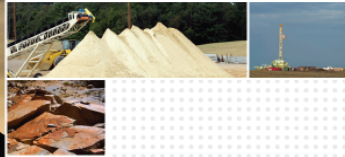
next?



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Questions and Comments?

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