

Natural Gas Development and Hydraulic Fracturing A Policymaker's Guide

By Jacquelyn Pless

Revised June 2012

In recent years, technological advances in hydraulic fracturing and horizontal drilling have led to dramatic growth in natural gas development, with tremendous economic potential for state and local economies. Development currently is occurring in 32 states.¹ Although hydraulic fracturing has been employed for decades, its use has rapidly increased in the past few years, and some states are taking steps to ensure that water and air quality are adequately protected during surface and subsurface natural gas development activities.

This report provides an introduction to the domestic natural gas picture, explores the motivation behind state legislative involvement in natural gas regulation, and summarizes state legislation that is being developed to ensure safe, responsible development of this resource.

The Production Process

The recent increases in domestic natural gas supplies have been made possible by two technologies—horizontal drilling and hydraulic fracturing—that allow energy companies to tap natural gas supplies once thought to be inaccessible.

Constructing the well involves drilling a hole lined with layers of steel encased in cement to seal off development activities from fresh water supplies and to allow for the safe extraction of natural gas. Once the necessary depth is achieved, the vertical hole can curve horizontally. This process—horizontal drilling—reduces the surface impact of drilling activities by allowing access to more of the natural gas formation underground from fewer wells above ground.

Hydraulic fracturing—also known as “fracking”—is an oil and gas extraction method in which hydraulic pressure is used to create fractures in shale rock. Pressurized liquids—usually a mixture of 99.5 percent water and sand and 0.5 percent chemical additives—are pumped deep underground to help release trapped gas.² Fracking allows for commercially viable access to previously inaccessible unconventional oil and gas resources such as shale gas, which is making up an increasingly large portion of the overall energy supply in the United States.

Combined with recent advances in horizontal drilling, the technology has opened resources that, only a decade ago, were not economical to develop. Some forecast this increase in supply could sustain current U.S. consumption levels for another 90 years. Rapid expansion of hydraulic fracturing in densely populated regions where the process is unfamiliar, however, has focused efforts on ensuring that the practice is well-regulated, transparent, and protects public health and the environment.

Although a number of federal regulations govern the hydraulic fracturing process, states have regulatory primacy on this issue. Knowledge of local geology and environmental conditions allows state regulators and lawmakers to tailor regulations to meet their state's unique needs, and states are continuing to develop and refine regulations, particularly to protect drinking water.

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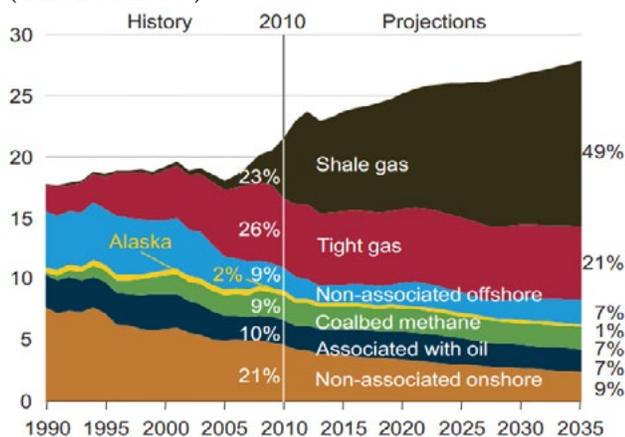
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The natural gas industry also is making efforts to ensure the resource is extracted safely and to improve transparency. FracFocus, a joint effort by the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission, is an online registry for companies to publicly disclose the chemicals used in hydraulic fracturing. As of May 11, 2012, it included more than 17,000 disclosures from 135 reporting companies.³ The initiative is run by state regulators and supported by industry. The State Review of Oil and Natural Gas Environmental Regulations (STRONGER), a multi-stakeholder organization, assists states in documenting the environmental regulations associated with the exploration, development and production of natural gas. Industry has also supported adoption of disclosure rules in Colorado, Texas and Wyoming, which are discussed later in this report. In some cases, companies are going above and beyond current state and local regulations by adopting voluntary drilling best practices standards on a regional basis.

Domestic Resource and Production Projections

Cumulative natural gas production from 2010 through 2035 is projected to be 7 percent higher than expected just a year ago.⁴ This is mainly due to technological advances in hydraulic fracturing that now make shale gas more accessible. According to the U.S. Energy Information Administration (EIA), shale gas production alone will increase nearly threefold from 5 trillion cubic feet in 2010 to 13.6 trillion cubic feet in 2035. This equates to 23 percent of total U.S. dry gas production in 2010, and 49 percent of total U.S. dry gas production in 2035 (Figure 1).

Figure 1. U.S. Natural Gas Production, 1990-2035 (trillion cubic feet)



Source: U.S. Energy Information Administration, Annual Energy Outlook 2012 Early Release Overview.

The EIA expects domestic natural gas production to exceed consumption early in the next decade. *The EIA projects that the United States could become an LNG net exporter by 2016.*

By 2016, the United States is projected to become a net exporter of liquefied natural gas (LNG) and an overall net exporter of natural gas by 2021.⁵ Some energy companies are beginning to explore the potential effects on supply and domestic prices of exporting natural gas.⁶ Although the EIA reports that natural gas exports could lead to domestic price increases,⁷ a Deloitte report found that, between 2016 and 2035, exporting 6 billion cubic feet of liquid natural gas (LNG) per day would increase domestic natural gas prices by only \$0.12 per million British Thermal Units (MMBtu).⁸

Outlook for Natural Gas Prices

Natural gas prices, like most commodity prices, are driven by market forces. On the supply side, many factors affect prices, including production levels, net imports and storage levels. Demand can be affected by economic growth, extreme weather, prices and other factors.

Historically, natural gas prices have been volatile and often high. Unpredictable fluctuations were a major drawback to heavy reliance on natural gas as prices hovered between \$3 and \$13 per 1,000 cubic feet of natural gas.

Increased production and expanded domestic supplies are expected to help sustain low and stable prices, however. The EIA projects average annual wellhead prices will remain below \$5 per 1,000 cubic feet through 2023 as industry taps into the expansive resources. After 2023, prices are expected to moderately increase as the number of tight gas and shale gas wells drilled increase and meet demand, rising to \$6.52 per 1,000 cubic feet in 2035.

Economic Benefits and Implications

Extracting natural resources can produce significant economic benefits for state and local economies. From manufacturing to the wellhead, the industry contributes to job creation, capital expenditures, gross domestic product (GDP) and tax revenues, and it creates savings through lower natural gas and electric power prices.

According to an industry-supported study by IHS Global Insight published in December 2011, the shale gas industry supported 600,000 total jobs (direct, indirect and induced) nationwide in 2010. The study indicates that shale gas production contributed \$18.6 billion in federal, state and local government taxes and federal royalty revenues in 2010. It also projects that savings from lower natural gas prices will equate to an annual average of \$926 per year in disposable household income between 2012 and 2015.⁹ It is clear that the shale gas industry has tremendous economic potential for federal, state and local economies.

Generally, economists often debate the assumptions made in economic studies, and some argue that vital factors sometimes could be omitted.¹⁰ A wider range of questions—such as benefit allocation, public costs and impacts on existing industries—also could be addressed to fully assess the overall long-term economic impact of any industry.^{11,12} Natural gas supply, price and employment projections inherently rely on assumptions and include or omit various factors that often vary and can be a matter of debate.¹³

Impacts on Local Industries and Communities

Natural gas development brings tremendous economic benefits to local communities. In Pennsylvania, for example, natural gas development has spurred creation of training and educational opportunities. Despite the local induced benefits, addition of a new industry also could negatively affect existing local industries. Agriculture, farming, fishing and hunting could be affected by water contamination or other habitat disturbances. State regulation of natural gas production ideally balances interests so industries that also rely on the land are not affected. In addition, although increased demand for services such as first responders, road maintenance and local hospitals can create job opportunities, it also can be a cost to local communities.

Public Health and the Environment

Although fracking to develop natural gas offers many benefits to state and local economies, its rapid expansion near densely populated areas has increased attention to its effects on human health and the environment. Cases of water contamination have been linked to natural gas operations, including incidences of spills and leaks. Recent research released by the Energy Institute at the University of Texas did not find a direct link between

hydraulic fracturing and groundwater pollution problems. Rather, above-ground spills, leaking drill casings and wastewater mishandling can be sources of groundwater pollution.

Protecting Surface Water and Disposing of Wastewater

One growing concern is contamination of public drinking water. Fracking fluid could contain hazardous chemicals and, if mismanaged, spills could leak harmful substances into groundwater or surface water.

Since hydraulic fracturing produces wastewater that needs to be treated, states may consider regulatory oversight of wastewater storage and disposal.

Water Withdrawals

A deep shale gas well hydraulic fracturing operation can require 3 million to 5 million gallons of water. Although this is a significant amount of water, generating electricity with natural gas is less water-intensive compared to other forms of fossil fuel electricity generation.

Significant water withdrawal could affect aquatic habitats or water availability, particularly in regions where water supply is threatened. Innovative water use approaches are being pursued by industry. For example, recent research revealed that use of coal mine drainage is technically viable, although its economic viability may depend upon site-specific conditions.¹⁴

Air Quality

Natural gas is efficient and clean compared to other fossil fuels, emitting 80 percent fewer nitrogen oxides, less sulfur dioxide, no mercury and very few particulates. Nonetheless, some remain concerned about air quality and greenhouse gas emissions. The drilling process potentially could release chemicals such as benzene and methane. According to the U.S. Environmental Protection Agency (EPA), natural gas systems remain one of the most significant methane emitters in the United States, although the issue is being revisited due to lack of data.

The EPA recently finalized New Source Performance Standards for natural gas hydraulic fracturing operations to help reduce smog-forming air pollution and harmful air toxins. The new rules—effective in 2015—are

projected to reduce methane emissions and to reduce volatile organic compound emissions by 95 percent.

Surrounding Habitat

Increased exploration and development also affect surrounding habitat and wildlife. Vegetation and soils may be disturbed if gas wells require new roads, clearing and leveling. At the same time, advanced technologies in horizontal drilling and hydraulic fracturing allow energy companies to access far more natural gas from fewer wells.

Seismic Activity

Recent seismic activity in Ohio and Oklahoma is drawing attention to a possible link between earthquakes and deep wells used to dispose of hydraulic fracturing wastes. For instance, the Oklahoma Geological Survey is examining the possibility of induced seismicity from hydraulic fracturing.¹⁵ Pending S.B. 6903 in New York would require a seismological impact study related to hydraulic fracturing.

States Take Action: The Balancing Act

At least 119 bills in 19 states have been introduced this session that address hydraulic fracturing.

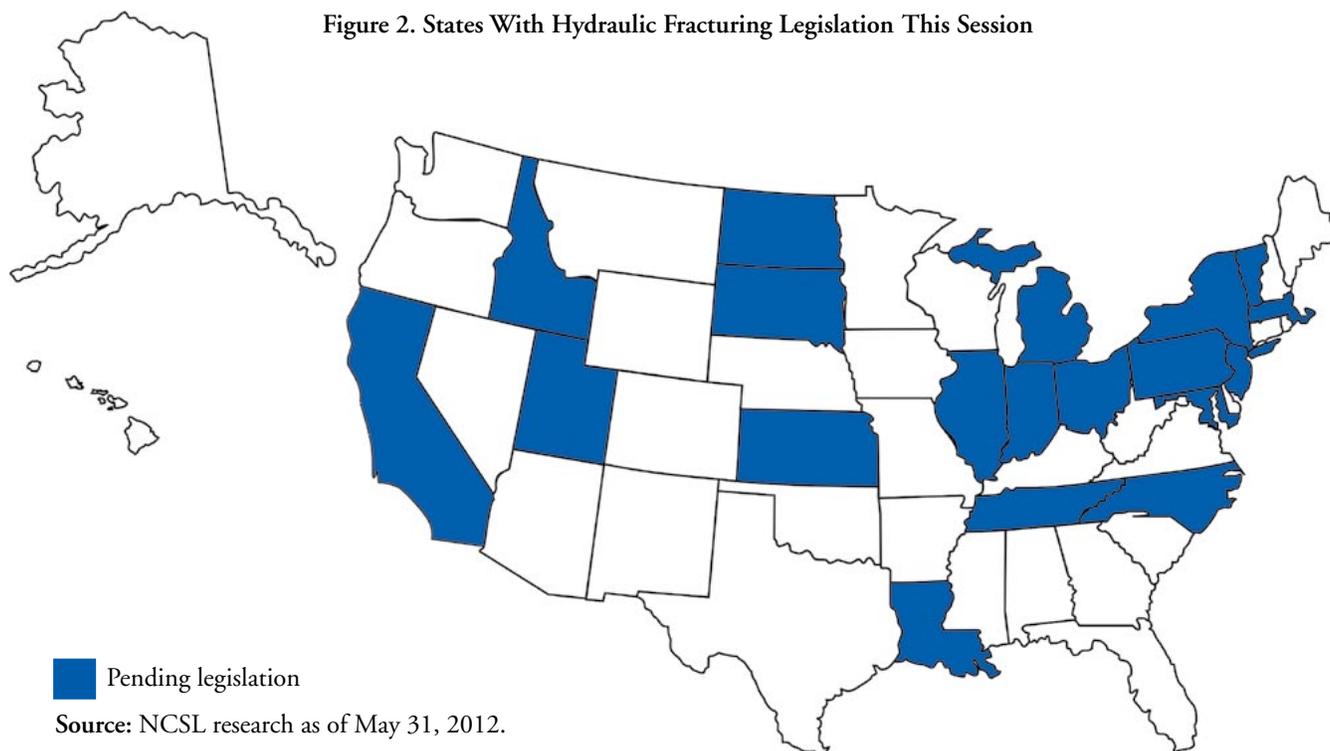
The debate continues regarding the regulation of natural gas development in many states, and it has become a balancing act. Policymakers who are responsible for ensuring that regulations are in place to protect the environment and public health also recognize the revenue potential the industry could bring to state and local economies.

As of May 2012, at least 119 bills in 19 states have been introduced this session that address hydraulic fracturing (Figure 2). At least nine states—Indiana, Maryland, New Jersey, North Carolina, Pennsylvania, South Dakota, Tennessee, Utah and Vermont—have enacted legislation.

2012 Legislative Trends

State legislatures are actively working to alleviate public health and environmental concerns, while also taking advantage of the economic potential offered by shale

Figure 2. States With Hydraulic Fracturing Legislation This Session



gas development. Specific proposals include severance tax structure changes; impact fees; well spacing requirements; set-back requirements; waste treatment and disposal regulations; and requirements to publicly disclose the names and/or composition of fracturing fluid chemicals.

So far this session:

- At least nine states have proposed chemical disclosure requirements (see Table 1 in the appendix);
- At least eight states have proposed casing, well spacing, setback, water withdrawal, flowback, waste regulation requirements or other measures to protect water resources (see Table 2 in the appendix);
- At least 11 states have proposed legislation to impose new or amend existing severance taxes (see *Oil and Gas Severance Taxes: States Work to Alleviate Fiscal Pressures amid the Natural Gas Boom*);
- Legislators in at least eight states have proposed hydraulic fracturing suspensions, moratoria or studies to investigate fracking impacts (see Table 3 in the appendix); and
- At least seven states have proposed resolutions addressing hydraulic fracturing (see Table 4 in the appendix).

State Policy Actions

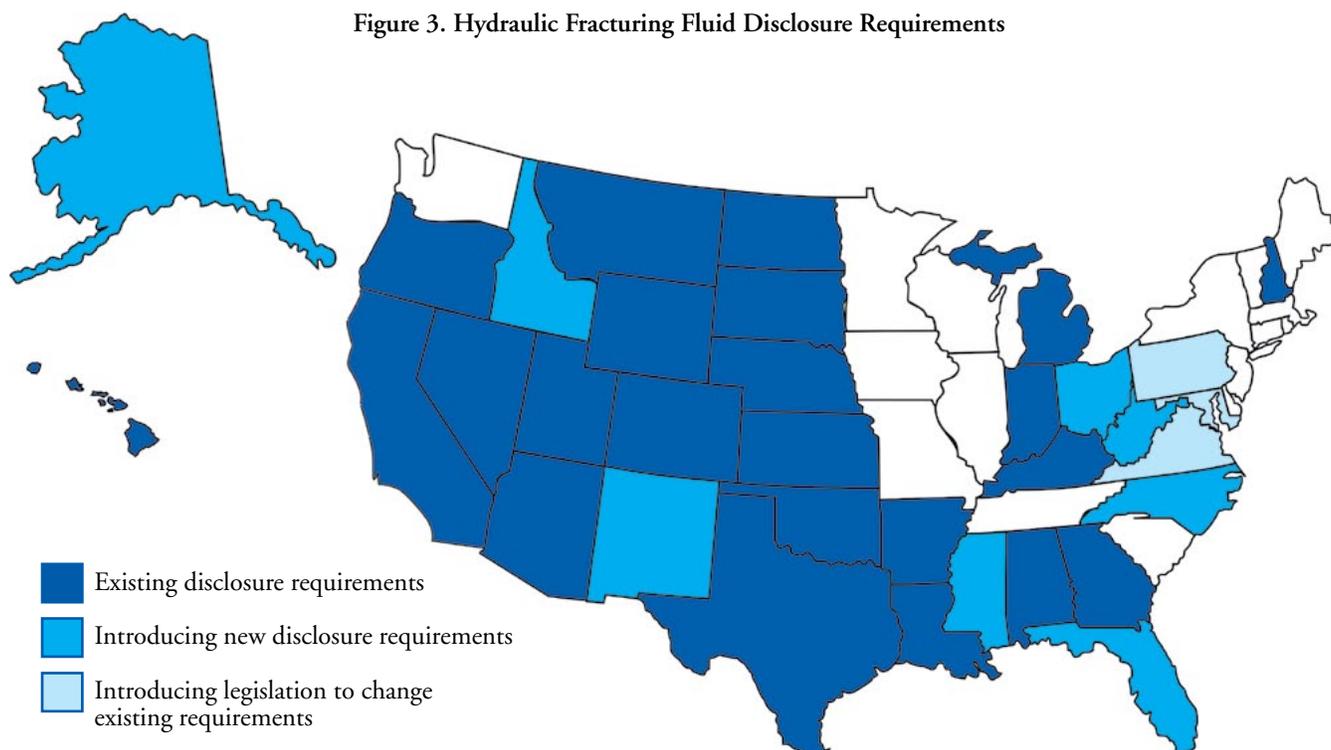
Increasing Transparency

1. Fracking Fluid Chemical and Additive Disclosure

The most frequently addressed legislative trend this session is to require disclosure of fracking fluid additives. In June 2010, Wyoming became the first state to approve rules requiring public disclosure of the chemicals in fracking fluid. In 2011, Texas became the first to enact legislation (H.B. 3328). Colorado's rule, the most comprehensive to date, requires drillers to disclose not only chemical names, but also their concentrations.

Some states—such as Illinois and Pennsylvania—are considering requiring companies to specifically use FracFocus, the national online registry previously described, while others require the use of state agency websites.

In an attempt to address both industry and transparency needs, states also are working to help protect in-



Source: NCSL research as of May 31, 2012.

At least 11 states are considering legislation to impose new or amend existing oil and gas severance taxes so far this session. (See *Oil and Gas Severance Taxes: States Work to Alleviate Fiscal Pressures amid the Natural Gas Boom* for 50-state charts that detail existing severance tax rates and structures, and pending state legislation that would impose new—or amend existing—oil and gas severance taxes.)

Idaho enacted H.B. 379 to increase the state's oil and gas conservation tax to 2.5 percent (from 2 percent) of market value of the extracted oil or gas. At least 13 bills have been introduced in Pennsylvania with a range of proposed rates and structures. S.B. 352, for example, would impose a natural gas severance tax of 5 percent on the gross value of gas extracted at the wellhead, plus 4.6 cents per 1,000 cubic feet of natural gas extracted. H.B. 1705 would impose a natural gas severance tax of 1.5 percent of the gross value of gas severed at the wellhead for the first 60 months of production and 5 percent thereafter.

3. Impact Fees

States also can impose impact fees. Pennsylvania enacted H.B. 1950 (February 2012) to implement an impact fee based on the average price of natural gas in the preceding year. It is capped at \$355,000 per well during a 15-year period. The new law aims to benefit local communities that are affected by drilling.

Water Quality Protection

State legislatures are taking a number of steps to help protect water quality by creating well location, water withdrawal, flowback or waste regulations, or setting casing and mechanical integrity requirements. Table 2 in the appendix details legislation so far this session.

4. Spills and Leak Prevention Through Mechanical Integrity Tests or Casing Requirements

Recent research released by the Energy Institute at the University of Texas did not find a direct link between hydraulic fracturing and groundwater pollution problems. Rather, above-ground spills, leaking drill casings and wastewater mishandling may be more common causes of groundwater pollution. Possible solutions could include more stringent regulation of drill casings or other mechanical integrity measures to prevent spills or leaks.

Pending H.B. 3897 in Illinois, for example, would require integrity tests of casings or other mechanical testing prior to hydraulic fracturing. New York's pending A.B. 6540 would require certificates of competence to use a derrick or other drilling equipment, and a few pending bills in Pennsylvania (S.B. 425, H.B. 971 and H.B. 1645) address casing requirements.

5. Wastewater Transportation Requirements

Concern exists about possible spills during waste transportation after a hydraulic fracturing treatment, and some states are taking steps to help mitigate associated risks. Pennsylvania's pending H.B. 1741, for example, would require vehicles to display a placard on the outside of the vehicle indicating it is carrying hydraulic fracturing wastewater.

6. Regulations for Treating and Disposing Waste

States are addressing waste treatment and disposal in a variety of ways, partially due to unique geological factors, and some states are working to address these issues through legislation. Illinois' pending H.B. 3897, for example, addresses disposal and reuse of well stimulation fluid that is recovered during flowback, and S.B. 3280 addresses storage of such fluids. Two pending bills in New Jersey (A.B. 575 and S.B. 253) would prohibit treatment, discharge, disposal or storage of fracking operations wastewater in the state.

In New York, A.B. 6488 (pending) would require treatment works to refuse industrial waste from fracking operations that contain high levels of radium. Waste must be tested for radioactive containments, and the bill would provide for scheduled wastewater discharges.

7. Well Location Restrictions

A number of states are considering well setbacks or location restrictions to create buffers between drilling and public drinking water resources. In New York, pending A.B. 4237 and S.B. 1230 would prohibit drilling within 10 miles of the New York City water supply infrastructure. A few pending bills in Pennsylvania address well spacing or location restrictions. H.B. 230, for example, would prohibit drilling within the surface or subsurface area of, or using hydraulic fracturing or horizontal drilling within, 2,500 feet of any primary source of a community water system.

Monitoring to Improve Knowledge Base

8. Water Withdrawal Monitoring

Since hydraulic fracturing may lead to competition for scarce water supply in some regions, state legislatures may consider managing water withdrawals. In California, A.B. 591 (pending) would require the amount and source of water used in hydraulic fracturing to be recorded. Pending legislation in New York (S.B. 1234) also would regulate water withdrawals, and A.B. 6426 would require permits for water withdrawals of more than 5,000 gallons.

9. Water Quality Monitoring

Water quality monitoring may help improve knowledge of how hydraulic fracturing affects water supplies and quality. In New York, pending legislation (S.B. 3483 and A.B. 7986) would require groundwater testing prior to and after drilling wells for oil and gas.

10. Drilling Moratoria

Some state legislators are aiming to delay hydraulic fracturing operations until more is known about its effects. Michigan's pending H.B. 5150, for example, would prohibit hydraulic fracturing under certain circumstances until a specified advisory committee makes recommendations. New Jersey enacted legislation (S.B. 2576) to impose a one-year moratorium on hydraulic fracturing in order to investigate the potential effects of hydraulic fracturing on air and water quality in the state. In New York, pending A.B. 5547 would establish a moratorium until 120 days after the U.S. EPA issues its report on the effects of a fracking treatment. Most recently, Vermont enacted H.B. 464 to prohibit hydraulic fracturing in the state. Table 3 in the appendix contains a chart of pending legislation.

Federal Action

At the federal level, many regulations govern aspects of hydraulic fracturing, such as the disposal of fluid waste deep underground and certain reporting requirements.¹⁷ The Underground Injection Control (UIC) program set forth in the Safe Drinking Water Act “regulates the subsurface emplacement of fluid.”¹⁸ However, the Energy Policy act of 2005 provided language to exempt

hydraulic fracturing from UIC regulation. Congress has considered legislation—known as the FRAC Act—that would remove this exemption and require public disclosure of chemicals used in fracking treatments.

New Jersey adopted a resolution, and Pennsylvania legislators proposed a resolution, urging Congress to pass the FRAC Act. However, legislators in at least four states—Kansas, North Dakota, South Dakota and Utah—proposed resolutions to urge Congress to limit federal regulation of hydraulic fracturing. North Dakota adopted HCR 3053a, urging Congress to clearly limit U.S. EPA regulation of hydraulic fracturing under the Safe Drinking Water Act to well stimulation treatments that use diesel fuel as the primary constituent of hydraulic fracturing fluid. Utah enacted SCR 12, urging Congress to clearly delegate responsibility for regulating hydraulic fracturing to the states.

Table 4 in the appendix outlines state resolutions that address state versus federal regulation of hydraulic fracturing.

In May 2011, Secretary of Energy Chu asked an advisory board subcommittee to make recommendations to improve the safety and environmental performance of hydraulic fracturing. The subcommittee held several public meetings throughout 2011 and released its final report in November 2011.

The report focuses on implementation of 20 recommendations for reducing the environmental impacts of shale gas production. It stresses the importance of using best practices in measurement and public disclosure, improving air quality, protecting water quality and disclosing hydraulic fracturing fluid components.

In February 2012, the U.S. Department of Interior released draft regulations that would require operators on public lands to seek approval to conduct hydraulic fracturing and disclose the chemical ingredients of proposed fracking fluid, but trade secrets are protected. The proposal also would require operators to outline a record-keeping method and would require a mechanical integrity test of the casing prior to well stimulation. The U.S. EPA also is investigating the potential effects of hydraulic fracturing on drinking water resources. Initial study results should be released by the end of 2012, followed by a final report in 2014.

Outlook

Shale gas has transformed the domestic energy outlook. Natural gas development offers significant benefits, and states are working to ensure safe gas extraction, especially in densely populated regions.

In 2012, fracking will continue to be debated. Top legislative trends likely will be in fracking fluid

disclosure and monitoring. Many states also will consider how to treat and dispose of waste to protect water sources; improve drill casing and well spacing requirements to prevent spills and leaks; and consider severance tax changes to help environmental projects, mitigate impacts on local communities and balance state budgets.

Table 1. Legislation Proposing Disclosure Requirements
(as of May 31, 2012)

State	Bill	Status	Description
California	A.B. 591	Pending	Would require a person carrying out hydraulic fracturing on behalf of an owner or operator to provide to the owner a list of the chemical constituents used in the fluid. The amount of recovered fracking fluid and other procedural elements also must be recorded. The information must be made available to the public.
Illinois	S.B. 2058	Pending	Would require fluid identity by additive type and chemical compound names; the Chemical Abstracts Service (CAS) numbers must be reported to a specified department.
	H.B. 3897	Pending	Would require chemical disclosure information to be posted on FracFocus.
	S.B. 3280	Pending	Would require chemical disclosure information to be posted on a website.
	H.B. 5853	Pending	Would require operators to complete forms that include the total volume of water used in hydraulic fracturing a well and each chemical ingredient. The information would have to be posted on FracFocus.
Indiana	H.B. 1107	House Enrolled Act No. 1107	Requires the Natural Resources Commission to adopt rules addressing reporting and disclosure of hydraulic fracturing treatments. Requires volumes of additives to be disclosed as a maximum percentage of the total fracturing fluid volume.
Kansas	H.B. 2526	Enrolled—Law effective July 1, 2012	Would allow a commission to promulgate rules addressing hydraulic fracturing disclosure.
	H.B. 2642	Pending	Relates to disclosure requirements.
Louisiana	H.B. 957	To Governor	Would provide for the disclosure of the composition of hydraulic fracturing fluids.
Massachusetts	H.B. 3055	Pending	Would require hydraulic fracturing fluids and volumes to be identified and described.
New York	S.B. 425 and A.B. 2922	Pending	Would require disclosure of all fluid chemicals used in hydraulic fracturing.
	S.B. 1234	Pending	Would require disclosure of components in fracking fluid.
	S.B. 3765	Pending	Would prohibit contracts that refer to hydraulic fracturing from containing provisions that would prohibit disclosure of chemicals used in the process.
	A.B. 6426	Pending	Would require disclosure of hydraulic fracturing materials.
	S.B. 5879 and A.B. 8805	Pending	Would require disclosure of the composition of hydraulic fracturing fluids to the Department of Environmental Conservation. Additive and chemical concentrations must be disclosed and expressed as pounds per 1,000 gallons or gallons per 1,000 gallons, and expressed as a percentage by volume of the fracturing fluid used.

Table 1. Legislation Proposing Disclosure Requirements (continued)
(as of May 31, 2012)

State	Bill	Status	Description
Ohio	S.B. 212	Pending	Would require lists of all chemicals used in hydraulic fracturing to be disclosed to the Board of Health where the well is located.
	S.B. 318	Pending	Would require disclosure of all chemicals and substances used in hydraulic fracturing.
Pennsylvania	S.B. 127	Pending	Would require operators to file a report to specified departments within 30 days of well completion, including a list of chemicals and compounds. Volumes of fluids used in each operation, along with the Chemical Abstract Service (CAS) registry numbers, must be provided and available to the public on the department's website.
	S.B. 425 and H.B. 971	Pending	Would require fluid volumes to be reported to a department that must make the report available to the public upon written request.
	H.B. 1680	Pending	Would require fracking fluid disclosure to a specified department. Chemical constituents must be disclosed, but not proprietary chemical formulas. The information must be made available to the public. If a medical emergency exists and the proprietary chemical formula or specific identity is necessary for treatment, then it must be disclosed.
	S.B. 1226	Pending	Would provide for disclosure of the composition of hydraulic fracturing fluids and would require the information to be posted on FracFocus.
	H.B. 24	Pending	Would require chemical ingredients to be disclosed.
	H.B. 1950	Enacted	Requires disclosure of the chemicals used in hydraulic fracturing a well within 60 days of finishing a procedure. Chemicals must be publicly disclosed on a website and posted in a form that does not link the chemicals to their respective hydraulic fracturing additive. Information will be published on FracFocus.

Table 2. Water Quality Protection – Casing Requirements, Well Spacing, Setbacks, Water Withdrawals, Flowback, Waste Regulation and More
(as of May 31, 2012)

State	Bill	Status	Description
California	A.B. 591	Pending	Would require the amount and source of water used to be recorded, as well as radiological components or tracers. The amount and disposition of water and hydraulic fracturing fluid recovered would have to be recorded.
Illinois	H.B. 3897	Pending	Addresses disposal and reuse of well stimulation fluid recovered during flowback. Would require integrity tests of casing or of casing-tubing annulus, or other mechanical testing prior to hydraulic fracturing.
	S.B. 3280	Pending	Would require mechanical integrity tests prior to drilling. Addresses disposal of flowback and storage of fluids.
	S.B. 3534	Pending	Would require the total volume of water used to be posted on FracFocus.
Maryland	H.B. 1123	Enacted	Establishes a presumptive impact area around gas wells and require certain water supplies to be replaced. Generally relates to contamination caused by certain gas exploration and production activities.
Michigan	H.B. 4736	Pending– Carryover	Would create presumption of liability for contamination of groundwater caused by hydraulic fracturing fluids.
New Jersey	A.B. 575	Pending	Would prohibit treatment, discharge, disposal or storage of hydraulic fracturing wastewater in the state.
	S.B. 253	Pending	Would prohibit shipment, transport or treatment of hydraulic fracturing wastewater in the state.
New York	S.B. 425 and A.B. 2922	Pending	Would prohibit use of fluids that contain a chemical substance that poses a risk to human health and would require disclosure of all fracking fluid chemicals.
	S.B. 1234	Pending	Would aim to protect local resources, regulate water withdrawals and prohibit certain activities near watersheds.
	A.B. 2108 and S.B. 893	Pending	Would establish the Natural Gas Exploration and Extraction Liability Act of 2011.
	A.B. 3579	Pending	Would address expected water use, potential water conservation measures, fluid storage and disposal measures, and site-specific biological and water quality data.
	A.B. 4237 and S.B. 1230	Pending	Would prohibit drilling within 10 miles of the New York City water supply infrastructure.
	S.B. 3483 and A.B. 7986	Pending	Would require groundwater testing prior to and after drilling wells for oil and gas.

Table 2. Water Quality Protection – Casing Requirements, Well Spacing, Setbacks, Water Withdrawals, Flowback, Waste Regulation and More (continued)
(as of May 31, 2012)

State	Bill	Status	Description
New York (continued)	A.B. 6426	Pending	Would prohibit natural gas drilling near watersheds and would require permits for water withdrawals exceeding 5,000 gallons. Would also require inspections and annual audits.
	A.B. 6488	Pending	Would require treatment works to refuse industrial waste from fracking operations that contain high levels of radium. Would require testing for radioactive containments and provide for scheduled discharges of wastewater.
	S.B. 4251 and A.B. 7283	Pending	Would require promulgation of regulations to require treatment works to test fracking waste and to test for radioactivity.
	A.B. 7071	Pending	Would direct the commissioner of the Department of Environmental Conservation to promulgate rules and regulations requiring that wastewater screening not harm sewage treatment works.
	A.B. 6540	Pending	Would require certificates of competence for using a derrick or other drilling equipment.
	A.B. 7987	Pending	Would prohibit wastewater treatment facilities from accepting wastewater from hydraulic fracturing operations unless they meet certain performance requirements.
	S.B. 6891	Pending	Would require notification within two hours by any person causing a natural gas production discharge from high-volume hydraulic fracturing. The designated department would have to notify the public within 48 hours through its website.
	S.B. 6892	Pending	Would create a High-Volume Hydraulic Fracturing Waste Tracking Program. Would require the commissioner of environmental conservation to track the generation, transportation and receipt of wastewater that is associated with oil and gas production.
	S.B. 6893	Pending	Would prohibit publicly-owned treatment works from accepting wastewater that is associated with high-volume hydraulic fracturing.
	S.B. 6894	Pending	Would authorize the creation of a geographic information system-based display that would provide high-volume hydraulic fracturing information to the public, such as locations of wells, location of public water supply wells and intakes, and the stage of the operation for each well.
	S.B. 6895	Pending	Would prohibit the use of high-volume hydraulic fracturing wastewater for road and land spreading, or for dust control and de-icing.
	S.B. 7012	Pending	Would prohibit the purchase, use, or sale of any liquid waste from hydraulic fracturing and would require the Department of Environmental Conservation to establish regulations for proper disposal of waste products generated from hydraulic fracturing.

Table 2. Water Quality Protection – Casing Requirements, Well Spacing, Setbacks, Water Withdrawals, Flowback, Waste Regulation and More (continued)
(as of May 31, 2012)

State	Bill	Status	Description
Ohio	S.B. 212	Pending	Would address brine disposal, water use in state land drilling, royalties, waste documentation, and baseline testing of surface and groundwater before well drilling.
	S.B. 318	Pending	Would revise setback distances of a well from occupied dwellings.
Pennsylvania	S.B. 127	Pending	Would address fracturing chemicals, surface impoundments and fluid monitoring. Would require operators to maintain records of the volume of fracturing fluids used for operations and the volume of fluids returned to the surface.
	H.B. 234	Pending	Would require the amount of production and waste generated by each well to be reported.
	S.B. 680	Pending	Would provide for location restrictions, water protection, use of surface impoundments for temporary flowback storage, well reporting requirements, and more.
	S.B. 1346	Pending	Would provide for the use of mine drainage water in hydraulic fracturing procedures.
	H.B. 1346	Pending	Would provide for well location restrictions and emergency preparedness plans.
	H.B. 1565	Pending	Would provide for chemical analysis of recycled wastewater during storage and of wastewater generated by oil and gas activities, and for electronic tracking of wastewater from oil and gas activities.
	H.B. 1741	Pending	Would address hydraulic fracturing wastewater transportation and require any vehicle carrying fracking wastewater to show placard on the outside of the vehicle.
	H.B. 1800	Pending	Would address water protection, use of surface impoundments and fracking fluids, emergency response, well reporting, bonding and a severance tax.
	H.B. 1887	Pending	Would address well location restrictions, groundwater protection, casing requirements, well reporting and more.
	H.B. 24	Pending	Would require operators to disclose total volume of water used and the chemical ingredients.
	H.B. 230	Pending	Would prohibit wells from being drilled within the surface or subsurface area of, or using hydraulic fracturing or horizontal drilling within 2,500 feet of a water well, lake, reservoir, impoundment, spring, etc. or anything that is the primary source for a community water system.
H.B. 232	Pending	Would provide for well permits, well location restrictions, and disposal of wastewater requirements.	
H.B. 1211	Pending	Would provide for well spacing requirements.	
H.B. 1975	Pending	Would address water supply protection, wastewater, etc.	

Table 2. Water Quality Protection – Casing Requirements, Well Spacing, Setbacks, Water Withdrawals, Flowback, Waste Regulation and More (continued)
(as of May 31, 2012)

State	Bill	Status	Description
Pennsylvania (continued)	S.B. 425 and H.B. 971	Pending	Would address well permits, well location restrictions, groundwater protection and casing requirements. Would also provide for fracking chemicals and surface impoundments, and fluid monitoring, and for use of surface impoundments for temporary flowback storage. Further, this bill would provide for bonding, penalties and well plugging funds.
	H.B. 1645	Pending	Would aim to protect fresh groundwater and water supplies and provide for casing requirements.
	H.B. 2350	Pending	Would provide for the Injection Well Safe Water Act and the disposal of waste in injection wells.
	S.B. 1100	Pending	Would amend impact fees, severance taxes, well restrictions, water supply protections, well reporting requirements, containment, transportation regulations, and more.
	H.B. 1950	Enacted	Enacted new requirements addressing well location restrictions, water supply protections, well reporting requirements, bonding, penalties, civil penalties, containment, emergency response, and more.

Table 3. Legislation Proposing Moratoria or Impact Studies
(as of May 31, 2012)

State	Bill	Status	Description
Illinois	H.B. 3939	Pending	Would direct a department to adopt rules that prohibit hydraulic fracturing in designated state areas.
Michigan	H.B. 5150	Pending– Carryover	Would prohibit hydraulic fracturing under certain circumstances until the advisory committee makes recommendations.
	H.B. 5151	Pending– Carryover	Would provide for a study of hydraulic fracturing by the Department of Environmental Quality.
New Jersey	A.B. 567 and S.B. 246	Pending	Would prohibit hydraulic fracturing.
	S.B. 247	Pending	Would establish a moratorium on hydraulic fracturing until certain conditions are met.
	S.B. 2576	Enacted	Imposed a one-year moratorium on hydraulic fracturing to conduct an investigation into the impacts of hydraulic fracturing on air and water quality in the state.
New York	A.B. 2924	Pending	Would require an Environmental Impact Statement to be prepared for any natural gas or oil drilling involving use of hydraulic fracturing.
	A.B. 9409	Pending	Would require an assessment by a geologist prior to issuing a permit for a well that will be hydraulically fractured.
	A.B. 4237 and S.B. 1230	Pending	Would establish a moratorium on permits for the drilling of wells.
	A.B. 5547	Pending	Would establish a moratorium until 120 days after the U.S. EPA issues its report on the effects of fracking.
	A.B. 5677	Pending	Would prohibit fracturing and horizontal drilling on land operated by the Office of Parks, Recreation and Historic Preservation and within one mile thereof.
	A.B. 6541	Pending	Would establish the Look Before You Leap Act of 2011, which would set a five-year moratorium on high-volume hydraulic fracturing and provide for an investigation.
	A.B. 300 and S.B. 6097	Pending	Would establish a moratorium on the disposal of fluids until 120 days after the U.S. EPA issues its report.
	A.B. 7172	Pending	Would create a temporary state commission on the economic benefits and costs of hydraulic fracturing in New York.
	S.B. 5592, A.B. 7400 and S.B. 6261	Pending	Would suspend hydraulic fracturing.
	S.B. 4220 and A.B. 7218	Pending	Would prohibit hydraulic fracturing.
	A.B. 9419	Pending	Would prohibit high-volume hydraulic fracturing in reforestation areas.

Table 3. Legislation Proposing Moratoria or Impact Studies (continued)
(as of May 31, 2012)

State	Bill	Status	Description
New York (continued)	S.B. 6703 and A.B. 6541	Pending	Would enact a “Look Before You Leap Act of 2012” which would establish a 5-year moratorium on high-volume hydraulic fracturing.
	S.B. 6772	Pending	Would require a health impact assessment for horizontal drilling and high-volume hydraulic fracturing. Would also establish a moratorium on these activities until a final health impact assessment is implemented.
North Carolina	H.B. 773	Pending– Carryover	Relates to statutory oversight studies, including hydraulic fracturing.
Ohio	H.B. 345 and S.B. 213	Pending	Would establish a moratorium on horizontal stimulation of wells until the U.S. EPA publishes its report and the chief of the Division of Oil and Gas Resources Management issues a report analyzing how Ohio’s rules address the issues that are raised in the EPA report.
Pennsylvania	H.B. 232	Pending	Would provide for a cumulative impacts study.
Vermont	H.B. 464	Enacted	Prohibits hydraulic fracturing in the state and prohibits collection, storage or treatment of wastewater from hydraulic fracturing within the state.

Table 4. Legislation Addressing Authority to Regulate
(as of May 31, 2012)

State	Bill	Status	Description
Idaho	H.B. 464	Enacted	Imposes local restrictions noting that it is the intent of the legislature to occupy oil and gas exploration and production regulation. No city, county, or political subdivision, except a state agency with authority, can prohibit the extraction of oil and gas. The extraction may be subject to reasonable local ordinance provisions.
Kansas	HCR 5023	Pending– Carryover	Would urge Congress to permit the Kansas Corporation Commission to regulate hydraulic fracturing.
New Jersey	AR 112 and SR 98	Adopted	Urged enactment of the federal FRAC Act.
	SJR 13	Pending	Would urge Delaware, New York and Pennsylvania to enact moratoria against hydraulic fracturing until the U.S. EPA concludes its study and issues findings.
	SJR 22	Pending	Would urge Delaware, New York and Pennsylvania to join New Jersey in disapproving requests for withdrawing water for hydraulic fracturing and would enact bans on such practices.
North Dakota	HCR 3053a	Adopted	Urged Congress to clearly limit U.S. EPA regulation of hydraulic fracturing, under the Safe Drinking Water Act, to well stimulation treatments that use diesel fuel as the primary constituent of hydraulic fracturing fluid.
Pennsylvania	H.R. 296	Pending	Urges Congress to pass the FRAC Act.
	H.B. 1950	Enacted	Placed restrictions on local governments' ability to zone and regulate natural gas drilling. Municipalities lose impact fee revenue if they pass ordinances or zoning requirements.
Ohio	S.B. 318	Pending	Would prohibit wells to be drilled in an urbanized area unless it will comply with zoning requirements of the municipal corporation or township in which the well will be located.
South Dakota	HCR 1005	Adopted	Urged Congress to clearly delegate responsibility for regulating hydraulic fracturing to the states.
Tennessee	HR 98	Adopted	Encouraged meeting to propose regulations that would provide oversight for use of fracking as a method of modern natural gas extraction. The goal of the meeting would be to protect groundwater quality and drinking water supplies and land and mineral owner rights.
Utah	SCR 12	Enacted	Urged Congress to clearly delegate responsibility for regulating hydraulic fracturing to the states.

Notes

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2. U.S. Department of Energy, *Modern Shale Gas Development in the United States: A Primer* (Oklahoma City, Okla.: Ground Water Protection Council, April 2009); http://www.netl.doe.gov/technologies/oil-gas/publications/eports/shale_gas_primer_2009.pdf.
3. FracFocus, <http://fracfocus.org/>.
4. U.S. Energy Information Administration, *Annual Energy Outlook 2012 Early Release* (Washington, D.C.: EIA, January 2012); <http://www.eia.gov/forecasts/aeo/er/>.
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7. U.S. Energy Information Administration, *Effect of Increased Natural Gas Exports on Domestic Energy Markets as requested by the Office of Fossil Energy*.
8. *Made in America: The economic impact of LNG exports from the United States* (Washington, D.C., and Houston, Texas: Deloitte Center for Energy Solutions and Deloitte MarketPoint LLC, n.d.); http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/Energy_us_er/us_er_MadeinAmerica_LNGPaper_122011.pdf.
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11. Susan Christopherson and Ned Rightor, *How Should We Think About the Economic Consequences of Shale Gas Drilling?* Working Paper Series: A Comprehensive Economic Impact Analysis of Natural Gas Extraction in the Marcellus Shale (Ithaca, N.Y.: Cornell University, May 2011); http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_SC_NR.pdf.
12. Jannette M. Barth, Comments on IHS Global Insight's study, "The Economic and Employment Contributions of Shale Gas in the United States," December 2011 (Fremont Center, N.Y.: Catskill Citizens for Safe Energy, Jan. 27, 2012); http://www.catskillcitizens.org/barth/barth_IHS_Study_comments.pdf.
13. Ibid.
14. Aimee E. Curtright and Kate Giglio, *Coal Mine Drainage for Marcellus Shale Natural Gas Extraction: Proceedings and Recommendations from a Roundtable on Feasibility and Challenges* (Santa Monica, Calif.: RAND Corporation, 2012); http://www.rand.org/pubs/conf_proceedings/CF300.html.
15. Austin Holland, *Examination of Possibly Induced Seismicity from Hydraulic Fracturing in the Eola Field, Garvin County, Oklahoma* (Norman, Okla.: Oklahoma Geological Survey, August 2011); http://www.ogs.ou.edu/pubsscanned/openfile/OF1_2011.pdf.
16. Melissa Braybrooks, Julio Ruiz, and Elizabeth Accetta, *State Government Tax Collections Summary Report: 2010* (Washington, D.C.: U.S. Census Bureau, March 2011); <http://www2.census.gov/govs/statetax/2010stcreport.pdf>.
17. Several federal regulations apply to natural gas development. The Clean Water Act regulates surface water discharges; the Clean Air Act sets rules for air emissions from engines, gas processing equipment and other sources associated with drilling and production; the National Environmental Policy Act requires permits and environmental impact assessments for drilling on federal lands; the Occupational Safety and Health Act sets standards to keep workers safe; and the Emergency Planning and Community Right-to-Know Act requires storage of regulated chemicals in certain quantities to be reported annually to local and state emergency responders.
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Natural Gas Fracking Operation photo on cover courtesy of Richard Waite, World Resources Institute.



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William T. Pound, Executive Director

7700 East First Place
Denver, Colorado 80230
(303) 364-7700

444 North Capitol Street, N.W., #515
Washington, D.C. 20001
(202) 624-5400

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ISBN 978-1-58024-662-0