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Mineral Rights

Basic information about mineral, surface, oil and gas rights.

Fee Simple - Complete Ownership

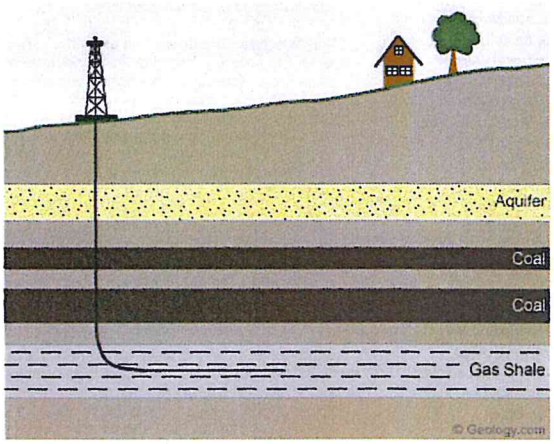
In most countries of the world all mineral resources belong to the government. This includes all valuable rocks, minerals, oil or gas found on or within the Earth. Organizations or individuals in those countries can not legally extract and sell any mineral commodity without first obtaining an authorization from the government.

In the United States and a few other countries, ownership of mineral resources was originally granted to the individuals or organizations that owned the surface. These property owners had both "surface rights" and "mineral rights". This complete private ownership is known as a "fee simple estate".

Fee simple is the most basic type of ownership. The owner controls the surface, the subsurface and the air above a property. The owner also has the freedom to sell, lease, gift or bequest these rights individually or entirely to others.

If we go back in time to the days before drilling and mining, real estate transactions were fee simple transfers. However, once commercial mineral production became possible, the ways in which people own property became much more complex. Today, the leases, sales, gifts and bequests of the past have produced a landscape where multiple people or companies have a partial ownership of or rights to many real estate parcels.

Most states have laws that govern the transfer of mineral rights from one owner to another. They also have laws that govern mining and drilling activity. These laws vary from one state to another. If you are considering a mineral rights transaction or have concerns about mineral extraction near your property it is essential to understand the laws of your state. If you do not understand these laws you should get advice from an attorney who can explain how they apply to your situation.



"Mineral Rights" entitle a person or organization to explore and produce the rocks, minerals, oil and gas found at or below the surface of a tract of land. The owner of mineral rights can sell, lease, gift or bequest them to others individually or entirely. For example, it is possible to sell or lease rights to all mineral commodities beneath a property and retain rights to the surface. It is also possible to sell the rights to a specific rock unit (such as the Pittsburgh Coal Seam) or sell the rights to a specific mineral commodity (such as limestone).

Surface Rights vs. Mineral Rights

"I'll pay you $100,000 for the coal beneath your property!" This type of transaction has happened many times. The fee simple owner may not have the interest or the ability to produce the coal beneath his property but a coal company does.

In this type of transaction the owner wants to sell the coal but retain possession and control of the surface. The coal company wants to produce the coal but does not want to pay an additional price to acquire the buildings and the surface. So, an agreement is made to share the property. The original owner will retain the buildings and rights to the surface, and the coal company will acquire rights to the coal. The transaction can involve all mineral commodities (known or unknown) that exist beneath the property, or, the transaction can be limited to a specific mineral commodity (such as "all coal") or even a specific rock unit (such as the "Pittsburgh Coal").

Buying Mineral Rights

Buying a coal seam is much more complex than buying a car. When you buy a car you simply pay for it, file a title transfer with the government and drive the car home. However, when mineral rights are purchased the buyer and all future mineral rights owners will have a right to exploit the property. And, the seller and all future surface owners must live with the consequences. Usually, mineral extraction will occur at some future time. Mining companies often schedule their equipment and employees years in advance. Or, the mining company might purchase the property as a future "reserve".

It is also possible that the new mineral owner has no intentions of production. They are simply buying the property as an investment. Their goal is to sell the mineral rights to a mining company who will assume the duties of production. Speculators who have no intent to mine purchase lots of mineral properties. They are simply attempting to be "middle men" who acquire valuable property from individual owners and broker those properties to mining companies for higher prices.

(These "speculator" buyers also frequently use options. In an option transaction they offer the property owner a small amount of money today for the option of buying the property at a specified price on or before a specified date in the future. The speculator then quickly tries to find someone who will pay an even higher price and make a significant profit. If the speculator fails to pay the specified price by the

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expiration date the property owner keeps the option payment.)

When a company buys mineral rights it also buys the right to enter the property and remove the resource at some future time. In most of these transactions the surface owner has no say in when the mining takes place, how it will be done and what will be done to restore the property. Most disagreements between buyers and sellers occur at the time of mining. If the seller wants any control at that time he must anticipate what might go wrong and write a contract that will preserve his wishes.

Mineral Leases and Royalties

Sometimes a mining company does not want to purchase a property because they are uncertain of the type, amount or quality of minerals that exist there. In these situations the mining company will lease the mineral rights or a portion of those rights.

A lease is an agreement that gives the mining company the right to enter the property, conduct tests and determine if suitable minerals exist there. To acquire this right the mining company will pay the property owner an amount of money when the lease is signed. This payment reserves the property for the mining company for a specific duration of time. If the company finds suitable minerals it may proceed to mine. If the mining company does not commence production before the lease expires then all rights to the property and the minerals return to the owner.

When minerals are produced from a leased property the owner is usually paid a share of the production income. This money is known as a "royalty payment". The amount of the royalty payment is specified in the lease agreement. It can be a fixed amount per ton of minerals produced or a percentage of the production value. Other terms are also possible.

When entering into a lease agreement the property owner must anticipate any activities that the lessee might do while exploring the property. This exploration might included drilling holes, opening excavations, or bringing machines and instruments onto the property. Defining what is allowed and what restoration is required is part of a good lease agreement.

Oil and Gas Rights

Mineral rights also include the rights to any oil and natural gas that exist beneath a property. The rights to these commodities can be sold or leased to others. In most cases, oil and gas rights are leased. The lessee is usually uncertain if oil or gas will be found so they generally prefer to pay a small amount for a lease rather than pay a larger amount to purchase. A lease gives the lessee a right to test the property by drilling and other methods. If drilling discovers oil or gas of marketable quantity and quality it may be produced directly from the exploratory well.

To entice the property owner to commit to a lease the lessee generally offers a lease payment (often called a "signing bonus"). This is an up-front payment to the owner for granting the lessee a right to explore the property for a limited period of time (usually a few months to a few years). If the lessee does not explore or explores and does not find marketable oil or gas then the lease expires and the lessee has no further rights. If the lessee finds oil or gas and begins production, a regular stream of royalty payments usually keeps the terms of the lease in force.

One problem that can occur is when the lessee discovers oil or gas but has no way to transport it to market. Some lease agreements have a "waiting on pipeline" clause that extends the lessee's rights for a limited or indefinite period of time.

In addition to a signing bonus, most lease agreements require the lessee to pay the owner a share of the value of produced oil or gas. The customary royalty percentage is 12.5 percent or 1/8 of the value of the oil or gas at the wellhead. Some states have laws that require the owner be paid a minimum royalty (often 12.5 percent). However, owners who have highly desirable properties and highly developed negotiating skills can sometimes get 15 percent, 20 percent, 25 percent or more. When oil or natural gas is produced the royalty payments can greatly exceed the amounts paid as a signing bonus. (Royalty estimation tool).

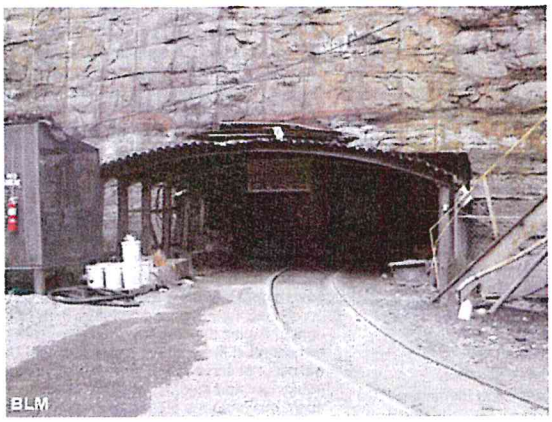
Oil and Gas Unitization and Pooling

Below the surface, oil and gas have the ability to move through the rock. They can travel through tiny pore spaces - such as between the grains of sand in sandstone or through the tiny openings created by fractures. This mobility allows a well to drain oil or gas from adjacent lands. So, a well drilled on your land could drain gas from a neighbor's land if the well was drilled sufficiently close to the boundary.

Some states have recognized the ability of oil and gas to cross property boundaries underground. These states have produced regulations that govern the fair sharing of oil and gas royalties. These states generally require drilling companies to specify how oil and gas royalties will be shared among adjacent property owners when a permit for drilling is filed. The proposed sharing of royalties will be based upon what is known about the geometry of the oil or gas reservoir compared to the

- Three Bottom Lines

Large mining trucks are loaded with coal at this surface mine. Here two thick coal seams are being removed. Surface mining involves stripping away all overburden (rock and soil above the coal seam), removing the coal, replacing the overburden and revegetating the land. Surface mining completely disturbs the land and produces a new landscape. It can be done when coal seams are close to the surface. Depending upon coal quality and other factors, about ten feet of overburden can be removed for each foot of coal. © iStockphoto / Rob Belknap.



When the coal is too deep to surface mine a mining company will build an underground mine. They can tunnel into the coal seam or drill a large shaft down to the mining level. These shafts are large enough to lower mining equipment and workers into the mine and remove coal. Extra shafts must be built to ventilate the mine. Underground mining can damage the surface because the rooms and passages usually close through collapse or settlement over time. Sometimes the damage occurs after responsible individuals are dead and the mining companies are defunct. Thus, no one to sue. Or, the contract that conveyed the mineral rights gave the mining company immunity. Bureau of Land Management Image.

geometry of property ownership at the surface. This procedure is known as "unitization".

Some states do not have rules for unitization of oil and gas royalties. Other states have them but only for wells that produce from certain areas or from certain depths. These rules can play a critical role in a leasing or resource development strategy. Some people tell stories about landmen saying "Lease to me now or we will drill your neighbor's land and drain your gas without paying you a cent." In some situations, an absence of state regulations allows this to occur. If you are contacted about leasing your mineral rights you should contact an attorney for advice on how the laws of your state will apply to your property.

(Note: In Pennsylvania the rules for natural gas sharing change at certain depths below the surface and at certain positions in the stratigraphic column. See the section labeled "Stratigraphic Column" near the bottom of the right column of this page for more information. In some areas the rules used for sharing Marcellus Shale gas can be different from the rules used for sharing gas from the underlying Utica Shale.)

Mineral Rights Negotiations

A short story.... Two men were at the hardware store and in walks a guy who asks... "Have you sold your mineral rights yet? I'll pay you $500 an acre for them - and write your check this morning." One man grabbed the check and ran straight to the bar. The other man grabbed the contract and ran straight to his attorney. One of these men had a million friends that night. The other had a million dollars in the bank.

Three things are required to make a successful mineral rights deal: 1) knowledge, 2) skill, and 3) patience. If your abilities fail in any one of the three you can lose a lot of money. If you don't have all three of these abilities then find a good a attorney or other mineral property professional. Their assistance usually doesn't cost a lot but the difference that they can make in the transaction can be enormous.

There's More to a Good Contract than Money!

In addition to financial matters, a lease or sales contract can do more than simply specify the amounts paid to the owner. It can also contain language that protects the owner's property and way of life while exploration, mining, drilling and production take place. The contract can set guidelines that protect the owner's buildings, roads, livestock, crops and other assets. It can also reserve portions of the property that will not be disturbed during exploration, mining, drilling and production.

In most transactions the lessee is the one who prepares a contract for signature. If the owner signs without getting professional advice, the rights conveyed to the lessee might be greater than the owner wants to give away. Any owner who does not have knowledge or experience with mineral rights transactions should seek advice or representation from an attorney or mineral property professional. Lessees will often accept significant revisions to what is contained in their standard lease or sales contract.

Disagreements During Extraction

Disputes between the mineral rights owner and the surface rights owner usually arise at the time of mineral extraction.

These activities can require use of the surface and damage the surface owner's enjoyment of the property. Here is where the wording of the mineral rights agreement or lease agreement becomes very important. The agreement may give the mineral owner the right to extract the mineral at any time, using any methods and without compensation or regard for the surface owner. This is why legal assistance should be obtained when selling or leasing mineral rights.

When purchasing surface rights it is a good idea to carefully examine the wording of any mineral rights agreements that apply to the propety These could grant significant liberties to the mineral owner at the time of extraction. Although you were not involved in the transaction that sold the mineral rights from the property, you will nevertheless be bound by that contract. When you buy a property you buy both its assets and its liabilities. Hire an attorney who can do the necessary research and educate you about what you are buying. When mineral rights are being sold or leased, the parties involved in the transaction should be in full agreement on how extraction will occur, what reclamation will be done and who is responsible for anticipated problems. Most states have mining laws and regulations that limit the mining company's actions during the extraction process and require reclamation. However, these laws might not meet the surface owner's expectations. To avoid problems these matters should be addressed in the contract at the time of sale. Again, the property owner should have an attorney who can research, negotiate, educate and ensure that the contract is appropriate.

Delayed Damage to the Surface

Damage to the surface can be delayed. Subsidence of underground works or settlement of surface mined areas might not occur or be detected until decades after mining is completed. The owner of a fee

Should you sign a gas lease? (Part One): A discussion of the factors landowners need to consider before signing a gas lease on their property. Featuring Ken Balliet and Dave Messersmith, both Extension Educators with Penn State Extension.

Should you sign a gas lease? (Part Two): A discussion of the factors landowners need to consider before signing a gas lease on their property. Featuring Ken Balliet and Dave Messersmith, both Extension Educators with Penn State Extension.

Drilling for natural gas usually disturbs several acres of land. A few acres are usually cleared for the drill pad. Sometimes a couple of acres are needed for runoff capture or water treatment. And, if the gas well is successful, a pipeline will be built to transport the gas to market. © iStockphoto / Edward Todd.

simple estate should consider these facts before entering into a mineral rights sale or lease agreement. The consequences of mineral extraction will be passed on to heirs and all subsequent owners of the property. It is not uncommon for undermined properties to show no signs of subsidence for decades after mining is completed. Then, cracks and settlement begin to appear. In this situation the mining company may be long defunct and its owners long dead. There is no one to hold responsible - even if repair of any damage was written into the lease or sales agreement.

Damage to Aquifers

Many households in areas where mining or drilling takes place are outside of the service of public water supplies. These property owners rely on water wells for the production of their water. When underground mining occurs beneath a property some subsidence and settlement should be expected. If the mine is below the aquifer tapped by the well, subsidence of the mine could damage the aquifer, causing its water to drain into deeper rock units. This can cause a temporary or permanent loss of the water supply. The value of a rural property without a water supply is a lot lower than the same property with a water supply.

Buying a Home, Land or a Farm

When buying property in areas of potential or historic mineral development, a buyer should determine if a fee simple estate is being purchased or if ownership will be shared with others. Mineral rights transactions are normally a matter of public record and copies of deeds or other agreements are filed at a government office.

Real estate buyers should ask the seller to specify what rights are being conveyed and have an attorney confirm that the seller owns what is being sold. In many areas the sale of mineral rights are recorded in the government record in a different deed book or database than the sale of surface property. This means that the deed to the surface property might not mention mineral rights that have been sold away. In areas of historic or potential mining activity the buyer of a property should hire an attorney who can do this research and confirm what is being purchased. This can prevent future surprises and problems.

The mineral rights buyer probably prepared the sales agreement and prepared it so that everything will be in his favor. He wants the liberty to enter the property at any time, bring whatever equipment needed, extract the mineral using any method, and make the minimum reclamation required by state law. A person who buys a home above these mineral rights one hundred years later will have no say in how the mineral owner uses his property as long as the mineral owner abides by the sales agreement and applicable laws.

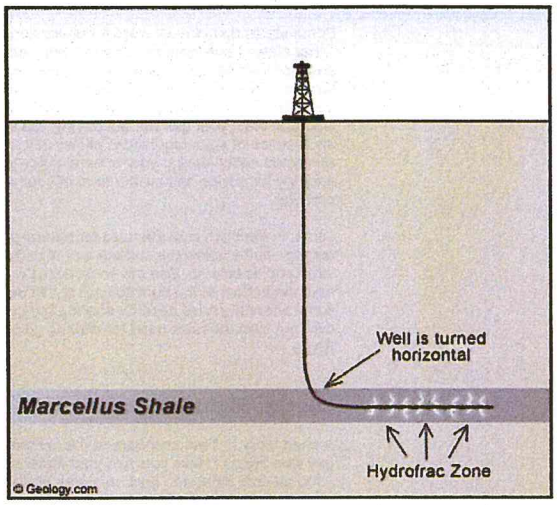
State and Local Laws Always Apply

Most states have laws that regulate mining and drilling activity. There are also laws that regulate the sale of surface and mineral property. These laws are meant to protect the environment and all parties involved in property transactions. These laws are the only protection available to buyers or sellers on issues that are not specifically addressed in the mineral transaction agreement.

Although mineral rights laws are similar from state to state, small variations can make an enormous difference when applied to individual transactions. In addition, mining and oil and gas regulations can vary significantly from one state to another. These can also have an enormous difference when applied to individual transactions. Each transaction is unique and should be carefully considered before any permanent agreement is made.

What Qualifies as a "Mineral"?

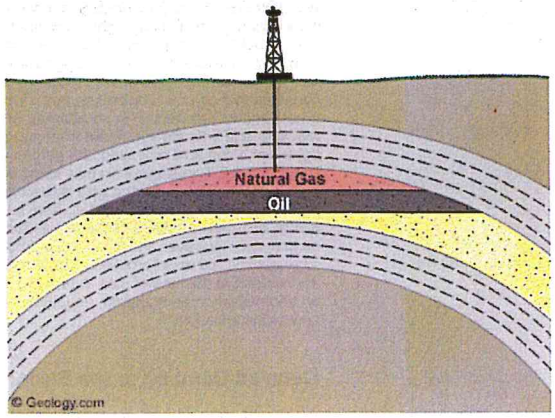
The word "mineral" is used in a variety of contexts. Generally, ores of metals, coal, oil, natural gas, gemstones, dimension stone, construction aggregate, salt and other materials extracted from the ground are considered to be minerals. However, there is no definition of "mineral" that applies in every situation and what is considered to be a "mineral" can vary from state to state.



In this illustration a well has been drilled vertically but deviated to horizontal below the surface. This type of drilling can extend the reach of a well for a mile or more in any direction. It is therefore possible to drill a well on one property and drain oil or gas from adjacent lands. How the gas and royalties will be shared is sometimes determined by state regulations and sometimes by private agreements. Regulations governing the sharing of oil and gas production vary from one state to another (and for different drilling situations within a single state). It is critical to either know the regulations or get reliable advice before entering into any oil and gas transaction.

Recommended

- Oil and Gas Articles
- Marcellus Shale
- Mineral Rights
- Oil and Gas Jobs
- Largest Oil Spills Map
- Barnett Shale
- Natural Gas Royalty Calculator
- Who Owns The Arctic Oil?



This illustration shows a well that will produce oil and natural gas from an anticline. In this drawing we can easily see that only a portion of the surface property is directly

What Kind of Money Are We Talking About?

The amounts of money that change hands in mineral property transactions can be huge in comparision with the average person's financial experience. The total yield (lease + royalties) or mineral sale price can often exceed the value of the surface rights. Let's consider two examples:

Example A: A 100 acre property is completely underlain by a coal seam that is eight feet thick. The owner agrees to let a mining company remove the coal for a royalty of $3 per ton that will be paid upon extraction. Assuming a coal recovery rate of 90% the owner would be paid nearly $4 million.

Example B: A 100 acre property is drilled for natural gas and the royalties will be shared by owners of a 640 acre unit that immediately surround the well. The property owner is to receive a 12.5% royalty based upon the wellhead value of the gas which at the time of production is $8 per thousand cubic feet. Assuming an average well production rate of 2 million cubic feet of gas per day throuthout the calendar year the property owner would be paid over $100,000 dollars for one year of gas production.

Oil and natural gas transactions involve large sums of money but the true value can be difficult to estimate - especially in areas where very little drilling has occurred in the past or where deep rock units are being tested for the first time.

Three Bottom Lines

1) Get professional assistance: Mineral rights and mineral lease transactions involve large amounts of money and are very complex. This article is intended to be no more than a brief introduction. If you are contacted about leasing or selling your mineral rights you should promptly get advice from an attorney who has expertise in mineral transactions and the laws of your state. If you do not have an attorney you can contact the local Bar Association for guidance.

2) The surface owner has rights: In general, the purpose of a lease or a purchase contract is to convey the rights of exploration and production to a mineral development company. However, the owner of the surface also has some rights. Basic rights of the surface owner are provided by state laws, however, every surface owner should decide if stronger protections are needed. The only way to preserve them is to be sure that the contract contains adequate language to protect crops, livestock, buildings, personal property, access and any other desires during the duration of a lease or permanently in the case of a sale. Lessees will often accept significant revisions to what is contained in their standard lease or sales contract.

3) Buyers and sellers beware: If you want a good financial outcome and protection for your property during and after mineral production it is up to you and your attorney to be sure that you have a good contract. Knowledge and negotiating skills are what will determine the success of your deal. If you don't have these you are taking a huge risk.

Disclaimer

The information above should not be considered as legal advice. It presents examples of situations that might occur when valuable commodities exist beneath the land. It repeatedly suggests seeking professional assistance if you are considering a mineral rights transaction. Geology.com does not offer that assistance or recommend people who provide it.

Contributor: Hobart King

above the oil and gas accumulation. The placement of the well is critical for proper development of this reservoir.

120 Acres of coal
× 6' thick
720 Acre-feet
× 1800 tons / Acre-foot
1,296,000 tons of coal

How many tons of coal are down there? This is a fairly easy calculation. An acre-foot is the basic unit of measurement for coal below earth's surface. An acre-foot of coal is one acre in area and one foot thick. It weighs about 1800 tons. Calculating the number of tons of coal beneath a property involves two multiplications.

1) In this calculation we have a 120 acre property that is completely underlain by a coal seam with an average thickness of 6 feet. Multiplying the number of acres times the average thickness of the coal would yield the number of acre-feet of coal beneath the property.

2) It is known that one acre-foot of coal weighs about 1800 tons. Therefore if we multiply the number of acre-feet of coal beneath the property by 1800 tons/acre-foot the result will be the number of tons of coal beneath the property.

The number of tons obtained in this calculation is the total tons below. The number of tons that can be recovered will be a much smaller number. Recovery rates for suface mining are often about 90%. Recovery rates for underground mining can be as low as 50% because pillars of coal must be left in the mine to support the roof.

Local Mineral, Oil and Gas Information

The websites below contain descriptive information about mineral mining and production in various U.S. states and Canadian provinces.

- Alaska: Mineral Property Records
- Alberta: Mineral Rights Information
- Arizona: Land Ownership Status
- Arkansas: Royalty and Surface Owner Information
- California: Questions about Oil, Gas and Geothermal
- Colorado: Questions About Oil and Gas Development
- Florida: Mineral Rights FAQ
- Idaho: Mineral Leasing
- Illinois: Mineral Rights
- Indiana: Oil and Gas Lease Negotiation
- Kansas: Mineral Rights and Leasing Information
- Kentucky: Coal Property and Oil and Gas
- Maine: Mining and Quarrying FAQ
- Michigan: Mineral Rights Information
- Minnesota: Mineral Rights Ownership
- New Mexico: Mineral Rights and Claims
- New York: Oil and Gas Lease Information
- North Dakota: Surface and Mineral Owners Information
- Oklahoma: Oil and Gas FAQ
- Pennsylvania: Oil and Gas Lease Information
- Texas: Lease and Royalty Information

What Might Be in Your Deed

The language below is quoted directly from the deed of a property owned by the author. This same language also appears on the Certificate of Title.

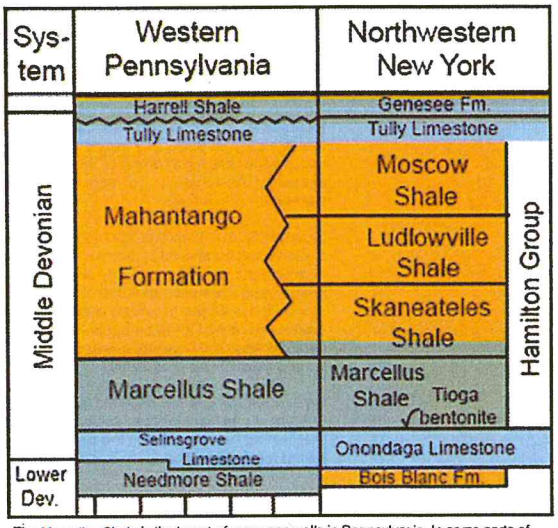
> *"Excepting and Reserving, thereout and therefrom, all the nine-foot vein of coal, iron and other minerals, together with appurtenant mining rights, as described in deed from James B. Wiggins, et ux, to Jasper M. Thompson, dated December 17, 1885, and of record in the aforesaid Recorder's Office of in Deed Book 66, page 157."*

In 1885, "the nine-foot vein" was a description used for what is now known as the "Pittsburgh Coal Seam". This language conveyed ownership of the Pittsburgh Coal and other minerals from James B. Wiggins to Jasper M. Thompson. Jasper Thompson also received rights to mine the property. It was a sale that severed mineral rights from a fee simple property.

The mineral rights transaction was done in 1885. Since then the surface property, originally owned by James Wiggins, has been

subdivided many times and now is in the hands of many owners. None of those surface owners have any claim to the minerals sold to Jasper Thompson. All of them should realize that the Pittsburgh Coal has been deep mined in the area of their property.

Stratigraphic Column



The Marcellus Shale is the target of many gas wells in Pennsylvania. In some parts of the state it is immediately above the Onondaga Limestone. The Utica Shale is located beneath the Onondaga. Here is a quote from the Pennsylvania Department of Environmental Protection website that explains the siginficance:

"Your oil or gas could be produced or captured from a well outside your property tract boundaries. In fact, your only protection is if your oil or gas property is subject to the Oil and Gas Conservation Law, 58 P.S. § 401.1 et seq. If so, the gas on your property could be included in a unitization or pooling order issued by the Commonwealth at the behest of a producer on a neighboring tract. That well operator would then have to pay you a production royalty based on your prorated share of the production from the well, depending on how much of your tract was deemed to be contributing to the well's pool. This law applies to oil or gas wells that penetrate the Onondaga horizon and are more than 3,800 feet deep."

Image by: Robert Milici and Christopher Swezey, 2006, Assessment of Appalachian Basin Oil and Gas Resources: Devonian Shale–Middle and Upper Paleozoic Total Petroleum System. Open-File Report Series 2006-1237. United States Geological Survey.

Haynesville Shale Resources

Haynesville Shale News

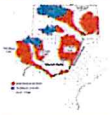
Marcellus Shale Resources

Marcellus Shale Article

Marcellus Shale News

Fayetteville Shale Resources

Fayetteville Shale News



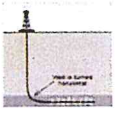
Barnett Shale Article

Barnett Shale News

Bakken Shale Article

Bakken Formation Resources

Bakken Formation News



Utica Shale News

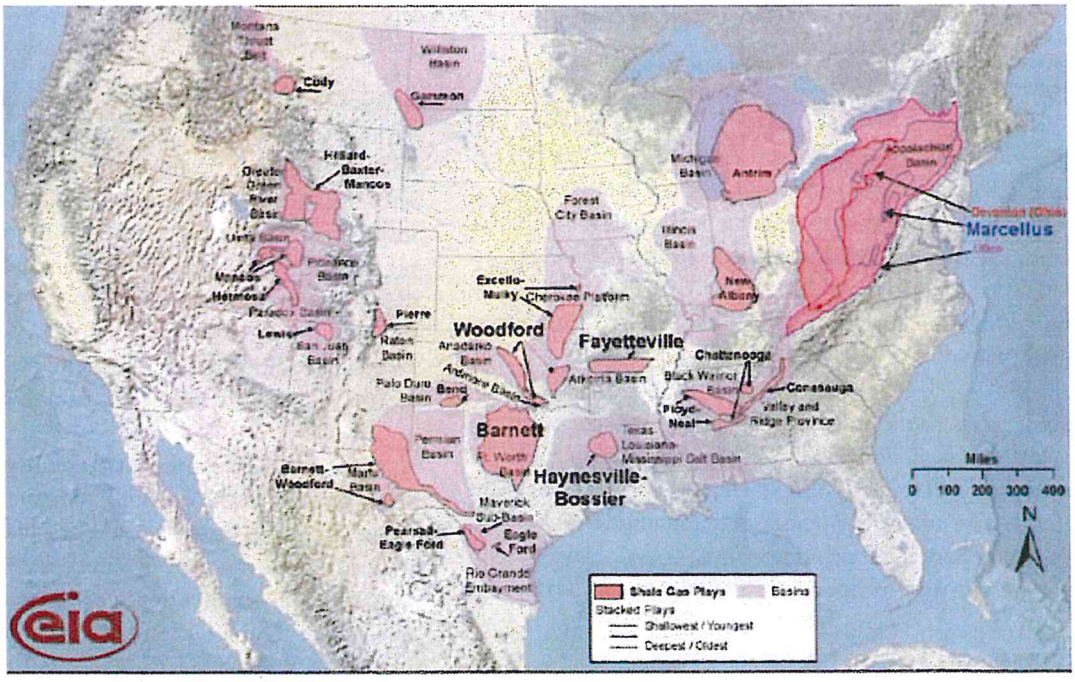
Regulating Hydraulic Fracturing: States Take Action

By Jacquelyn Pless December 2010

Recent advances in natural gas drilling techniques have opened up U.S. natural gas supplies that were unavailable just a decade ago, expanding supplies so much that some forecast current consumption levels could be sustained for another century.[1] In the lower 48 states, the most active extraction sites include the Antrim Shale, the Fayetteville Shale, the Haynesville/Bossier Shale, the Barnett Shale, the New Albany Shale, and the Marcellus Shale. The "gas rush" of the Marcellus Shale gas play—a geographic area targeted for natural gas exploration which stretches from Ohio to upstate New York and lies beneath two-thirds of Pennsylvania—holds the largest untapped natural gas reserves in the nation. While this region alone could provide enough natural gas to satisfy U.S. demand for at least a decade, some are concerned that extraction methods may threaten freshwater supplies.

Natural gas production from hydrocarbon-rich shale is one of the most rapidly expanding trends in oil and gas exploration and production, and states are working to regulate new extraction technologies to protect water resources and the environment. Figure 1 illustrates locations of shale gas plays in the lower 48 states.

Figure 1. Shale Gas Plays, Lower 48 States



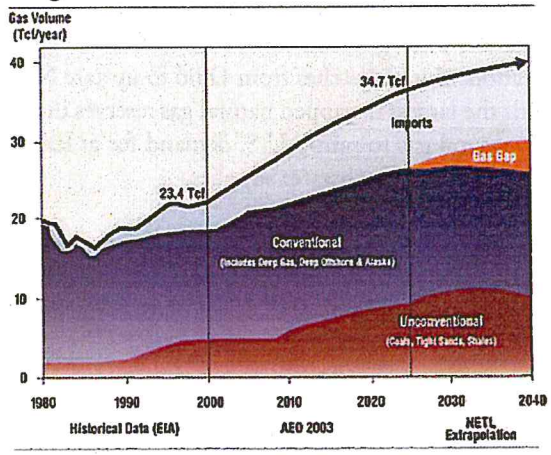
Source: Energy Information Administration, based on data from various published studies. Updated March 10, 2010.

Natural Gas: A Key Role in U.S. Energy Supply

Natural gas, coal and oil supply about 85 percent of U.S. energy. Natural gas alone, often favored over coal because it emits far fewer pollutants, provides about 22 percent of the total energy supply.[2] In the past, fluctuations in natural gas prices and consistently higher prices than coal have been major drawbacks to heavy reliance on the resource. U.S. reliance on natural gas is expected to continue to increase, however, as advances in natural gas drilling technology increase domestic supplies. Although costs in the

past have generally fluctuated between $3 per MMBtu (1,000 cubic feet of natural gas) and $13 per MMBtu, they are expected to remain between $5.5 per MMBtu and $7.5 per MMBtu until 2030; new shale gas supplies are expected to help sustain lower prices.[3] Figure 2 illustrates domestic conventional and unconventional gas supply projections through 2040.

Figure 2. Conventional/Unconventional Gas



Source: National Energy Technology Laboratory, U.S. Department of Energy.

In general, natural gas produced from unconventional sources (shale gas, tight sands and coalbed methane) is expected to constitute an increasing portion of the U.S. reserves as conventional gas reserves decline. Shale gas is estimated to make up 28 percent or more of total estimated technically recoverable gas resources in the United States.[4]

Natural gas is found in porous rock reservoirs beneath the earth's surface. Fossil fuel fills gaps or cracks in rock, and hydraulic fracturing allows release of trapped natural gas. The main differences between modern shale gas development and conventional natural gas development are the uses of horizontal drilling and hydraulic fracturing.

What Is Fracking?

Hydraulic fracturing—"fracking"—uses hydraulic pressure to break up rock. Millions of gallons of pressurized liquids, usually a water-based mixture of sand and chemical additives, are pumped into geologic formations to force open cracks and gaps to optimize natural gas extraction. Following fracturing, a proppant, commonly sand, is pumped into cracks to keep them open while the gas is removed.

The first use of fracking for oil or gas production occurred in the 1940s. Since then, the technology has been commonly used in completion of gas wells, especially when drilling into shale reservoirs. It is estimated that approximately 70 percent of the world's fracturing activity occurs in North America.[5] Hydro-fracking significantly enhances gas recovery in vertical wells by increasing available pathways for fluid movement, which is even more substantial in horizontal wells. The advancement of hydraulic fracturing and horizontal drilling technologies allows shale gas development in previously inaccessible areas, some of which are densely populated. Although fracking for natural gas extraction offers economic benefits to local communities, its rapid expansion near populated areas has drawn attention to its potential effects on human health and the environment.

Local Economic Effects of Natural Gas Fracking

Besides the benefits incurred from increasing domestic natural gas supplies, resource development spurs rippling economic effects. Activities before, during and after drilling generate positive economic effects, which may be substantial. Job creation is likely the most significant effect, since workers are needed for legal and regulatory work, construction and infrastructure development. Local, state and federal tax revenues are generated, and additional expenditures by workers in drilling-related jobs and royalties stimulate the local economy.

A recent study by professors at Pennsylvania State University evaluates the economic impacts of the Pennsylvania Marcellus Shale natural gas play. They estimate that, in 2009, the sum of direct, indirect and induced impacts from the development of Marcellus Shale totaled more than $7.17 billion with industry providing a direct stimulus of $3.77 billion to the local economy.[6] An additional $1.56 billion is added to total state gross output as direct stimulus leads to spending by other firms, and direct and indirect business activities are estimated to generate income resulting in the purchase of $1.84 billion in additional goods and services.

The study estimates that 21,000 direct jobs and 44,000 total (including indirect and induced) jobs were created in Pennsylvania in 2009 from Marcellus Shale develop-

ment. Job creation and economic output resulted in an increase of more than $389 million in state and local tax revenues and $1.05 billion in federal taxes in Pennsylvania.[7]

Although economic impact studies can help municipalities identify potential gains from natural gas development, limitations exist that communities must consider. Most impact studies analyze only employment and income and do not address the distribution of money or who benefits from development activities. Often ignored are potential negative impacts on other sectors, distribution of tax revenue, impact on local government services, and environmental costs and implications.[8]

Human Health and Environmental Concerns

A recent study funded by the U.S. Department of Energy (DOE) found fracturing fluids are 98 percent to 99.5 percent water by volume. Between three and 12 chemical additives typically are used for a fracture.[9] These additives serve various purposes, but generally improve efficiency and help carry sand into fractures.

Natural Gas Fracking Operation
Source: Richard Waite, World Resources Institute.

Some are concerned about the chemicals used in fracking fluid. Because fluids are pumped into the ground and portions flow back to the wellhead following a fracture treatment, groundwater contamination is possible. Although no state has passed legislation requiring disclosure of fracking ingredients, Wyoming's Oil and Gas Conservation Commission set new rules, effective September 2010, requiring companies to submit a comprehensive list of the substances that are injected into wells during hydraulic fracturing procedures. The U.S. Department of the Interior is also considering disclosure rules.

After injection, fracking fluid mixes with water and absorbs naturally occurring radiation, salts and metals.[10] Some fluids cannot be recovered from the cracks following a treatment, and pressure from the formation may cause some to flow back through the well casing to the wellhead.[11] Recovered water is either stored or recycled to be discharged into surface water or injected underground. Flowback can continue for several months after gas production has begun.[12]

Many question where the wastewater goes once it has been used to extract gas. While flowback fluid presumably is stored until it can be disposed of or reused, tears in storage liners have led to spills into local water supplies. Hydraulic fracturing is suspected to be the cause of incidents of drinking water contamination in several states. In 2009, a U.S. Environmental Protection Agency (EPA) investigation of the Pavilion area in Fremont County, Wyo., found that harmful substances contaminated 11 of 39 water wells near hydro-fracking operations. Residents noted changes—such as a yellow color, oil sheen and small gas bubbles—in their drinking water.[13] In Pennsylvania, 13 families have filed a lawsuit claiming their well water was contaminated by nearby hydraulic fracturing operations, exposing them to harmful chemicals.

Water Use

Approximately 2 million to 4 million gallons of water are needed to drill and fracture a horizontal shale gas well.[14] Although this volume can be relatively small for an area's overall surface water budget, using that much water in a short time period may challenge infrastructure and supplies.[15] Significant water withdrawals could affect municipal water supplies, aquatic life, fishing and recreational activities, and industries such as power plants that depend on water use.

It is critical to identify water supplies that can meet the needs for drilling and fracturing without interfering with current community needs. One option suggested by the DOE is adapting to seasonal changes to capture water when surface water flows are greatest. It can be helpful for operators to work with local water planning agencies, however, to fully understand specific regional needs.

Federal Regulation

In June 2009, Congress introduced the Fracturing Responsibility and Awareness of Chemicals (FRAC) Act (HR 2766 and S. 1215). Although neither bill passed, if enacted, they would have removed a current exemption from the Safe Drinking Water Act commonly known as the "Halliburton Loop," which exempts hydraulic fracturing from restrictions on underground injection near drinking water sources. The act also would have required disclosure of chemicals in the fracking fluid for each operating source, and the U.S. Environmental Protection Agency (EPA) would have regulated hydraulic fracturing. While the energy industry argued the FRAC Act adds unnecessary and cumbersome regulation and that states already adequately regulate hydro-fracking, others claimed it would address problems that currently are ignored.

Lawmakers in Alabama, Alaska, Louisiana, Mississippi, North Dakota, Oklahoma, Pennsylvania, Texas, Utah, and Wyoming, recognizing the benefits fracking brings to local economies and landowners, introduced legislation urging Congress not to remove the exemption from the Safe Drinking Water Act. Alabama, North Dakota, Oklahoma, Utah and Wyoming adopted the resolutions. New Jersey and Pennsylvania introduced resolutions supporting passage of the FRAC Act.

In November 2010, the U.S. Department of the Interior announced it was considering changing regulations to require drillers to disclose fracking chemicals used on federal land, which is drawing support and opposition from members on both sides of the aisle.

Environmental Protection Agency Study

The EPA is conducting a nationwide study to assess the environmental and public health effects of hydraulic fracturing. Initial results are expected to be available by late 2012. In response, a number of related bills were introduced in New York. One would place a moratorium on the disposal or processing of fluids used in a hydraulic fracturing process performed outside the state (AB 10710), while others (SB 7592, SB 7593 and AB 10490) would establish a moratorium on hydraulic fracturing for natural gas or oil extraction until study results are released.

State Action

State agencies have the power to regulate, permit and enforce all activities relating to natural gas development. Every state where oil and gas is produced has at least one regulatory agency that permits wells and sets environmental regulations. Severance taxes also can benefit states, although some argue they limit production.

Protecting Water Resources

- Recent incidents have drawn special attention to hydraulic fracturing, and some states believe greater oversight is needed. Michigan, New York, Ohio, Pennsylvania and Wyoming, for example, are considering requiring disclosure of all chemicals added to each well's particular fracking cocktail. No legislation has been adopted to date.

- A Louisiana resolution (HCR 1) requests the Ground Water Resources Commission to prepare a report on ground and surface water resources. The commission also is to provide recommendations to manage and protect water resources, specifically in areas of the state where increased water usage is associated with hydraulic fracturing.

- West Virginia is considering a bill (HB 4513) to establish requirements for water use in Marcellus gas well operations. Before drilling, if a gas well in Marcellus will use more than 210,000 gallons in state water resources during any month, the operator must submit a form tracking aspects of the process, including the amount of water used for hydraulic fracturing, flowback water, and method of management or disposal.

- Michigan is considering a bill (SB 1532) that presumes liability for the operator of a well that uses hydro-fracking if the groundwater in the vicinity is found to contain at least one hazardous substance originally injected into the nearby well during the hydraulic fracturing process.

- Bills introduced in Ohio (SB 165, SB 196 and HB 426) would modify environmental safety standards relating to drilling; provide for spill and leak warning systems; require permits; require well inspections and monitoring systems; and require operators to submit a list of substances in hydraulic fracturing fluids.

More comprehensive fracking legislation has been introduced in New Jersey, New York and Pennsylvania. In New York, AB 8748 would require disclosure of hydro-fracking materials, prohibit natural gas drilling near watersheds, require spills to be immediately reported, and require that all chemical components be tracked. Another bill, New York AB 10092, would require an environmental impact statement for any natural gas or oil drilling that involves use of hydro-fracking fluid. Senate Bill 7377 addresses liability, making landowners who enter into or extend leases with natural gas developers partially responsible for damage caused by hydraulic fracturing activities. New York SB 6654 would prohibit drilling within a certain distance of drinking water sources, and AB 6953 would prohibit use of toxic fracking solutions.

Pennsylvania legislators have introduced more than 10 bills addressing hydro-fracking. Proposals include provisions relating to well permits, location restrictions (such as maintaining a certain distance from water sources), reporting requirements, well spacing, and monitoring hydraulic fracturing fluids. In New Jersey, some lawmakers have taken a more aggressive approach, introducing legislation (AB 3313) that would ban the use of hydro-fracking in the state for natural gas exploration or production.

Severance Taxes

Severance taxes traditionally are based on the volume or value of gas extracted or on a combination of these two methods. Ranking 15th in natural gas production among the states, Pennsylvania is the largest producer that has no severance tax. In September 2010, however, the Pennsylvania House passed a bill that would implement a severance tax on natural gas. The Senate version of the bill, SB 1155, would set a fixed tax rate of $0.39 per 1,000 cubic feet (MCF) of gas produced, generating $144.3 million in 2010-11 and $326.1 million in 2011-12.[16] The legislation remains under consideration.

Although the most recent proposal in Pennsylvania is volume-based, various severance taxes have been debated. An earlier proposal reflected West Virginia's 5 percent tax on the wellhead value plus 4.7 cents/MCF extracted.[17] Louisiana uses a volume-based tax rate similar to the one currently proposed in Pennsylvania.[18] Arkansas and Texas, on the other hand, use value-based taxes.

Those who oppose the tax in Pennsylvania argue that severance taxes may limit production should potential producers instead choose to drill in New York, for instance (another Marcellus Shale state that has no severance tax on natural gas). New York's production tax is based on the amount of natural gas produced on a property. A recent study concludes that, although a severance tax on natural gas in Pennsylvania would increase costs for gas drillers, spending the state revenue generated by the tax could still have small, but positive, effects on the state's economy.[19] Other studies illustrate energy taxes, including severance taxes, have little effect on energy producers' actions, and research has shown that changes in severance tax rates may significantly affect government revenues but not industry production.[20] Some argue that a severance tax could provide resources to mitigate possible environmental impacts of natural gas extraction.[21]

Conclusion

Although hydraulic fracturing has been a game-changing technique for natural gas exploration and production, its explosive growth has raised questions regarding potential environmental effects and adequate regulation. States are responsible for environmental protection during fracking procedures, but some in Congress support increased federal oversight. While the EPA currently is conducting an environmental impact review of fracking, states are continuing efforts to regulate fracking to ensure access to critical natural gas resources while protecting increasingly scarce freshwater supplies.

Notes

1. This is according to research conducted by the Potential Gas Committee at the Colorado School of Mines in 2009. See www.mines.edu/Potential-Gas-Committee-reports-unprecedented-increase-in-magnitude-of-U.S.-natural-gas-resource-base.

2. U.S. Energy Information Administration, *Annual Energy Outlook 2008 with Projections to 2030* (Washington, D.C.: U.S. EIA, June 2008); http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2008).pdf.

3. Kevin Petak, ICF International, Powerpoint Presentation (April 20, 2010); www.naseo.org/events/summer/2010/presentations/Petak.pdf.

4. Gordon Pickering and Richard Smead, *North American Natural Gas Supply Assessment* (Rancho Cordova, Calif.: Navigant Consulting Inc., June 2008).

5. Chariag, Belgacem, Schlumberger Inc., "Maximize reservoir contact," *Global Exploration & Production News* (January 2007).

6. Timothy J. Considine et al., *The Economic Impacts of the Pennsylvania Marcellus Shale Natural Gas Play: An Update* (University Park, Pa.: Pennsylvania State University, Department of Energy and Mineral Engineering, May 2010).

7. Ibid.

8. Timothy W. Kelsey, *Marcellus Shale Impact: What Do the Economic Impact Studies Imply?* Penn State Cooperative Extension Webinar on March 18, 2010; http://extension.psu.edu/naturalgas/presentations/marcellus-shale-impact-what-do-the-economic-impact-studies-imply.

9. Ibid.

10. U.S. Department of Energy, *Modern Shale Gas Development in the United States: A Primer* (Oklahoma City, Okla.: Ground Water Protection Council, April 2009).

11. U.S. Environmental Protection Agency, *Hydraulic Fracturing Background Information* (Washington, D.C.: U.S. EPA, September 2010); http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydrowhat.cfm.

12. D.M. Willberg et al., *Optimization of Fracture Cleanup Using Flowback Analysis,* SPE Rocky Mountain Regional/Low-Permeability Symposium (Richardson, Texas: Society of Petroleum Engineers Inc., 1998).

13. U.S. Environmental Protection Agency, *Expanded Site Investigation Analytical Results Report,* Pavilion Area GW Investigation, Pavilion, Fremont County, Wyoming, Prepared by Rebecca Laramie, Deputy Program Manager. EPA Region 8 (Denver, Colo.: URS Operating Services, Inc., August 2010); http://www.epa.gov/region8/superfund/wy/pavillion/PavillionAnalyticalResultsReport.pdf.

14. J. Satterfield et al., Chesapeake Energy Corporation, *Managing Water Resource Challenges in Select Natural Gas Shale Plays,* presented at the GWPC Annual Meeting, September 2008; http://www.gwpc.org/meetings/forum/2008/proceedings/Ground%20Water%20&%20Energy/SatterfieldWaterEnergy.pdf.

15. U.S. Department of Energy, *Modern Shale Gas Development in the United States: A Primer* (Oklahoma City, Okla.: Ground Water Protection Council, April 2009).

16. Pennsylvania Budget and Policy Center, *House Approves Natural Gas Severance Tax Bill,* State Budget and Tax Policy (Harrisburg, Pa.: PBPC, September 2010); http://www.pennbpc.org/house-approves-natural-gas-severance-tax-bill.

17. Francis A. Muracca and Thomas E. Zahn, *The Marcellus Shale Formation: Pennsylvania's Natural Gas Severance Tax Debate* (n.p.: Martindale-Hubbell Legal Library, Oct. 5, 2010); http://www.martindale.com/natural-resources-law/article_Jones-Day_1160300.htm.

18. Ibid.

19. Rose M. Baker and David Passmore, *Benchmarks for Assessing the Potential Impact of a Natural Gas Severance Tax on the Pennsylvania Economy* (University Park, Pa.: Penn State University, September 2010); http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1667022.

20. *Energy Revenue in the Intermountain West: State and Local Government Taxes and Royalties from Oil, Natural Gas, and Coal,* Energy and the West series (Bozeman, Mont.: Headwaters Economics, October 2008); http://www.headwaterseconomics.org/energy/HeadwatersEconomics_EnergyRevenue.pdf.

21. Ibid.

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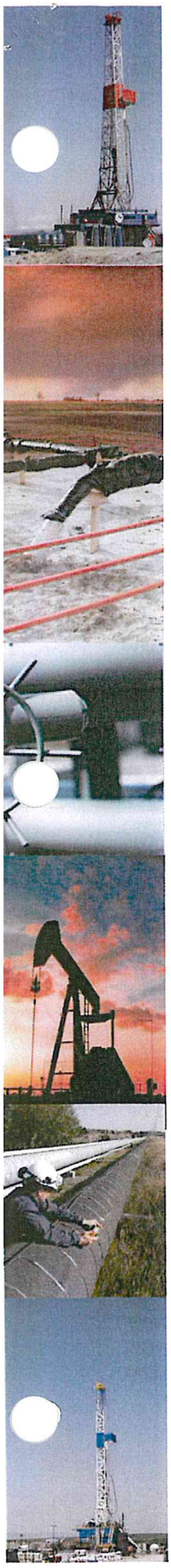


Natural Gas Development and Hydraulic Fracturing
A Policymaker's Guide

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.

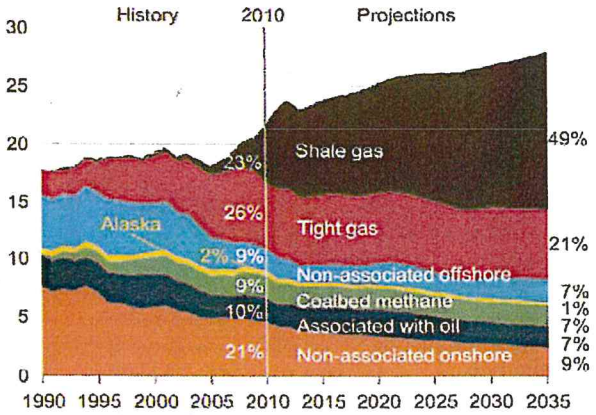
Contents

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 projects that the United States could become an LNG net exporter by 2016.

The EIA expects domestic natural gas production to exceed consumption early in the next decade. 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.

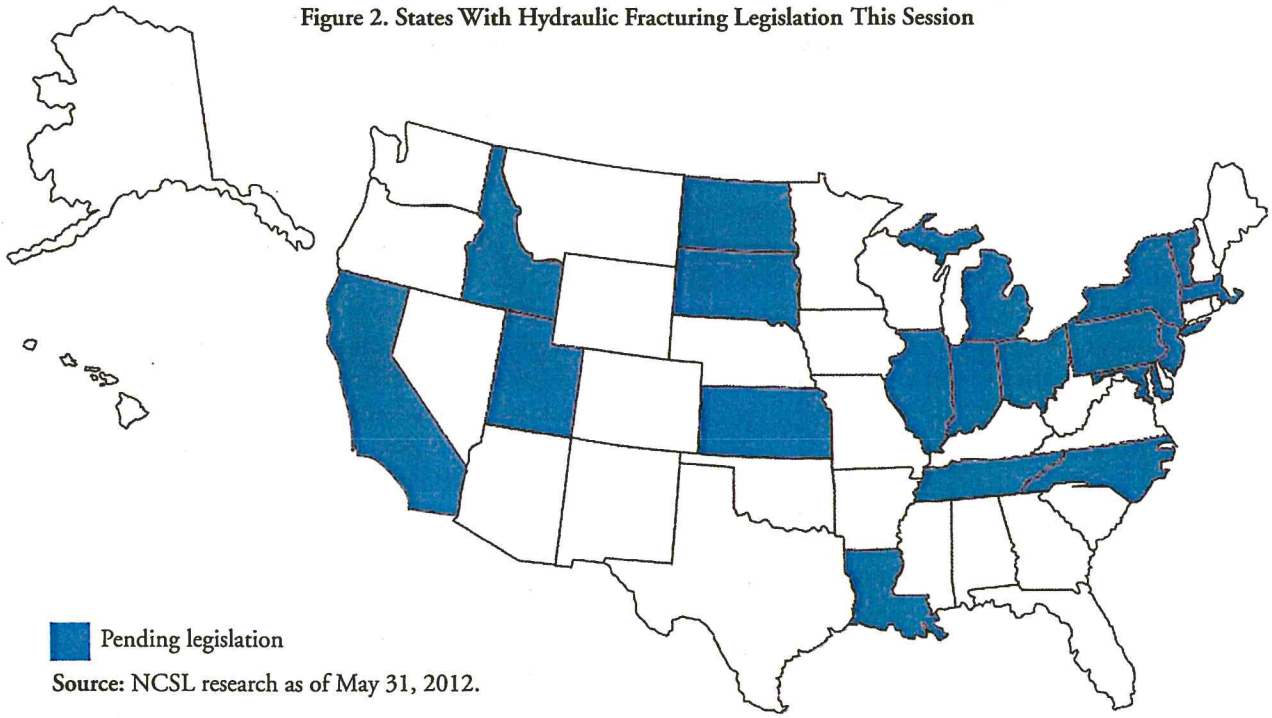
The debate continues regarding the regulation of natural gas development in many states, and it has become a balancing act. Policymakers who are responsible for ensuring that regulations are in place to protect the environment and public health also recognize the revenue potential the industry could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



Source: NCSL research as of May 31, 2012.

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

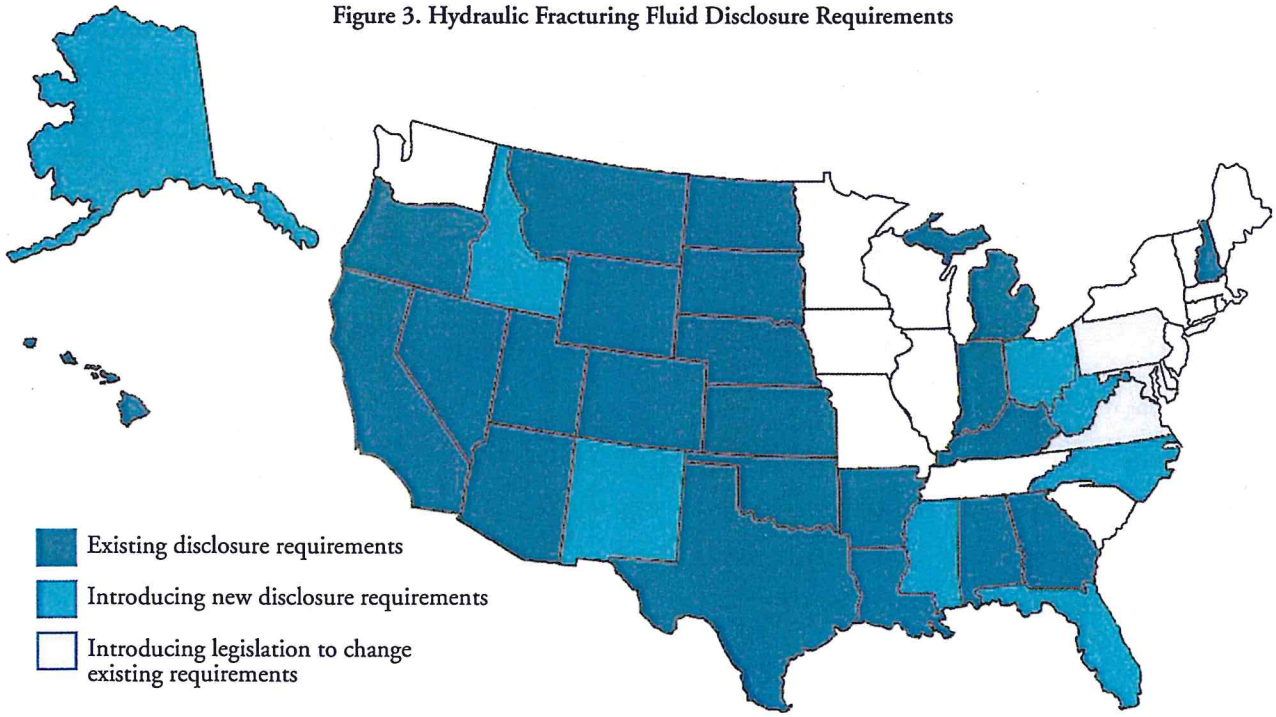
1. Fracking Fluid Chemical and Additive Disclosure

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-

Figure 3. Hydraulic Fracturing Fluid Disclosure Requirements



Source: NCSL research as of May 31, 2012.

dustry trade secrets. In Colorado, for example, drillers can claim a chemical used in their process as a trade secret, but the ingredient's chemical family name must be disclosed. More details must be disclosed if trade secret information is requested by regulators or medical professionals in special circumstances.

Figure 3 illustrates the states that have disclosure requirements (determined either by legislation or rule), are introducing new legislative requirements, or are proposing changes to existing requirements through legislation.

Table 1 in the appendix contains a detailed chart of pending legislation.

Generating Revenue through Severance Taxes and Impact Fees

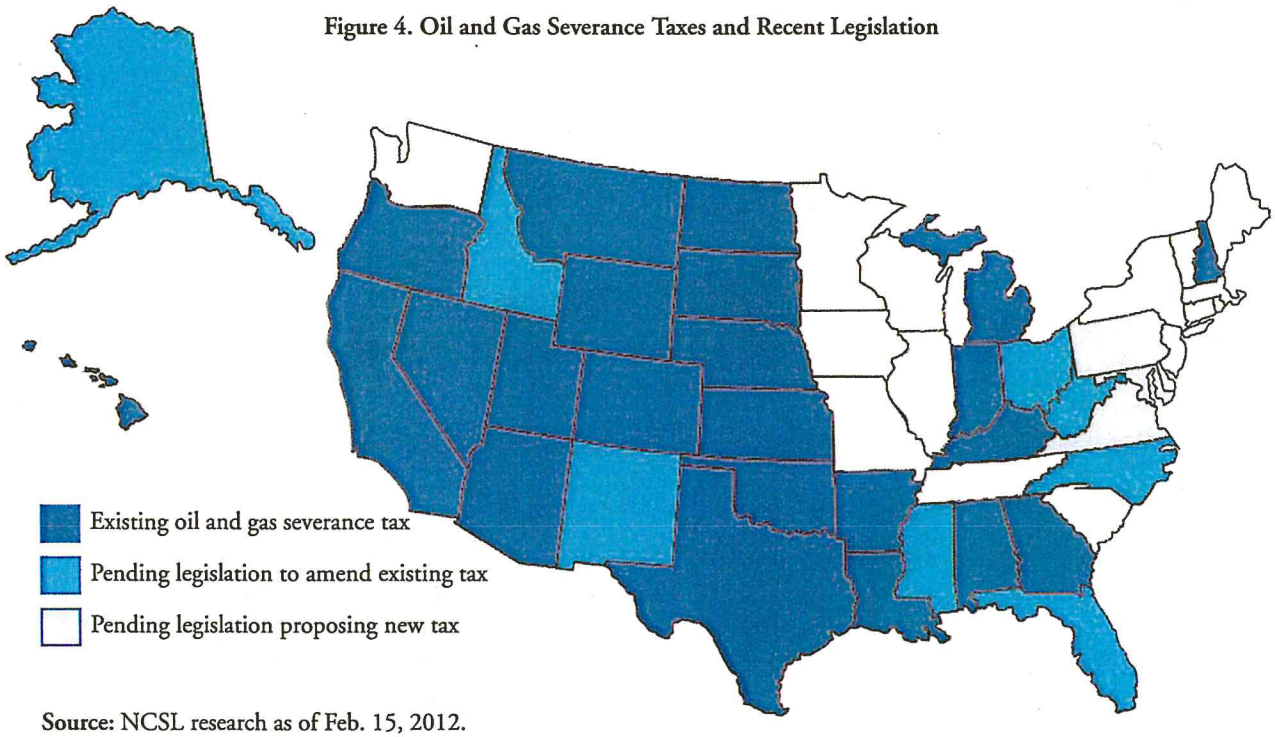
Many avenues are available to states to generate revenue to help balance state budgets, fund environmental conservation projects and alleviate the effects on local communities.

2. Severance Taxes

Historically, severance taxes have been the source of a significant stream of revenue for energy-rich states. Most natural gas-producing states have some form of severance tax. Severance taxes are excise taxes on resources that are "severed" from the earth, and such tax structures vary across the states. Severance taxes help ensure that costs associated with resource extraction are paid by the producers, alleviating some of the potential effects felt by state and local taxpayers.

In 2010, more than $11 billion was generated in the United States from severance taxes alone, and in at least six states—Alaska, Montana, New Mexico, North Dakota, Oklahoma and Wyoming—between 10.5 percent and 74.3 percent of total state tax revenue came from severance taxes.[16] At least 36 states impose some sort of severance tax, and 31 specifically levy taxes on oil and gas extraction (Figure 4). Pennsylvania remains the largest natural gas-producing state that has no severance tax; however, it enacted legislation to impose an impact fee, which is described below.

Figure 4. Oil and Gas Severance Taxes and Recent Legislation



Source: NCSL research as of Feb. 15, 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

1. U.S. Energy Information Administration, *State Ranking 3. Natural Gas Marketed Production, 2010 (million cubic feet)* (Washington, D.C.: EIA, n.d.); http://www.eia.gov/state/state-energy-rankings.cfm?keyid=29&orderid=1.

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/epreports/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/.

5. Ibid.

6. Navigant Consulting Inc., *Market Analysis for Sabine Pass LNG Export Project*, prepared for Sabine Pass LNG, L.P. (Rancho Cordova, Calif.: Navigant Consulting Inc., Aug. 23, 2010); http://www.navigant.com/~/media/WWW/Site/Insights/Energy/Cheniere_LNG_Export_Report_Energy.ashx.

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.

9. IHS Global Insight, *The Economic and Employment Contributions of Shale Gas in the United States*, prepared for America's Natural Gas Alliance (Washington, D.C.: IHS Global Insight, December 2011); http://anga.us/media/235626/shale-gas-economic-impact-dec-2011.pdf.

10. David Kay, *The Economic Impact of Marcellus Shale Gas Drilling, What Have We Learned? What Are the Limitations?* Working Paper Series: A Comprehensive Economic Impact Analysis of Natural Gas Extraction in the Marcellus Shale (Ithaca, N.Y.: Cornell University, April 2011); http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_Kay.pdf.

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.

18. U.S. Environmental Protection Agency, *Regulation of Hydraulic Fracturing Under the Safe Drinking Water Act* (Washington, D.C.: EPA, May 4, 2012); http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/wells_hydroreg.cfm.

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