
Hydraulic Fracturing: Risks and Risk Management

Thomas Swartz

And the 2011 Oscar for Best Documentary goes to . . .” The Oscar did not go to *Gasland*, but not since *Erin Brockovich* or *An Inconvenient Truth* has an environmental issue gotten quite so much Hollywood attention. The focus of *Gasland* is the alleged contamination of numerous residential water wells by gas exploration activities utilizing hydraulic fracturing. Hydraulic fracturing, or “fracking,” is a method that is now being utilized to recover natural gas from shale formations. It is an emerging area of gas recovery that has the potential to supply our country’s gas needs for as much as a century; but fracking is not without its risks. Some of these risks are common to the oil and gas exploration industry, and some of them are unique to fracking operations. All the risks encountered require prudent management to best utilize the gas resources now available through this emerging recovery method.

“Fracking” Basics

The technology used to enhance the recovery of gas from shales involves pumping fluids (water, sand, or other particles and additive chemicals) into wells drilled through the shale formation. In the Marcellus Shale, located through much of the Appalachian Basin in the Eastern United States, and the Barnett Shale, located primarily in Texas, the wells are usually horizontal. A single drilling pad may have several horizontal wells drilled in various directions from a central location. The horizontal portion of the well will be thousands of feet below the surface but may extend several thousand feet away from the well head.

The pressurized fluid pumped through the well under pressure creates fractures in the shale, which release the trapped gas. “Propping” agents (predominately sand) are used to keep the fractures open, but the natural formation pressure will return most of the fluids to the surface, where they will be either recycled or treated and disposed. The “flowback” water is generally held at the drilling pads in large lagoons or ponds, or “frack tanks.” Until recently, the contents of the hydraulic fracturing fluids (additives to the water) generally were held to be “proprietary” by their producers; the “proprietary” nature of the additives prompted numerous groups to raise concerns about the potential impact of fracking fluids on drinking water aquifers or surface waters. While the chemicals used in the

fluids are now more widely disclosed, concerns still exist about the potential impact of these fluids on nearby water resources.

In 2004, the U.S. Environmental Protection Agency (EPA) performed a study of the impact to U.S. drinking water supplies from the use of fracking in coalbed methane enhanced recovery. At the time, EPA concluded that coalbed methane enhanced recovery did not have a significant impact on U.S. drinking water supplies, but it reserved the right to expand the study at a later date. On March 18, 2010, EPA announced a “comprehensive” research study to investigate the environmental impacts of hydraulic fracturing. In February 2011, EPA published its proposed study plan to the Science Advisory Board. EPA anticipates completion of the study by 2012. In the meantime, numerous claims have arisen in Pennsylvania (Marcellus Formation) and Texas (Barnett Formation) alleging that fracking operations have impacted drinking water aquifers causing bodily injury and property damage. These claims include contamination of the groundwater by both fracking fluid and methane. Insurance coverage for these claims will be largely dependent on the alleged damage and what the alleged proximate cause of the loss is, as discussed below. But, if the allegation relates to gradual releases, many operators may be uninsured for these losses.

While the industry has utilized fracking for many years, EPA had never focused on fracking as used in the recovery of shale gas resources. This increased scrutiny could eventually lead to a tighter regulatory framework, more permitting requirements (if, for example, EPA were to require a new permitting regime under the Underground Injection Control program rules) or even a push to eliminate fracking altogether. While this last scenario seems highly unlikely, there is no doubt that this focus will result in additional scrutiny for the industry.

Risks and Risk Management

As with any oil and gas operation, there are environmental risks associated with oil and gas production sites; however, there are some additional risks associated with shale gas fracking operations. As the industry matures, risk management techniques will improve, but as with any operation, even the best-managed facilities can have releases.

One of the unique aspects of fracking operations is the transportation, storage, and use of significant quantities of water. Millions of gallons of water may be used for each of these production sites. Sources of water include groundwater withdrawal from wells drilled at the site into shallow aquifers or municipal

Mr. Swartz is a senior vice president at Marsh USA, Inc. and may be reached at Thomas.E.Swartz@marsh.com.

sources. This intensive use of water resources can create a conflict of priorities and risks to local area residences. Can the municipal system support such an intense use of water? What will be the impact of withdrawing water from the shallow aquifers? Is there a potential to impact other groundwater users in the area by lowering the water table? The effects of this heavy use of a resource need to be carefully considered and managed so as to minimize the potential impacts to the surrounding areas.

The frack water is typically stored in purpose-built ponds or “frack tanks” at the drilling location. A percentage of the frack water is returned from the formation after it is pumped into the well, resulting in large quantities of flowback water, which must be handled at the drilling site. This means that the pond or frack tank is potentially storing water containing the fracking additives. These ponds can represent both short- and long-term risks of environmental damage. Depending on the concentration of additives in the water, a storm event that results in surface runoff can cause environmental impacts to nearby land and water resources. Likewise, slow releases from the pond to soils and shallow groundwater could potentially impact useable shallow aquifers. While these risks exist, they can be managed. The ponds can be lined with geosynthetic liners to reduce the potential for slow releases from the bottoms of the ponds. The ponds can also be designed and constructed with sufficient freeboard space to minimize the potential for anything but a catastrophic flood from causing an overflow. These protective measures are regularly employed to meet local regulatory requirements or best practices, and, while no system is ever perfect, utilizing these practices can greatly reduce the potential for releases.

In addition to the storage of water at the site, operators may also construct pits, which are used to store drill cuttings, drilling muds (the material used to weight the formation and minimize blowouts), and even cement. These pits also should be lined to minimize the potential for chemicals to impact shallow soils and groundwater. Oftentimes, these pits are closed in place, with some operators evaluating the potential for excavation and disposal of the materials to a third-party location, such as a landfill.

Another area of risk is the potential for releases from the vertical casings of these wells to impact shallow aquifers with either fracking fluid or recovered methane. Typical well construction includes the use of numerous casings, starting with the largest “conductor casing” used to stabilize the shallow soils while drilling the well. The next casing is the “surface casing,” used to establish a seal between the borehole and the shallow formations (which may include shallow, freshwater aquifers). Most jurisdictions require that the surface casing be cemented all the way to the surface. Cementing is the process of injecting a cement slurry between the borehole and the casing. The next casing is either the production casing or an intermediate casing (depending on the depth of drilling). An intermediate casing is typically cemented to the bottom of the surface casing. Some operators will cement the intermediate casing to the surface as well. The production casing is typically cemented through the production area, but due to difficulties in cementing and potential damage to the casings, it may not be cemented to the

bottom of the surface or intermediate casing. The purpose of multiple casings is to seal off shallow zones (including aquifers) from the borehole and/or to stabilize the borehole. A well-cased borehole reduces the risk that formation liquids or production fluids will impact the shallow aquifers.

Once the well is constructed, the formation (either vertical or horizontal) is perforated in stages. With horizontal wells, the well is perforated and fractured progressively from the point farthest away toward the vertical riser in steps. Perforations in the well are created by “shooting” the well, which is essentially the use of small downhole charges. This methodology is common to all oil and gas wells and has been successfully used for many years. The risk to shallow aquifers during the completion of these wells is that the fracking process will open up new fractures that will communicate with existing fractures in the overburden, which in turn allows for communication between the deep gas-bearing zone and the shallow drinking-water aquifers.

The primary risk-management tool associated with this risk is the monitoring of nearby existing groundwater wells for exposure to fracking fluid constituents or natural gas. The Pennsylvania Department of Environmental Protection has developed a recommended protocol that includes sampling active water wells within 1,000 feet of the well head for indicator parameters before and after drilling. Some operators in the Marcellus either follow these protocols or have developed their own, which meet or exceed the recommended sampling. This monitoring helps to protect both the operator and the water well owners in the event that a shallow aquifer water well is alleged to be impacted. If the baseline sampling indicates that there are no prior impacts, then arguments or allegations as to what caused the impact (i.e., is it naturally occurring methane or an impact from fracking) are minimized and the regulatory authorities can require a much quicker response from the operator. Likewise, if the baseline assessment demonstrates a naturally occurring condition in the well (such as methane), then the operator has a better defense in the case of spurious claims.

One significant risk of any oil and gas operation is the potential for a “blowout” or loss of well during the drilling phases. In the case of shale gas drilling, this can also include the loss of “flowback” water from the production site, which is treated with the fracking chemicals. The primary risk associated with this is the impact to surrounding sensitive receptors, including farmland, homesteads, and waterways. Blowouts can be of particular concern if the drilling pad is located in a relatively urban area where the damage from a blowout can impact many individuals and commercial/public entities. As with any oil and gas drilling operation, these risks are managed through sound drilling techniques, but as has already been seen in several of these formations, blowouts can occur.

Finally, there are also risks associated with the handling and storage of fracking additives at the drill pad location. The risk-management tools for this risk are familiar to any prudent operator and are not unique to gas exploration and production. Making sure that there are proper material-handling and contingency plans in place is key to minimizing the potential that a release will occur and making sure that, if it does occur,

the response is timely and appropriate. Prudent operators can minimize these risks by controlling runoff from their site using collection ditches surrounding the drilling pad and by properly handling the chemicals while on site. If a release does occur, the operator should be prepared via proper contingency and spill planning to quickly recover the chemicals. Spill-response planning includes training employees and subcontractors in the proper response techniques, having appropriate equipment on hand, such as absorbent materials and booms, and/or having prearranged contracts with specialized spill-response contractors who can quickly and efficiently respond to larger losses with the required equipment.

Risk Allocation

There are numerous parties involved in the drilling and completion of a shale gas well. First and foremost, there is the owner/operator of the site. This operator will then have numerous parties working at the site beginning with the contractors building out infrastructure, such as roads, pads, and ponds. Drilling contractors will be utilized by the operator to supply the rig and the crew to drill the well. There also likely will be wireline operators, equipment suppliers, and fracking operators, who provide the chemicals, blend the fluid, and supply the pumps to perform the fracking of the wells. The operator may hire a separate driller to complete water wells on the site. In addition to the operator and the contractor, there may also be “nonoperating” owners involved in the sites. These entities own a portion of the well through a “joint operating agreement.”

So, how is all this risk allocated? Of course, every agreement and arrangement is unique and must be evaluated on its own, but the on-shore exploration and production industry is relatively uniform in how the risks are allocated. This risk allocation has been developed over many years of contracting history, and most of the parties are used to the allocation of risks and have already accounted for the allocations within their business models.

Operating agreements will generally allocate the risk to the operator and the “nonoperating” ownership in accordance with the ownership interest. The agreements may even specify that the nonoperating owner purchase their own insurance programs for casualty risks.

With regard to the contractors on the site, they are generally responsible for their workers and their equipment regardless of fault. This form of contract is generally referred to as “knock for knock.” Under a “knock for knock” contract, each party indemnifies the other for damage to their personnel and their property. This enables each party to insure the risks associated with only their personnel and equipment rather than having to insure others’ personnel or property in the event that their acts lead to damage of others’. In addition, contractors will also generally not be responsible for downhole or “resource” damages. So, for instance, the owner/operator cannot hold the driller responsible for failure to recover gas by alleging that the fracturing or drilling resulted in damage to the formation, making recovery impossible.

There are several different contracting methodologies used by the on-shore industry for drillers including day rates, footage rates, or turn key. Turn-key contracts are the only contracts where the drillers accept liabilities from the operations. However, the majority of the drilling contracts are written as day rate or footage contracts. Under these contracts, the operator essentially assumes control of the drilling rig (i.e., they are instructing the driller) and, as such, the operator assumes the risk and provides the liability and “control of well” insurances for the site. The driller will be responsible for certain insurances for their equipment and, of course, workers compensation for their employees. Some larger drillers may also choose to purchase their own “control of well” programs (discussed below) in the event that they are working for smaller operators. But, generally speaking, the owner/operator takes on the bulk of the liability for the operations at a fracking site.

Insurance Risk Transfer

Given the risks associated with these production sites, operators may wish to look to their insurance programs to further manage the financial risk in the event of a loss or claim. Traditionally, on-shore operators will carry several insurance policies that have the potential to provide environmental coverage in the event of a loss at a site. These policies include: (1) Casualty Insurance Programs (i.e., General Liability and Umbrella Policies); (2) Operators Extra Expense (OEE) Policy (often referred to as “Control of Well”); and (3) Environmental Site Liability (ESL coverage).

In our experience, nearly all operators will carry the first two lines of coverage, but the third is far less common. While the casualty and OEE programs provide important risk transfer, there are significant potential gaps between the risk and the coverage afforded under these policies. It is relatively common that the casualty coverage within an energy package program also provides third-party liability coverage from sudden and accidental pollution releases as discussed below. It is important for operators to review their coverage carefully and make sure that their casualty programs do not include a total or absolute pollution exclusion.

Some programs will provide coverage through endorsement for named peril coverage only (such as fire). This provides slightly better coverage than an absolute pollution exclusion but can still result in significant gaps in coverage if the release of pollutants is not related to the specific named perils. The best alternative within a casualty program is to maintain “blended” pollution coverage via endorsement. The blended coverage provides for both named peril coverage and “time element” coverage. The time element component of the endorsement allows for third-party liability coverage resulting from a pollution condition as long as it is discovered and reported within a specified time frame. A common structure would include a seven-day discovery time period and a twenty-one-day reporting time period. This type of coverage is often referred to as “sudden and accidental.” While this provides an important element of coverage, any gradual pollution condition, which can take years

to be discovered, would not be afforded any coverage under this structure. Furthermore, these casualty programs do not provide any on-site cleanup coverage.

Another potential gap arises from the policy structure itself. Casualty programs will exclude fines and penalties. Notably, Natural Resource Damages (NRD) are often experienced as a “civil fine” or “civil penalty” and, therefore, would not be afforded coverage under the typical casualty structure even in the event that the pollution condition was “sudden and accidental.”

Most exploration and production companies also carry Operator’s Extra Expense or Control of Well, including pollution coverage for third-party exposures as well as cleanup coverage. But the coverage only applies to “named peril” releases associated with a triggering event under the policy, such as a well “out of control.” They may also contain time-element restrictions. Therefore, Control of Well coverage would not apply to gradual losses or claims related to historic use of hydraulic fracturing. And, as with the casualty programs, fines and penalties will also be excluded so certain NRD losses may not be covered.

Broadly speaking, the Environmental Site Liability policies respond to losses resulting from pollution conditions at, on, under, or emanating from a covered location. The pollution condition could have commenced prior to the inception of the policy, after the inception of the policy, or both. Because these policies are responding to pollution conditions that may have begun outside the policy period, they are offered on a claims-made basis and may provide coverage for (1) an off-site cleanup; (2) third-party bodily injury and property damage claims; (3) civil fines, penalties and punitive damages (where allowed by law); (4) natural resource damages or NRD losses;

(5) investigation costs; (6) defense costs, including attorneys’ fees, subject to the policy limits; (7) nonowned disposal sites (liability arising from disposal of wastes to a third-party disposal site); (8) transportation; and even (9) business interruption resulting from pollution conditions. These policies are available to on-shore oil and gas operators, including those involved in the hydraulic fracturing of shale formations.

If an Environmental Site Liability program is considered, operators should work with their risk advisors and underwriters to maximize their coverage while minimizing clashes or overlaps in coverage. For example, a pollution policy does not differentiate in the proximate cause of a pollution event, so it would provide pollution coverage in the event of a blowout. However, OEE policies provide coverage unrelated to pollution coverage, such as recovery costs to bring the well under control. Therefore, likely it is still important to carry an OEE policy when purchasing an Environmental Site Liability program. Because the purchase of two policies with potential overlaps in coverage can create ambiguity, it will be important that the policies are clear as to which coverage is primary. It is also possible to structure policies to be primary for different components of the coverage. For instance, in the event of a gradual pollution condition, it is important for the ESL policy to be primary, as there is generally no coverage for gradual pollution conditions within the casualty program or the OEE.

The use of hydraulic fracturing techniques has the potential to alter our energy landscape. But, it is not without environmental risks that have the potential to impact stakeholders, whether they are nearby landowners, the public, or the operators. Prudent risk evaluation, management, and transfer can help reduce the risks to all parties. 🌳