Water Grand Challenges: Water Rights

Fracking 101

Background - Hydraulic fracturing, or "fracking," is a method of oil and natural gas extraction, which utilizes traditional deep vertical and horizontal drilling technologies in conjunction with deep-well solution injection to fracture and stimulate geologically unproductive petroleum-bearing rock formations.[1] The recent boom in shale gas extraction nationwide is a result of successful fracking practices revitalizing formerly unproductive fields. The economic benefit of fracking to the petroleum industry includes profits from expansions in trucking, pipeline services, oil well equipment and services, transportation, storage, refining and distribution. Petroleum and chemical engineering jobs have seen a corresponding growth rate in both the applied and research sectors.[1]

The energy production process associated with fracking creates potential environmental dangers. Wells are bored through relatively shallow groundwater aquifers to reach petroleum-bearing shale located thousands of feet below the surface. These wells are typically encased in layers of steel and concrete to prevent leakage of groundwater into the borehole, thus preventing loss of natural gas into the geology or atmosphere. This casement system must be strong enough to withstand the impact of highly pressurized fracturing fluids as they are forced down the well and then returned to the surface as waste without rupturing and contaminating clean aquifers.[2]

Fracking fluids are primarily (99%) fresh groundwater produced on or near the well site that is mixed with a cocktail of chemicals and fine sand. This fluid, or "slickwater," expedites the fracturing of shale resulting in the release of trapped natural gas.[2] The quantity of water used in the process varies, but on average, a producer will use five million (15.3-acre feet) gallons of water per fracking well.[3] These estimates will peak at 148,262,399,285 gallons of water (455,000-acre feet) per year in Texas alone by 2030.[3]

Fracking in Texas – In Texas, the productive shale strata at a depth of four- to twelve-thousand feet below the surface is commonly referred to as the *Eagle Ford Shale Play* in South Texas and the *Barnett Shale Play* in North Texas (see figure 1 below). The test wells in the Texas Panhandle's *Cline Shale* show that this play contains 3.6 million barrels of oil per square mile, which equates to approximately 30 billion barrels of oil.[2]

Many shale strata are naturally radioactive. Refuse water returning to the surface post-fracking has radioactive levels that exceed the Texas Commission on Environmental Quality's (TCEQ) standards, and is too contaminated for most wastewater treatment systems to process.[4] This contaminated water is disposed of by deep-well injection thousands of feet below the surface, permanently rendering that water unusable for future use.[5] The additives used in fracking may

contain diesel fuel or other potentially hazardous chemicals.[6] Texas state law requires public disclosure of all of fracking agents used in each specific well. However, volume ratios are exempt from disclosure in Texas.

In addition to the environmental dangers, another concern of both those living near fracking operations, and county authorities, is the destruction of roads by heavy fracking equipment. The Texas Department of Transportation (TxDOT) estimates that $2 billion of state funds will be needed to make repairs and improvements to damaged roads.[5]

The Future of Fracking in Texas – Natural gas produces half of the carbon dioxide, one-third of smog forming nitrogen oxides, and a fraction of the sulfur dioxides and mercury that are emitted into the atmosphere by burning oil or coal.[7] The greatest danger of natural gas lies in its escape prior to consumption. With attention to detail and enforced regulation, containment of natural gas is attainable and within the industries' current ability. Given Texas' perennial drought conditions, the greatest concern regarding fracking is the permanent and substantial loss of freshwater.

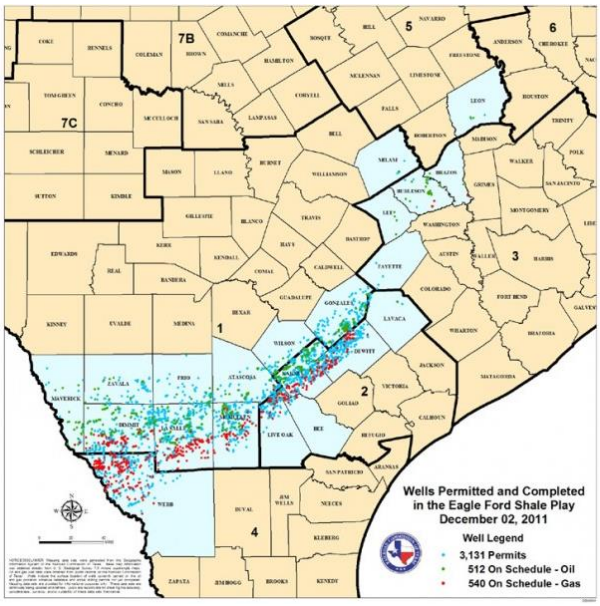

Figure 1: Wells Permitted Eagle Ford Shale (source: Railroad Commission of Texas 2011)

1 U.S. Department of Energy. Hydraulic Fracturing Technology. August 2, 2011. http://www.fossil.energy.gov/programs/oilgas/shalegas/hydraulicfracturing.html (accessed February 14, 2013).
2 Railroad Commission of Texas. "HYDRAULIC FRACTURING FREQUENTLY ASKED QUESTIONS." Railroad Commission of Texas. n.d. http://www.rrc.state.tx.us/about/faqs/hydraulicfracturing.php#frac10 (accessed February 19, 2013).
3 Nicot, Jean-Philippe; Reedy, Robert C. Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report, Austin: The University of Texas at Austin, 2012.
4 Railroad Commission of Texas. NORM – Naturally Occurring Radioactive Material. n.d. http://www.rrc.state.tx.us/environmental/publications/norm/index.php (accessed February 19, 2013).
5 Railroad Commission of Texas. Injection/Disposal Well Permit Testing and Monitoring Seminar Manual. March 13, 2012. http://www.rrc.state.tx.us/forms/publications/HTML/index.php (accessed February 19, 2013).
6 Groundwater Protection Council; Interstate Oil and Gas Compact Commission. Chemicals Use. 2013. http://fracfocus.org/chemical-use/what-chemicals-are-used (accessed February 19, 2013).
7 U.S. Department of Energy. Energy in Brief. n.d. http://www.eia.gov/energy_in_brief/article/about_shale_gas.cfm (accessed February 19, 2013).