POLICY MEMORANDUM

SUBJECT: **Water and Energy: The natural resource relationships, challenges, and opportunities**

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Topic and Purpose

The interconnection between energy and water has become increasingly apparent as both resources are stretched to provide for growing populations. Producing energy requires water, and providing water requires energy. Impacts on one resource impact the other. The purpose of this memo examines some ways in which the state of Texas might continue balanced policy conversations on hydraulic fracturing (HF) that consider the needs of industry, business, and economics, as well as public health, the environment, rural and urban interests.

Background

Rapidly growing populations demand more energy and more water, while energy production requires water use and vice versa. This combined with drought and climatic uncertainty has made the water-energy nexus an important space in Texas policy. While there are concerns over water and energy use across the entire nexus, one of the issues receiving the most media and public attention is hydraulic fracturing. Hydraulic fracturing involves injecting frac fluid—a mixture of mostly water and sand and a small amount of chemicals—at high pressures into a rock formation deep underground containing oil or natural gas—in this case shale—to crack or fracture that rock and increase oil or gas flow out of it. With the advent of horizontal and directional drilling, natural gas and oil production via HF became economically viable. Traditional drilling for oil and gas involved drilling straight into the ground (a vertical well) and casing that well with cement through any aquifer or permeable zone prior to production. The casing is the primary protection for water quality in the surrounding underground environment but also ensures their product flows to the surface rather than into the underground environment. Horizontal drilling involves drilling the vertical well, then turning the drill horizontally; the well is still cased with cement to protect the environment. The horizontal well can then be fractured at multiple points, or stages, along the horizontal line of the well, instead of just at one or a few points at the end of the vertical, making the horizontal well more productive than its vertical counterpart. Hydraulic fracturing uses more water per well (though not more water per energy extracted) than traditional exploration for oil and gas in a vertical does. Because the process is productive and allows access to oil and gas in shale previously too impervious to access, production has increased in areas that previously had little to no oil or gas activity, increasing water demands in those areas.

Issues and Assessment of Current Policy

As use of HF has increased, so has public anxiety surrounding the well stimulation technique, including concerns over the water quantity used in the HF process, the potential for water contamination, and the proper management and disposal of wastewater. Additionally, concerns about seismic activity resulting from water injection - deemed induced seismicity - have recently become an issue. Hydraulic fracturing is highly politicized, and misinformation is a large challenge.

Water Quality

While most production occurs without a major issue, drilling and exploration for natural gas carries risks, namely potential to contaminate nearby water sources. Public concern has centered around the potential for fracturing fluid injected miles below the earth's surface to reach our more shallow groundwater resources, but scientific research has instead pointed to the risk of contamination from faulty well casings near the surface of the well or contamination of aquifers via nearby orphaned oil or gas wells. Other contamination could occur at the surface due to waste or chemical spills.

Water Use

In Texas, water use per well ranges in the millions of gallons yet the amount of water used is less than 2% of state water use in Texas and, in the Eagle Ford Shale in Texas, is equivalent to the water used for conventional oil production on a water-to-oil produced basis. While the numbers are small relative to other fossil fuel production, 50% of shale oil wells are in water scarce regions, and oil and gas production in these regions has led to increased population growth and water use in areas unaccustomed to meeting large water demands. Much of the water that is used in HF is lost permanently. A large percentage of the water injected in the gas production process becomes lost in the shale formations. The produced water–water that originated in the production zone of the shale–that returns to the surface is often re-injected into secure formations underground via injection wells, removing it from the region's hydrologic cycle. According to the EPA, "when states began to implement rules preventing disposal of brine to surface water bodies and soils, injection became the preferred way to dispose of this waste fluid." However, there has been some debate over whether these wells are safe, and whether there is consistent oversight for these wells.

Stakeholders

The primary social actors in the debate surrounding HF in Texas fall under five categories: (1) regulators, (2) producers and others profiting from production, (3) landowners and nearby citizens, (4) environmental advocates, (5) political subdivisions, and (6) scientists. (1) Oil and gas production in Texas is regulated by the Railroad Commission. The RRC alongside the US Environmental Protection Agency also regulates the disposal of produced water. The TCEQ regulates surface water use and protects it from contamination. Groundwater conservation districts (GCDs) can regulate the amount of water extracted from the aquifer below their district. The Texas Legislature can also pass regulations on HF. (2) Oil and gas producers often prefer less regulation because of a fear that regulation will increase production costs, though some believe clear regulations can be just as helpful for production. Within the oil business, there are smaller businesses for water sourcing and wastewater disposal or recycle. Landowners, municipalities, water rights holders, and water prospectors might wish to sell water for oil and gas production though other water users in the area might not approve. Small businesses run waste disposal wells and water recycling facilities. (3) Landowners are usually the owners of both the water and the mineral rights to be used to extract oil or gas. They can (though they do not always for various reasons) use their contracts to determine whether a company will use fresh, brackish, or recycled water on their property. Nearby citizens have a vested interest in whether water gets contaminated or depleted but often have less control than the landowner with the contract. (4) Environmental interests such as the Environmental Defense Fund, the Sierra Club, and Nature Conservancy seek to protect the environment and have joined the debate on HF in an effort to ensure the process remains safe. (5) Political subdivisions are in charge of management of water supplies for their small communities and have limited power to protect that resource. In case of water quality issues, cities and municipalities may be called upon to deal with negative impacts to their constituents. (6) Scientists studying HF can remain part of the conversation to ensure public information is reliable.

Statement of how topic is currently addressed in policy

Hydraulic fracturing is unevenly addressed in Texas policy. For example, whether a GCD has the power to regulate HF is up for debate. Currently, approximately 45% of GCDs require a permit for HF in their district, while 55 percent do not. Water used for oil and gas exploration is a beneficial use so it cannot be prohibited but a fee can be placed on use of that water. Oil and gas production, including the disposal of wastewater, water recycling rules, and induced seismicity rules are regulated by the Texas Railroad Commission, However, some view these regulations as too lax. Surface water use and any potential surface contamination issues fall under TCEQ's purview. The Texas Legislature can also pass regulations on HF and has required producers to report the chemicals used in their fracturing fluid mixtures and the amount of water used to fracfocus.org.

Key influencers

Some of the key influencers of public opinion and public policy surrounding water use for HF are (1) economics and (2) misinformation. Oil and gas production occurs when money can be made. Because the oil and gas industry is more profitable than other water user groups, water, even in water scarce regions, can be purchased for production. This production has been followed by a trail of misinformation about what HF is, how it works, and what the risks are which could shift focus from actual problems to perceived problems and inhibit adequate regulation. Misinformation could also keep interested citizens from getting involved in policy-making. The Texas Legislature attempted to change the name of the RRC to one that reflects its mandate of oil and gas regulation and could help reduce confusion within the public, but the proposal was not popular for both cultural and historical reasons. Recently RRC has barred its staff from talking to the media, instituting a policy that instead funnels all media requests through a spokesperson.

Addressing negative externalities, including environment, social justice, etc.

Some energy producers are looking at water-use through a more sustainable paradigm. Some producers are increasing their use of brackish, effluent, direct reuse, and recycled water in place of fresh water to hedge against drought and drum up public support. Environmental responsibility is not widespread in the industry, however, largely because many smaller producers might not have the capacity to implement such programs.

To supply water to these companies, nearby landowners lease their groundwater. While beneficial to some, this practice leaves farmers with a difficult choice; pumping affects water-levels in nearby wells, so those that do not sell their water risk lower well water levels without the economic advantages that comes with selling it. Many of the risks associated with HF such as degraded water quality and lower well levels impact the entire area in which drilling occurs, so even if a farmer refuses to sell their water or allow drilling on their land, they still face the risks. If an individual is worried about their water quality, they must pay for baseline testing. As a result, a lot of the risks of HF fall primarily on landowners in the area, rather than on the companies involved in production.

Internal and external sources of conflict

Energy production affects water resources, which causes tension in a water-scarce state. Much of this tension over water use for HF in Texas is between producers and those who use and want to protect water resources–citizens and environmental groups. The Railroad Commission, as the main regulator of the oil and gas industry acts to solve these problems. When citizens and environmental groups wanted more water recycling in Texas, the RRC instituted recycling rules to help promote the practice. When the public began complaining about induced seismicity from injection wells, the RRC developed rules for

injection wells. In some cases, the RRC's decision might solve one problem but exacerbate the conflict. In May 2014, the RRC sided with a driller in a contested-case hearing regarding converting a brackish water well within the Carrizo Aquifer to a disposal well. A nearby GCD disapproved of the conversion because the water into which the waste would be injected, though outside the GCD boundaries, is connected to the water the GCD protects. However, the RRC ruled that because the well is outside of the GCD's jurisdiction, its objection could be disregarded. This was a technical legality rather than a decision based on science.

Assessment of current public discussion surrounding the topic

There is an active discussion surrounding gas production in Texas, but the discussion is polarized and stakeholders are not always well-informed. Misinformation, including polarization of the issue, makes it difficult to focus on existing problems. The conversation–while active–is not necessarily robust. Texas has a long-standing history of oil and gas production and a culture that generally supports it. As citizens have become more cognizant of water issues associated with production, more questions have been asked; however, the conversation is not always a goal-oriented, non-partisan one.

Assessment: Current policy is not ideal

As previously mentioned, stakeholders are often misinformed about what HF is, how it works, and what the risks are. This misinformation could shift focus from actual problems to perceived problems and inhibit adequate regulation. Any bias toward profit over environmental stewardship might also result in overlooking environmental concerns in favor of production. These two paradigms also point to another major problem: policy is not founded on science. For example, current policy in Texas does not address risks to water contamination. Baseline testing of water quality is left to the citizens–who probably cannot afford it–rather than the government or the producers. If this policy continues, water contamination could occur unnoticed and Texans' health could be in danger. Furthermore, despite Texas' water scarcity, water use is not actively monitored, nor does any policy beyond enabling water recycling aim to reduce this water use. This water is often trucked, leading to destruction of roads and increased emissions. If Texas policy regarding monitoring and reducing water use does not change, water scarcity could be exacerbated and truck traffic will continue to emit pollution, potentially leading to health risks, and destroy roads, leading to more accidents.

Possible Policy Alternatives

As possible policy alternatives, we recommend three strategies that could mitigate water quantity and quality concerns associated with hydraulic fracturing: (1) more water use monitoring, (2) an incentive-based approach toward reducing fresh water use, and (3) baseline testing by state agencies.

1. **Water Use Monitoring**
   Groundwater use falls under the jurisdiction of GCDs, but, as local, often under-funded agencies, they most likely do not have the resources to provide for water monitors or incentives for reducing water use. To pay for water monitoring, GCDs could collect water use fees, simultaneously establishing a dis-incentive for excessive water use. Alternatively, GCDs could seek other funding, perhaps from the Texas Water Development Board (TWDB), to avoid attributing extra costs to water users who would resist water monitoring if they have to pay. However, even if water monitors could be funded, this kind of policy could hit another problem in implementation. GCDs do not all follow the same policies and not all areas of the state have a GCD, so some areas could end up with stringent monitoring rules while others have none at all, creating complications for producers that operate in more than one GCD. Texas could benefit

from a statewide policy on water monitoring to solve the complication of varying monitoring policies yet still allow GCDs to execute the plan and to create a clear basis for a funding program at the state level for monitoring technology in areas where GCDs could not provide it.

2. **Incentive-based approach toward reducing fresh water use**
   Incentives for reducing fresh water use would need to come from the Texas Legislature, as the Legislature sets the state budget. Incentives could include a tax credit for developing new fresh water sources to replace those depleted by production use or for using a non-fresh water source such as brackish water, reused or recycled produced water, or wastewater effluent. Potential dis-incentives that could also reduce total freshwater consumption are a fee set on produced water disposal or on fresh water use. A water use fee on fresh water use would be difficult to impose without water monitoring.

3. **Baseline testing by state agencies.**
   Required baseline testing at the producer or state level would help establish a baseline water quality prior to any activity on behalf of the producer. The testing would most likely need to be executed by the RRC because GCDs do not exist across the state. If the state were to pay for this program through the RRC, a fee could be placed on the producer. If producers were to test themselves, they should be filed to the RRC where an engineer could quality check the tests. Baseline testing helps citizens to know if their water has been contaminated after drilling. It also helps producers defend themselves against false accusations of contamination if they can prove pollution existed prior to drilling. The system would also help GCDs attempting to protect water quality make a case to the RRC if contamination has occurred. Shifting costs to the producer or the state rather than the citizen helps protect all citizens, particularly those who would not know to test their water or could not afford to test on their own.

Conclusions

Both water-use monitoring and baseline testing offer solutions to the root concerns about HF. Those concerns revolve around drinking water health and safety, and water supply issues. If the Texas RRC and TCEQ are convinced that oil and gas production in this manner are safe, there should be no reluctance on their part to implement strategies.

However, the recommendations included in this report could present challenges to both the state agencies involved and to producers. This is because more state agency oversight requires more staff, time, and resources. In challenging economic times, asking the State to increase oversight is difficult. Also, Texans are generally opposed to more oversight, which could also present challenges. Producers will not want more oversight because it may cost them money or delay operation.

If solid scientific studies lead the way in understanding HF, if proper monitoring is in place, and if producers are willing to think in more sustainable terms about their water use, oil and gas production in Texas on shale formations could become a safer practice, and a more widely accepted way to allow oil and gas production, even among environmental groups and citizens with health concerns.

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