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Testimony of Kevin P. Guilbeau and Tor Meling to members of the Kansas House Water & Environment Committee regarding House Bill 2641, relating to requirements for certain injection wells:

We are Kevin Guilbeau, President and CEO and Tor Meling, Senior Vice President for Engineering & Development of H2Oil Energy Company, LLC, an independent oil and gas company operating in Kansas as H2Oil Opco, LLC as operator #35474. We offer this testimony in hopes you will consider our position opposing House Bill 2641.

Our company acquires mature oil fields in which there are remaining reserves and applies current drilling and secondary recovery technology to produce those reserves that would otherwise not be produced. We started drilling and installing facilities in one such project in Rush County late last year, after many months of geological and reservoir studies. This project, if successful, will require an investment of over $100 million, much of which will be spent drilling injection wells to install a waterflood in this field. This investment will be put at risk by H.B. 2641.

We strongly oppose the passage of this measure not because we disagree with its intent, but because its grossly simplistic treatment of a larger problem will cause significant collateral damage and will be to the long-term detriment of the oil and gas industry in Kansas. The key points of our objection are:

1) A Class II injection disposal well is defined in such a way that it will also affect wells drilled for improved oil recovery. Improved oil recovery injection wells ARE NOT disposal wells and should not fall in under any legislation pertaining to disposal wells.
2) Injection volume is falsely assumed to be the only key issue.
3) The proposed bill does not allow for the impact of different well designs and seems to assume that all injection wells are vertical wells.
4) There is no credible evidence that Class II injection wells cause earthquake activity.

Our project is a large waterflood in a very old and under pressured reservoir. In order to recover the significant quantity of oil left in the reservoir, we are planning to use horizontal wells. As will be explained more below, our horizontal wells will be capable of safely injecting water at rates significantly higher than the 8,000 barrels per day singled out in House Bill No. 2641. Arbitrarily setting injection rates which will seemingly apply to all injection wells without considering their construction, intended use, and location of the well, all things considered by the Kansas Corporation Commission when deciding whether to permit injection wells, is not a prudent manner in which to address any concerns related to disposal wells.

Class II Injection Disposal Well

In the proposed legislation, a Class II injection disposal well is defined as “a well that is used to inject saltwater or other waste fluids that are brought to the surface in connection with oil or natural gas production.” This

definition would appear to include wells drilled or used for waterflooding or other wells designed to maximize oil and gas recovery. Wells for Improved oil recovery and disposal wells should clearly not be treated in the same way. There are completely different motivations for injecting fluids in these wells. Additionally, once the waterflood is developed, most of the injected water is recycled produced water from the waterflood itself, so the water injection is taking place into the same reservoir from which it has been produced. Oil is a finite resource, and it is our duty as an industry to do everything we can to maximize the economic recovery from our existing fields, so legislation for disposal wells should not impact wells used for improved oil recovery.

Injection Volume

Setting an arbitrary injection limit of 8,000 barrels of water per day without reference to:

- the purpose it is injected for (see above),
- the pressure at which it is injected
- the formation properties and the
- well design (see below)

is likely to cause significant collateral damage and unintended consequences as not all wells or applications are sensitive to injection rate. Our injection project has applied for an injection permit for 16,000 barrels of water per day. The reason our proposed injection rate should not give any cause for concern are several. First, we will be injecting below the formation parting pressure to ensure that all the water we inject help us mobilize oil in our reservoir and contribute to the waterflood. Secondly, the formation pressure in our reservoir is around 215 psi, significantly depleted from an original formation pressure of around 1,200 psi. Even with our planned 16,000 barrels of water per day injection rate, we are planning to manage the reservoir pressure at a level below the initial reservoir pressure. In addition to the pressure management, the reservoir permeability, i.e. the transport capacity of the formation, is high, so that water injected into the formation easily dissipates into the formation. The final thing that needs to be considered is the Well design. This is discussed in more detail in the section below.

Well Design

In addition to the factors discussed above, well design plays an important factor in determining maximum injection rate for a well. In our project, we are planning to use horizontal wells with long injection intervals to allow a more effective distribution of larger water volumes than what would be possible with vertical wells. We applied for 16,000 barrels per day as a conservative number for our first injector and we will collect and review the data from the performance of this well and will adjust future injection applications based on our findings. Our injection wells are planned to have around 4,500 ft of open injection interval which allow the injection rate per foot of reservoir to stay low compared with a vertical well. If one compares a horizontal injection well with 16,000 barrels of water per day distributed over 4,500 feet of injection interval with a vertical well with 30 feet of injection interval and the same injection rate per foot of interval, the equivalent injection rate for the vertical well would only be 107 barrels of water per day. Horizontal injectors in waterfloods with good permeability can be operated safely at very high injection rates, and Mr. Meling has personally been involved in drilling and operating onshore horizontal injection wells in the United Kingdom where we safely injected 25,000 to 65,000 barrels of water per well with no adverse effects for decades. Consequently, well design is an important factor in determining maximum injection rates and this should not be limited by an arbitrary constraint.

Induced Seismicity

We believe that it is inaccurate to claim that there is a direct link between injection volumes and "induced seismicity" and that as a result all injection needs to be limited as proposed in House Bill 2614. We believe there are many factors that contribute to seismicity, and that the risk of causing a seismic event – an earthquake – from the injection in any given well is so low as to be an unproved cause of such events. Data from the USGS shows that the percentage of U.S. injection wells potentially linked to induced seismicity to be 0.15%. This means that 99.85% of all Class II wells in the United States continue to operate without any issues whatsoever related to seismicity. Numerous peer-reviewed studies have noted that acquiring a proper understanding of induced seismicity requires knowledge of downhole pressure, volume, and location, including the orientation of faults. These studies have argued that mitigating the risk of induced seismicity requires a site by site assessment. In other words, a blanket, one-size-fits-all approach is not an appropriate solution, since wells that take on similar injection volumes and pressures may each be operating in different geologies and conditions. This report goes on to say:

> As a recent study looking at the link between injection wells and seismicity from researchers at Southern Methodist University and the University of Texas noted: "[T]ens of thousands of currently active injection wells apparently do not induce earthquakes or at least not earthquakes large enough to be felt or recorded by seismic networks." To illustrate this point, consider California, a state that houses more than 52,000 Class II injection wells (2,919 of which are disposal wells). California has not registered any seismic activity whatsoever related to wastewater injection. On the other end of the spectrum, the state of Connecticut has no Class II injection wells, yet there has been a recent uptick in recorded seismic activity throughout the state. Oklahoma has a long history of seismicity, and, according to Reuters, many of the state's recent earthquakes have "occurred in the Oklahoma City metropolitan area, where there are no high-volume wastewater injection wells." Oklahoma's first known earthquakes occurred in the 1800s, and another significant event occurred in 1918. As Oklahoma's state geologist Dr. Randy Keller has noted, there were "zero seismograph stations prior to late 1970s" in the state, and now there are many. To be clear, under specific and very rare conditions, wastewater injection activities can have the effect of inducing small seismic events. Several scientific analyses have linked Oklahoma's uptick in earthquakes with wastewater disposal activities. But all this underscores why these events must be studied in the actual context in which they occur, and why blanket assumptions about all earthquakes being induced by injection activities, especially in places like Texas and Oklahoma, are incorrect, in the best case, and irresponsible in the worst.

Summary

We appreciate the opportunity to voice our concerns with this proposed legislation, and for the reasons stated herein, H2Oil Energy Company, LLC opposes the passage of House Bill 2641, and urges the members to not pass a bill that paints unproven concerns with such a broad brush as to affect the significant investment decisions our industry makes, along with the resulting negative impacts on jobs and revenues to businesses and government in the State of Kansas.