COMMENTS OF
HALLIBURTON ENERGY SERVICES, INC.
ON THE
DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
DRAFT "ADDENDUM TO ENVIRONMENTAL REVIEW DOCUMENTS CONCERNING EXPORTS OF NATURAL GAS FROM THE UNITED STATES"

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I. Introduction

Halliburton Energy Services, Inc. ("HESI") offers the following comments in response to the "Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States" issued by the Office of Fossil Energy of the Department of Energy ("DOE") and a report issued by the National Environmental Technology Laboratory ("NETL") entitled "Environmental Impacts of Unconventional Natural Gas Development and Production" on which the Office relied in preparing the Draft Addendum. HESI appreciates the opportunity to submit these comments and requests that they be considered by DOE as it finalizes the Draft Addendum.

HESI is a leading provider of services to the energy industry and is the global leader with respect to hydraulic fracturing ("HF") services. HESI has performed HF services on tens of thousands of natural gas wells in the U.S. and internationally. As a result, HESI is interested in assuring that natural gas operations, including HF, involving unconventional resources are performed in the most environmentally responsible and effective manner possible.

HESI also develops some of the most innovative products used today in unconventional natural gas development and production. These products include high-performing fracturing fluids that provide greater production efficiency and result in significantly increased well production. HESI's innovative products also offer a number of environmental benefits such as smaller drilling footprints, increased recycling of flowback and produced water and reduced use of chemicals. Given its extensive experience, HESI is well-qualified to comment on the Office of Fossil Energy's Draft Addendum and the associated NETL report.

HESI appreciates DOE's efforts to "provide additional information to the public regarding the potential environmental impacts of unconventional natural gas production activities."[1] As an active participant in state and federal regulatory and legislative activities involving these issues, HESI has paid close attention to the landscape of resources on this topic. HESI believes that the Draft Addendum (and the NETL report) could be improved by recognizing and including the following:

- In the past few years, the legal landscape regulating unconventional natural gas development and production activities has evolved as state legislatures and regulatory agencies have continued to develop and update HF disclosure regulations. The Draft Addendum should reference these important recent developments, rather than rely solely on a summary of state regulations created in 2011.

- Several reports and studies, including peer-reviewed papers, have concluded that there is no risk of migration of HF fluids to sources of drinking water. The Draft Addendum should acknowledge these findings and include a reference to these materials.

[1] U.S. Department of Energy Natural Energy Technology Laboratory, *Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States*, 3 (May 29, 2014) ("Draft Addendum").

HESI believes that the inclusion of this information in the Draft Addendum will provide a more accurate and comprehensive report on the potential environmental impacts of unconventional natural gas production activities.

II. State Regulatory Requirements

The Draft Addendum's description of U.S. state regulatory requirements regarding HF chemical disclosure in Table 5 is derived from a chart originally created by the Louisiana Department of Natural Resources on December 30, 2011.[2] While this chart originally provided a comprehensive snapshot of certain aspects of state regulation, HESI believes the Draft Addendum should also reference some additional state regulatory developments that have occurred since the state of Louisiana's December 2011 review over two and a half years ago.

Since that time, states have continued to be particularly active in addressing disclosure of the constituents of fracturing fluids. The following states have all adopted regulations concerning disclosure of the make-up of fracturing fluids since December 2011: Alabama, Alaska, California, Idaho, Indiana, Kansas, Michigan, Mississippi, North Carolina, Ohio, Oklahoma, South Dakota, Tennessee, Utah and West Virginia. As described below, Pennsylvania is in the process of updating its disclosure regulations that were in place when Table 5 was created to reflect changes in its oil and gas law that were adopted in 2012. HESI recommends that DOE add a description of these recent state regulatory developments to make the addendum more accurate and comprehensive.

In addition, HESI would like to call DOE's attention to the NETL report's broader discussion of state developments in its section on the "U.S. Statutory and Regulatory Framework," which has also omitted recent state regulatory developments.[3] It is important for the NETL report to recognize that states have not only adopted comprehensive regulations to govern unconventional natural gas operations, but have also continued to revise and update their regulations to address new developments and/or continuing issues. This important concept is missing in the NETL report's current description of U.S. state regulations. Examples include the following:

- **Colorado**: Colorado was the first state to adopt HF disclosure requirements in 2008. The state updated its HF disclosure regulations in late 2011 and has adopted other oil and gas requirements multiple times since then to address various other issues associated with unconventional natural gas development and production.[4] In early 2013, Colorado adopted a statewide groundwater baseline sampling rule that requires oil and gas operators to sample nearby water wells before and after drilling activities.[5] In addition, as described below, Colorado recently adopted air emissions requirements for oil and gas

[2] *Id*. at 16-17 (citing KMPG's 2012 report entitled "Watered-down: Minimizing water risks in shale gas and oil drilling," which cites the origination of the chart as the Louisiana Department of Natural Resources, December 2011).
[3] U.S. Department of Energy Natural Energy Technology Laboratory, *Environmental Impacts of Unconventional Natural Gas Development and Production*, 22 (May 29, 2014) ("NETL report").
[4] COGCC Rule 205A.
[5] *Id*. Rule 609.

operations, including a statewide limit for methane emissions from these operations.[6]

- **California**: Following the September 2013 adoption of a comprehensive law addressing the environmental impacts of well stimulations, including HF, the state is in the process of developing regulations to implement the new law. The state Division of Oil, Gas and Geothermal Resources adopted emergency regulations in mid-December 2013, which were revised in late June 2014, that will be in place until final regulations are adopted to implement the new law.[7] The interim regulations include requirements for obtaining authorization to perform well stimulation treatments, well construction and casing, HF disclosure, notice to landowners and local/state agencies, and groundwater testing. Most recently, the state issued revised proposed regulations for public comment on June 13, 2014.[8]

- **Alaska**: Alaska adopted new regulations on April 2, 2014 that require the make-up of HF fluids used in the state to be disclosed to the Alaska Oil and Gas Conservation Commission and on the public FracFocus website registry.[9] In addition, the rules require a plan for baseline sampling of nearby water wells prior to HF operations.[10]

- **Texas**: Texas adopted HF disclosure regulations in early 2012.[11] More recently, Texas adopted updated regulations in May 2013 to strengthen well construction requirements in the state.[12]

- **Pennsylvania**: Pennsylvania is in the process of updating its regulations to implement the state's new oil and gas law, Act 13, which was signed into law in February 2012.[13] The Pennsylvania Department of Environmental Protection issued proposed regulations to implement the new law in December 2013; the rules are currently going through a state regulatory approval process.[14] The new rules will address environmental standards for unconventional natural gas operations, including updated requirements for disclosure of the make-up of HF fluids used in the state.

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[6] 5 Colo. Code Regs. § 1001-9.
[7] DOGGR, SB 4 Interim Well Stimulation Treatment Regulations, available at http://www.conservation.ca.gov/index/Documents/FInal%20Text%20of%20Readopted%20SB%204%20Interim%20WST%20Regulations%20with%20Revised%20IWSTN%20Form.pdf.
[8] DOGGR, SB 4 Well Stimulation Treatment Regulations, available at http://www.conservation.ca.gov/index/Documents/06-12-14%20-%20FINAL%20-%201st%20Revised%20SB%204%20WST%20Regulations.pdf.
[9] Proposed 20 Alaska Admin. Code tit. 20 § 25.283, available at http://doa.alaska.gov/ogc/hear/Combined%20regulations.pdf.
[10] *Id*.
[11] 16 Tex. Admin. Code § 3.29.
[12] *Id*. § 3.13.
[13] 58 Pa. Cons. Statutes Ch. 32, available at http://www.ctbpls.com/www/PA/11R/PDF/PA11RHB01950CC1.pdf.
[14] PADEP, Proposed Rulemaking: Chapter 78 Environmental Protection Performance Standards at Oil and Gas Well Sites, available at http://www.pabulletin.com/secure/data/vol43/43-50/2362.html.

HESI realizes that a reference to these developments would not be tied to any published material, unlike the majority of the NETL report as currently drafted. However, acknowledgement of these state regulatory developments are important to provide a comprehensive survey, similar to the NETL report's reference to the federal New Source Performance Standards adopted by the U.S. Environmental Protection Agency ("EPA").[15]

III. Potential Impacts to Water Quality

The Draft Addendum states that "fracture growth may result when fractures propagate outside of the production zone. If a connection is established, contaminants may reach aquifers used for water supply if []adequate protections are not in place."[16] However, a number of peer-reviewed papers and other studies demonstrate that the risk of contamination of shallow aquifers through subsurface migration of fluids from shales or other tight formations via induced fractures or existing faults is minimal.

- A peer-reviewed paper by researchers at the Lawrence Berkeley National Laboratory reports on some of the results of modeling being conducted for EPA's study of the impacts of HF on drinking water and concludes that the possibility of hydraulically induced fractures at great depths causing activation of faults and creation of a new flow path that can reach shallow groundwater resources is "remote."[17]

- Gradient's 2013 National Human Health Risk Evaluation evaluates whether it is possible for fluids pumped into a tight formation during the HF process to migrate upward to reach drinking water aquifers and determines that once the fracturing fluids are pumped into a tight formation, it is "simply not plausible" that the fluids would migrate upwards from the target formation through several thousand feet of rock to contaminate drinking water aquifers.[18]

- A peer-reviewed paper by Gradient discusses the physical constraints on upward fluid migration from black shales to shallow aquifers and concludes that upward migration of frac fluid and brine as a result of HF activity does not appear to be physically possible. These conclusions are confirmed by a review of an extensive microseismic database that includes over 12,000 HF stages throughout the US.[19]

- Another peer-reviewed paper by Gradient and a HESI expert concludes that it is not physically plausible for induced fractures – either alone or through activation of existing faults – to create a hydraulic connection between tight formations at depth

[15] NETL report at 18.
[16] Draft Addendum at 18.
[17] Rutqvist, J., et al., "Modeling of fault reactivation and induced seismicity during hydraulic fracturing of shale-gas reservoirs," *Journal of Petroleum Science and Engineering* (2013), available at http://dx.doi.org/10.1016/j.petrol.2013.04.023.
[18] Gradient, *National Human Health Risk Evaluation for Hydraulic Fracturing Fluid Additives* (May 1, 2013), available at http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=53a41a78-c06c-4695-a7be-84225aa7230f.
[19] Flewelling & Sharma, "Constraints on Upward Migration of Hydraulic Fracturing Fluid and Brine," *Groundwater* (Jul. 29, 2013), available at http://onlinelibrary.wiley.com/doi/10.1111/gwat.12095/abstract.

and overlying drinking water aquifers. This conclusion is again supported by extensive microseismic data.[20]

- An October 2012 report regarding HF operations in the Inglewood Oil Field in the Baldwin Hills area of Los Angeles County showed that, based on actual groundwater monitoring results, the groundwater quality in the area was not affected by hydraulic fracturing activities.[21]

- The MIT 2011 study on the potential risks of hydraulic fracturing to groundwater aquifers and found that "no incidents of direct invasion of shallow water zones by fracture fluids during the fracturing process have been recorded."[22]

These studies should be referenced in the "Water Quality" section, "Hydraulic Fracturing Fluids" subsection, of the Draft Addendum to provide more comprehensive and accurate information on this subject.

IV. Air Quality

HESI believes that the section on "Air Quality" would be more comprehensive if it referenced how state regulations are also currently being developed to address air quality issues associated with unconventional natural gas production. For example, Colorado recently adopted regulations to limit air emissions from unconventional natural gas production. Colorado adopted a statewide limit on emissions from natural gas HF operations, including methane, on February 23, 2014. Under these rules, components of unconventional natural gas production are required to control air emissions from hydrocarbons by 95% under certain phase-in schedules.[23] These rules could serve as a template for other states seeking to reduce air emissions from unconventional natural gas production.

V. Conclusion

HESI believes that by referencing the above information, DOE's addendum and the NETL report will serve as more comprehensive and accurate surveys of the environmental impacts of unconventional natural gas production activities. HESI appreciates the opportunity to comment on the Draft Addendum and NETL report and respectfully requests that DOE consider its comments in finalizing the reports.

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[20] Flewelling et al., "Hydraulic fracturing height limits and fault interactions in tight oil and gas formations," *Geophysical Research Letters* (Jul. 26, 2013), available at http://onlinelibrary.wiley.com/doi/10.1002/grl.50707/abstract.

[21] Cardno Entrix, *Hydraulic Fracturing Study: PXP Inglewood Oil Field* (Oct. 2012), available at http://www.inglewoodoilfield.com/fracturing-study/.

[22] MIT Energy Initiative, *The Future of Natural Gas: An Interdisciplinary MIT Study*, Appx. 2E (2011), available at https://mitei.mit.edu/publications/reports-studies/future-natural-gas.

[23] 5 Colo. Code Regs. § 1001-9, "Regulation Number 7 Control of Ozone via Ozone Precursors and Control of Hydrocarbons via Oil and Gas Emissions."