COMMENTS OF
HALLIBURTON ENERGY SERVICES, INC.
ON THE
SECRETARY OF ENERGY ADVISORY BOARD TASK FORCE
DRAFT REPORT ON FRACFOCUS 2.0

March 25, 2014

Halliburton Energy Services, Inc. ("HESI") offers the following comments in response to the draft report released by the Secretary of Energy Advisory Board ("SEAB") Task Force entitled *Task Force Report on FracFocus 2.0* on March 5, 2014 ("Draft Report"). HESI appreciates the opportunity to submit these comments on the Task Force's Draft Report and requests that they be considered by the Task Force as it finalizes the report.

Executive Summary

HESI fully concurs with the goal of transparency. HESI supports measures to provide information about hydraulic fracturing ("HF") chemicals to the public and regulators while protecting trade secrets. HESI believes that one of the best ways to provide this information is through FracFocus, and HESI is one of the leading contributors of information to the FracFocus Registry among service companies and vendors. HESI agrees with the Task Force that FracFocus has made a very significant contribution to public disclosure regarding HF chemicals.

HESI supports transparency notwithstanding the fact that, while some members of the public perceive there to be a risk of HF impacting drinking water supplies, there is little scientific basis for this concern. HESI appreciates the Task Force's recognition that the SEAB Shale Gas Production Subcommittee found a lack of risk from HF activities associated with shale gas operations in 2011. Evidence has continued to confirm the lack of risk from HF in the years since the SEAB last examined the issue, with many U.S. and international governmental agencies as well as peer-reviewed independent studies finding that there is little or no risk to drinking water from HF.

While HESI strongly supports transparency and the use of FracFocus, HESI has serious concerns regarding certain aspects of the Task Force's Draft Report:

- HESI is concerned that the Task Force is minimizing the importance of trade secret protection, with potential consequences for oil and gas production and American global competitiveness. Trade secret protection is critical to encourage innovation, the environmental and economic benefits of which are being demonstrated daily in the oil and gas industry. Moreover, the oil and gas industry is not unique in seeking to protect trade secrets, as the concept dates back centuries and is used by many different industries to protect innovations involving many different types of products.

- HESI also takes issue with the Draft Report's suggestion that the value of its intellectual property relating to its fracturing fluids is only "perceived" rather than real, that the industry's trade secret claims are of "uncertain technical merit," and that these claims are being asserted for information which is not "genuinely proprietary." HESI only seeks protection for legitimate trade secrets, and – consistent with the Task Force's recommendation – provides robust justifications for trade secret claims in those states that require it. Any suggestion to the contrary is unfounded.

- Likewise, any suggestion that trade secret claims for HF chemicals should be subject to a higher or more stringent standard for justification than all other types of trade secret claims is inappropriate and unwarranted, particularly given the lack of risk

associated with the use of these chemicals in HF operations. There is no basis for singling out hydraulic fracturing in this manner. A trade secret is a trade secret and should be protected regardless of the industry involved.

- HESI takes strong exception to the assertion that the risk of disclosing proprietary information is "very low" if the "systems approach" to disclosure is used. While HESI generally supports the "systems approach" to disclosure and itself uses a form of such disclosure, it does not obviate the need to keep confidential the identities of proprietary chemicals. Contrary to the assertions in the Draft Report, a systems approach does *not* prevent competitors from being able to discern trade secret information from the disclosure unless certain key ingredient information is withheld.

- The recommendations of the Task Force – which would expose the industry's trade secrets to exploitation by competitors and foreign governments – stand in stark contrast to the efforts of the Administration to protect American trade secrets from foreign entities in order to safeguard our global competitiveness. The Task Force should not undermine these efforts.

- HESI also has concerns about several other aspects of the Draft Report:

  - The proposed third-party audit of FracFocus operations appears to contemplate the disclosure of trade secret information to the auditor, which would give rise to a host of issues that would not be easily resolved.

  - Protocols and/or agreements within the supply chain will not eliminate the need for trade secret protection for the identities of proprietary chemicals.

  - States should not be expected to come up with a uniform standard for trade secret claims or a uniform process for assessing such claims, particularly where the need for uniformity has not been demonstrated. Moreover, the recommendation that states agree to modify their laws in the interest of uniformity is beyond the scope of the Task Force's charge.

  - Contrary to the assertions in the Draft Report, the proposed BLM regulations effectively incorporate a procedure for assessing and challenging trade secret claims.

  - The Task Force should be aware that undue efforts to increase the searchability of the FracFocus database will have ramifications for the security of American technology, and that at some point these concerns outweigh the benefit, if any, of added searchability.

Finally, HESI notes that, in focusing so heavily on trade secret issues in the Draft Report, the Task Force has gone beyond its charge from the Secretary, which was to examine the extent of trade secret claims being made in FracFocus reports. The Task Force has instead opined on the legitimacy of trade secret claims and addressed more broadly the extent to which trade secret claims should be made under state laws and state disclosure programs. In doing so the Task

Force has waded into areas outside the purview of FracFocus and reached conclusions that could have significant impacts on competition within the oilfield services industry and on the efficiency and effectiveness of HF operations without an adequate basis for its conclusions.

I. Introduction

HESI is a leading provider of services to the energy industry and is the global leader with respect to HF services. HESI has performed HF services on tens of thousands of wells in the U.S. and internationally. Not coincidentally, HESI is one of the leading contributors – if not the leading contributor – of information regarding fracturing fluids to FracFocus; the ingredients in various HESI fracturing fluids are disclosed on thousands of FracFocus forms from wells across the country.

In addition, HESI develops some of the most innovative products used today in hydraulically fracturing wells. 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. HESI invests substantial amounts of money and human resources in developing these innovative products to maintain a competitive advantage, and HESI's competitiveness as well as the benefits of innovation would be lost without trade secret protection. Given its extensive experience, HESI is well-qualified to comment on the Task Force's Draft Report.

As discussed further below, HESI agrees with the Task Force that FracFocus is a successful method of disseminating information about HF activities to the public and regulators. HESI supports providing the public with utmost transparency through FracFocus, while at the same time protecting American competitiveness through adequate trade secret protection. HESI believes that these goals are being achieved with FracFocus 2.0. In seeking to restructure FracFocus 2.0 to minimize or even eliminate trade secret claims for individual fracturing fluid ingredients, HESI believes that the Task Force underestimates the importance and legitimacy of trade secret protection with respect to HF. Furthermore, HESI believes that the Task Force's suggested approach to disclosure, the "systems approach," does not obviate or reduce the need to make trade secret claims with respect to the identities of a limited universe of proprietary chemicals. The Task Force should reconsider its recommendations.

II. HESI Supports Transparency Regarding Fracturing Fluids

Since the inception of FracFocus, HESI has supported the efforts of the Ground Water Protection Council ("GWPC") and the Independent Oil and Gas Compact Commission ("IOGCC") to provide an effective way to disclose the make-up of HF fluids used in any individual well. HESI works with its customers to provide information regarding its fracturing fluids for posting on FracFocus, either voluntarily or in compliance with state requirements, and operators have posted reports on thousands of wells that have been hydraulically fractured by HESI.

HESI has also supported the efforts of states to adopt disclosure programs that provide a high degree of transparency regarding fracturing fluids to regulators and the public. For

example, HESI participated actively in the 2012 chemical disclosure rulemaking process undertaken by the Colorado Oil and Gas Conservation Commission ("COGCC") and related stakeholder discussions, which resulted in a program that includes FracFocus as the vehicle for disclosure regarding the chemicals in HF fluids, the ability to claim trade secret protection for individual chemical identities and concentrations by providing a justification of the claim to the COGCC, and a mechanism for challenging those trade secret claims. HESI has participated in numerous other rulemaking proceedings around the country with the goal of supporting disclosure programs whereby the public and regulators may obtain detailed information while valuable trade secret information is adequately protected.

Beyond assisting with regulatory efforts, HESI goes a step further than required in making information regarding its fracturing fluids readily available to the public. For example, HESI makes the Safety Data Sheets for all of its additives freely available on the company's website. In addition, HESI discloses the constituents and additives used in typical fracturing formulations on its website, presenting the information in a way that is easy for the public to follow and understand.[1] This website allows anyone to see the make-up of typical HF formulations used in different geographical areas and understand the function of each component in an HF fluid formula. HESI believes that the best way to meet the public's desire to know more about HF is to provide extensive information about the make-up of HF fluids in a clear and understandable format.

III. FracFocus Effectively Responds to Public Concerns About HF Chemicals

The Draft Report states that "[t]he public is clearly concerned about the nature of chemicals used in hydraulic fracturing" and that it is "much to industry's advantage to meet this concern."[2] HESI fully recognizes that members of the public have expressed concern about the chemicals used in fracturing fluids and believes that the industry has taken these concerns seriously and has addressed them.

A. HESI Agrees with the Task Force's Support for FracFocus

One of the key ways in which the industry has addressed these concerns is through the development of FracFocus. HESI agrees with the Task Force's findings regarding the success of FracFocus, which "has greatly improved public disclosure quickly and with a significant degree of uniformity."[3] Since its inception in April 2011, FracFocus has amassed extensive information regarding the chemicals used in HF at individual well sites that is now readily available to the public. The Registry now includes disclosures for over 68,000 wells in 25 states. The site has been visited over 750,000 times. Moreover, 17 states have now incorporated FracFocus into their HF chemical disclosure programs;[4] these states accounted for 83% of U.S. onshore oil production in 2013 and 78% of onshore gas production in 2012[5] and another five

[1] *See* http://www.halliburton.com/public/projects/pubsdata/hydraulic_fracturing/fluids_disclosure.html (Attached Exhibit A). This site has had more than 88,000 visits since its inception in 2010.
[2] Draft Report at 12.
[3] *Id*. at 2.
[4] These states include Alabama, California, Colorado, Kansas, Louisiana, Mississippi, Montana, Nevada, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Texas, Utah, and West Virginia.
[5] These figures are based on production statistics from the U.S. Energy Information Administration.

states have proposed to do so.[6] HESI agrees with the Task Force that FracFocus is a success story with its ability to disseminate such extensive amounts of information and its widespread use.

In addition, the information provided concerning the fluids used in each HF operation provides a high degree of transparency. The Draft Report notes that on average 84% of chemicals on FracFocus – more than five out of every six chemicals – are completely disclosed to the public. Of the 15.8% claimed as trade secrets, many are chemicals that are not required to be disclosed on a Safety Data Sheet, meaning that these chemicals are either not hazardous or are present in very small quantities. Overall, any chemicals in a fracturing fluid that are claimed to be proprietary typically account for 0.1% or less of the total fluid mixture. Chemical family names are typically provided for these proprietary chemicals. As a result, regulators and the public have adequate information with which to assess any risks from HF operations in any given area.[7]

B. The Identities of All HF Chemicals Are Available to Regulators

HESI agrees with the Task Force's recognition that, in addition to what is on FracFocus, a substantial amount of other information, including trade secret information, is available to regulators for various purposes. This information includes:

- Service companies have submitted extensive information about the make-up of HF fluids to U.S. federal and state regulatory agencies as well as agencies in other countries to assist these agencies in assessing environmental and health risks from oil and gas development. In particular, service companies have provided the U.S. Environmental Protection Agency a complete list of all chemicals – including proprietary chemicals – used in HF operations in the U.S. during the period from 2005 to 2010 in connection with the Agency's study of HF and drinking water resources. A substantial portion of this information has been made public in various forms in government reports about the chemicals used in HF and the risks associated with the HF process.[8] These submittals of information have resulted in the public availability of extensive information about many chemicals used in the HF process.

- Safety Data Sheets for fluids used during drilling, cementing and stimulation operations identify hazardous ingredients in a product and are readily available to regulators.

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[6] These states include Alaska, Michigan, Nebraska, New York and North Carolina.

[7] For example, a number of states have adopted programs for sampling of water resources before and after HF operations that do not depend on knowledge of all the constituents in a fracturing fluid. *See, e.g.*, 2 Colo. Code Regs. 404-1 § 609; Wyoming Oil and Gas Conservation Commission ("WOGCC") Rules, Ch. 3 § 46; 225 Ill. Comp. Stat. 732 §1-80(e).

[8] U.S. EPA, *Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report*, Appx. A (Dec. 2012), available at http://www2.epa.gov/hfstudy/potential-impacts-hydraulic-fracturing-drinking-water-resources-progress-report-december; New York State Department of Environmental Conservation, *Revised Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program* (2011), available at http://www.dec.ny.gov/energy/75370.html.

- Information on company and trade association websites about the chemicals in HF fluids used in different areas of the world and the purpose for which the chemicals are used. For example, as noted above, HESI's website gives information about typical HF formulations used in the U.S., including additive names and functions as well as chemical constituent names, CAS numbers and descriptions of common uses for each constituent.

Moreover, the identities of trade secret chemicals are available to regulators whenever needed, such as in emergency situations.[9] A number of states now require that the identities of all chemicals in a fracturing fluid be submitted to regulators as part of the process of approving HF activities at a well site.[10] Other states specifically require that information concerning trade secret chemicals be provided to regulators upon request in specified circumstances. For example, the Colorado rules require disclosure of trade secret information to the COGCC upon receipt of a letter from the Director stating that the information is necessary to respond to a spill or release or a complaint from a person who may have been directly and adversely affected or aggrieved by such spill or release.[11] In other states that do not have such specific regulations, there are general reporting requirements that allow state regulators to get the information they need to respond to an incident.[12]

In sum, regulators have access to HF chemical information, including trade secret information, to meet all of their various environmental and public safety regulatory obligations.

C. The Risk to Human Health Associated with HF Chemicals Is Not Significant

HESI strongly supports transparency regarding the chemicals used in HF operations notwithstanding that, as recognized in the Draft Report, the risk to drinking water from HF chemicals is minimal. Since the time of the Subcommittee's report in 2011, the grounds for concluding that these risks are minimal have only gotten stronger. As in 2011, there are still no known incidents of groundwater contamination as a result of HF operations. For example, in January 2013 the U.S. Geological Survey ("USGS") published a report of the results of an analysis of water samples from 127 drinking water wells representing the western third of the Fayetteville shale.[13] The study used two comparative analysis methods to identify potential impacts to water quality from gas production activities in the area and found no evidence of migration of gas production fluids into the shallow groundwater based on the wells sampled in the study.[14]

Similarly, 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

[9] *See* Draft Report at 12.
[10] *See, e.g.*, Mont. Admin. R. § 36.22.608; WOGCC Rules, Ch. 3 § 8(c)(ix).
[11] 2 Colo. Code Regs. 404-1 § 205A(d)(2).
[12] *See, e.g.*, Mich. Admin. Code R. § 324.1008; N.D. Admin. Code § 43-02-03-30; 16 Tex. Admin. Code § 3.29(c)(4).
[13] Kresse, et al., *Shallow Groundwater Quality and Geochemistry in the Fayetteville Shale Gas-Production Area, North-Central Arkansas*, U.S. Geological Survey Scientific Investigations Report 2012-5273 (Jan. 2013), available at http://pubs.usgs.gov/sir/2012/5273/sir2012-5273.pdf.
[14] *Id*. at 28.

monitoring results, the groundwater quality in the area was not affected by HF activities.[15] Moreover, microseismic monitoring showed that most of the induced fractures were contained within the target formation, and that the few fractures that were outside the target formation did not contain any proppant and therefore would have closed back up once the HF operation was completed.[16]

HESI's consultant Gradient has done extensive work on the potential risks associated with HF chemicals in the past few years. Gradient undertook an extensive analysis of the potential risks to drinking water associated with the use of HF fluids in 2013 in which Gradient evaluated whether it is possible for fluids pumped into a tight formation during the HF process to migrate upward to reach drinking water aquifers.[17] Gradient determined 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] Gradient found that there are a variety of factors that contribute to the implausibility of this scenario:

- Tight oil and gas formations are found in geologic settings that greatly restrict upward fluid movement, as demonstrated by the fact that oil and gas as well as brines have been trapped in the target formation for millions of years;[19]

- The HF process itself does not create conditions that would overcome these natural restrictions on fluid movement because the associated pressures are too short-term and localized to push fluids through thousands of feet of low permeability rock;[20]

- The fractures created during HF are of limited height, as demonstrated by microseismic data from over 12,000 HF operations in shale plays and other formations across the country, which show that in all cases there were at least 1,500 feet (and usually more than 3,000 feet) of intact bedrock above the fractures;[21] and

- The same microseismic data show that – despite speculation to the contrary – the presence of natural faults in the bedrock does not significantly contribute to the upward movement of fluids.[22]

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[15] Cardno Entrix, *Hydraulic Fracturing Study: PXP Inglewood Oil Field* (Oct. 2012), available at http://www.inglewoodoilfield.com/fracturing-study/.
[16] *Id*.
[17] Gradient, *National Human Health Risk Evaluation for Hydraulic Fracturing Fluid Additives* (May 1, 2013) ("Gradient 2013 Study"), available at http://www.energy.senate.gov/mwg-internal/de5fs23hu73ds/progress?id=Ud/dG+zh3g.
[18] *Id*.
[19] *Id*. at ES-4. For example, the gas and brines in the Marcellus Shale have been trapped there for almost 400 million years.
[20] *Id*. at 35.
[21] *Id*. at 38. *See also* Fisher & Warpinski, *Hydraulic Fracture Height Growth: Real Data*, Society of Petroleum Engineers SPE 145949 (Feb. 2012), available at http://www.spe.org/atce/2011/pages/schedule/tech_program/documents/spe145949%201.pdf. For example, the shallowest hydraulic fracturing job in the extensive database used by Gradient, which occurred at about 1,600 feet below ground surface, had essentially no height growth.
[22] Gradient 2013 Study at 38, *supra* note 17.

Gradient found that even if the fracturing fluids could migrate upward through hundreds or thousands of feet of bedrock, the fluids would be so highly diluted that the concentrations of the chemical constituents would be well below levels that would begin to give rise to any human health concerns.[23] Accordingly, the report concludes that the fluids pumped into a target formation as part of the HF process do not present a risk to human health.[24]

Gradient also analyzed the potential for spills of HF fluids (or flowback fluid) to reach drinking water wells or surface waters. Using a "probabilistic" approach to address a wide range of spill scenarios and very conservative assumptions (e.g., no spill mitigation measures in place and no adsorption of chemical constituents to the soil or degradation in the environment), Gradient determined the concentrations at which HF constituents might be found in surface water or a drinking water well as a result of a spill and compared them to levels at which health effects might become a concern.[25] Gradient found that any human health risks would be insignificant because various dilution mechanisms would further reduce the already low concentration levels of HF constituents before they ever reached drinking water sources.[26]

Several peer-reviewed papers likewise confirming the lack of risk to groundwater from HF operations have been published in the past few years. A paper by Gradient discusses the physical constraints on upward fluid migration from black shales such as the Marcellus and Bakken shales to shallow aquifers and concludes that upward migration of HF fluid and brine as a result of HF activity does not appear to be physically possible.[27] The authors found that the conditions for upward migration of fluids (i.e., upward hydraulic gradients) are found only in the presence of low permeability layers such as shales and that the rock layers between shales being hydraulically fractured and shallow aquifers are generally dominated by multiple low-permeability layers, effectively ensuring that any upward migration will be very slow, resulting in migration timescales of hundreds of thousands or millions of years.[28]

Another paper by Gradient and a HESI expert examines the potential for fluid migration via induced fractures and considers the potential for interactions with natural faults to provide migration pathways.[29] The paper finds that given the constraints on upward flow of fluids from tight oil and gas formations, the upward migration of fracturing fluids will be governed by the extent of upward fracture growth and any related movement of natural faults. Based on principles of geophysics as confirmed by extensive microseismic data, the authors further concluded that fracture heights are limited by HF fluid volume and natural mechanisms such as in situ stress and the tendency of fractures at shallower depths to grow horizontally rather than vertically, and that additional fluid migration as a result of interactions with naturally occurring

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[23] *Id*. at 42.
[24] *Id*. at ES-5.
[25] *Id*. at ES-14.
[26] *Id*.
[27] 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.
[28] *Id*.
[29] 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.

faults is minimal. As a result, it is not physically plausible for induced fractures to create a hydraulic connection between tight formations at depth and overlying drinking water aquifers.[30]

In addition, a recent peer-reviewed paper by researchers at Lawrence Berkeley National Laboratory reports on some of the results of modeling being conducted by the researchers for EPA's comprehensive study of the impacts of HF on drinking water, focusing on the potential for injection-induced fault reactivation and notable seismic events associated with HF operations.[31] The paper concluded that the possibility of hydraulically induced fractures at great depths causing activation of faults and the creation of a new flow path that can reach shallow groundwater resources is remote.[32] Other governmental studies across the world have likewise concluded and continue to conclude that the HF process poses little risk to human health or the environment.[33]

In light of the lack of risk to human health posed by HF activities, HESI believes that the creation and extensive use of FracFocus and steps taken by individual companies effectively respond to public concerns regarding the nature of HF chemicals.

IV. The Protection of Trade Secrets Is Critical

Notwithstanding the extensive information that is already available regarding HF chemicals and the minimal risk posed by such chemicals, the Draft Report urges even greater disclosure – in fact, complete disclosure with no trade secret claims for individual chemicals – while at the same time professing to have no interest in constraining innovation. There is a clear

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[30] *Id*.

[31] 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.

[32] *Id*.

[33] For example, the Energy and Climate Change Committee appointed by the British House of Commons concluded in May 2011 that hydraulic fracturing itself does not pose a direct risk to water aquifers, provided that the well casing is intact before this commences. United Kingdom Parliament, House of Commons, Energy and Climate Change Committee, Fifth Report: Shale Gas (May 10, 2011), available at http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/795/79502.htm. In addition, the UK Royal Society, the Council for the Taranaki Region in New Zealand, the New Zealand Parliamentary Commissioner for the Environment, the South African Department of Mineral Resources, and the UK Department of Energy and Climate Change all completed comprehensive studies on HF in 2012-2013 finding a lack of risk to freshwater aquifers from properly conducted HF operations. The Royal Society, Royal Academy of Engineering, Shale gas extraction in the UK: a review of hydraulic fracturing, 33 (June 2012), available at http://royalsociety.org/policy/projects/shale-gas-extraction/report/; Government of New Zealand Taranaki Regional Council, Hydrogeologic Risk Assessment of Hydraulic Fracturing for Gas Recovery in the Taranaki Region (May 2012), available at http://www.trc.govt.nz/hydraulic-fracturing/; Government of New Zealand, Parliamentary Commissioner for the Environment, Evaluating the environmental impacts of fracking in New Zealand: An interim report (Nov. 2012), available at http://www.pce.parliament.nz/publications/all-publications/evaluating-the-environmental-impacts-of-fracking-in-new-zealand-an-interim-report/; Republic of South Africa, Department of Mineral Resources, Investigation of Hydraulic Fracturing in the Karoo Basin of South Africa (July 2012), available at http://www.dmr.gov.za/publications/summary/182-report-on-hydraulic-fracturing/852-executive-summary-investigation-of-hydraulic-fracturing-in-the-karoo-basin-of-south-africa.html; AMEC Environment & Infrastructure UK Limited, Department of Energy and Climate Change, Strategic Environmental Assessment for Further Onshore Oil and Gas Licensing, 96 (Dec. 2013), available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/273997/DECC_SEA_Environmental_Report.pdf.

disconnect between the Task Force's characterization of trade secret claims relating to fracturing fluids and the actual value of those trade secrets to the industry and to oil and gas production. The Task Force's premise that trade secret claims for individual chemicals can and should essentially be eliminated is misguided and will adversely impact not only companies like HESI but American oil and gas production and global competitiveness as a whole.

A. The Importance of Innovation

Trade secret protection is a concept that dates back at least two centuries. The purpose of protecting trade secrets is to foster innovation, and countries in all corners of the globe today recognize the critical role that trade secrets play in creating incentives for innovative efforts in a variety of fields that over the years have resulted in a wide range of benefits for people around the world. In the U.S., a wide range of laws – from provisions in federal laws such as the Emergency Planning and Community Right-To-Know Act and the Freedom of Information Act that exempt trade secrets from public disclosure requirements to the widespread adoption of the Uniform Trade Secrets Act at the state level – attest to the high degree of consensus that trade secrets are worth protecting.

HESI appreciates the Task Force's statement that it does not wish to constrain innovation, which has been critical to oil and gas development.[34] The shale boom itself is the product of innovation with respect to horizontal drilling and hydraulic fracturing. HESI and other service companies continue to develop new and innovative products used in drilling, casing, cementing and stimulating shale gas wells and other types of wells that provide significant environmental and economic benefits.

The economic benefits resulting from the use of HESI's own innovative products have been repeatedly demonstrated. HESI's analysis of various case studies shows an average loss in production of 25% when non-proprietary stimulation fluids are used instead of proprietary fluids.[35] For example, HESI's CleanStim®, which is an HF fluid system made entirely of ingredients sourced from the food industry, exhibits significantly improved fluid efficiency and increases productivity by helping to clean up the wellbore after the treatment is performed. This has been shown to improve well productivity over non-proprietary formulations by more than 10%.[36]

In addition, PermStim[SM] fracturing service is one of HESI's more recent fracturing fluid innovations. The result of an extensive development effort (including numerous field trials), PermStim[SM] replaces guar-based fluid systems and provides a cleaner, more robust system that results in more cost-effective treatments and improved well performance through the elimination of guar residues that can impede oil or gas flow. PermStim[SM] results in approximately 25% more production from shale formations as compared to wells fractured with typical guar-based gels. Similarly, HESI's proprietary proppant technologies have been shown to result in production increases of 20 to 25% or more compared to the use of conventional proppants in hydraulic fracturing. Moreover, proppant coating technology developments have resulted in

[34] Draft Report at 10.
[35] Analysis of Economic Impacts Resulting From Fracturing Stimulation 'Advanced Technology' Within the Marcellus Basin (Attached Exhibit B) ("Analysis of Economic Impacts").
[36] SPE 116237, *Surfactant Increases Production in the Codell Formation of the DJ Basin*, Paternie, M., Halliburton.

faster, more effective well clean-up after stimulation and have drastically reduced the number of workovers for treated wells.[37]

Overall, the customized fluid systems created by HESI and others using proprietary technologies have been shown to result in significantly increased production levels as compared to the use of commodity products, creating millions of dollars of additional value for its customers. For example, HESI has estimated that the use of advanced technologies in the Marcellus Shale will result in an increase in natural gas production of as much as $41 billion dollars through the year 2030.[38] The production increases from advanced technology also result in other substantial economic benefits, including: (1) increased lease bonuses and royalties for landowners and tax revenue for government at all levels; (2) reinvestment for further development; and (3) the creation of sustainable economic stimulus and thousands of jobs.

HESI's innovative technologies also provide significant environmental benefits, which include but are not limited to: (1) a reduction in overall chemical use; (2) the use of chemicals that provide an extra margin of environmental safety; (3) recycling of wastewater to reduce the use of fresh water and to reduce the amount of wastewater that must be disposed of; (4) reduced truck traffic; (5) less packaging and storage of materials; (6) a smaller well pad footprint; and (7) reduced air emissions. For example:

- HESI's UniStim™ is a high performance HF fluid that is tolerant of high concentrations of total dissolved solids, including contaminants consistent with heavy produced water brines. This tolerance facilitates recycling because it allows significantly greater use of minimally treated oilfield produced and flowback water, thereby reducing demands on fresh water and the associated need for truck transportation and disposal.

- HESI's CleanStim® is an HF fluid system made entirely of ingredients sourced from the food industry. As a result, CleanStim® offers an extra margin of environmental safety as compared to traditional formulations.

- HESI's SandCastle® vertical proppant storage system is powered by gravity and solar power rather than diesel engines, and saved approximately 2.8 million gallons of diesel fuel by the end of 2013.

- CleanWave® is a water treatment system that treats wastewater at the well site to enable recycling and reuse of the wastewater for drilling and fracturing subsequent wells. CleanWave® treated over 31 million gallons of water in 2012 in the U.S., resulting in an equivalent reduction in the amount of fresh water used in fluid systems. The recycling and reuse of wastewater kept approximately 5,680 truckloads of water off of roads.

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[37] SPE 00039428, *Enhancing Fracture Conductivity Through Surface Modification of Proppant*, Nguyen, Phillip D., Weaver, Jim D., Dewprashad, Brahmadeo T., Parker, Mark A., Terracina, John M., Halliburton Energy Services, Inc.; SPE 112461, *Controlling Proppant Flowback to Maintain Fracture Conductivity and Minimize Workovers: Lessons Learned from 1,500 Fracturing Treatments*, Jim M. Trela, Philip D. Nguyen, and Billy R. Smith, Halliburton.

[38] Analysis of Economic Impacts, *supra* note 35.

- CleanStream® Service treats bacteria present in the water provided at the well site with ultraviolet light instead of the biocides that are commonly used. In many cases, the CleanStream® process can be 99.9% effective, eliminating the need for chemical biocides. In 2012, Halliburton treated more than 866 million gallons of fluid using this method, allowing for the elimination of more than 129,900 gallons of biocides.

- The significant increases in production efficiency associated with the use of the innovative technologies described above result in reduced well completion times, thereby further reducing environmental impacts. For example, improvements in production enhancement processes are expected to reduce emissions from U.S. fracturing operations by 25% by the end of 2015.

If these innovative products were not available, the benefits of these advanced technologies would be lost. This would result in not only lost environmental benefits from the products but sub-optimum production from wells. Among other things, research indicates that 24-41% more wells would need to be drilled to achieve the production enhancement that advanced technology provides.[39] More wells would mean an increased footprint for oil and gas development, with more surface impacts and increased costs.

In short, the benefits of innovation in the oil and gas industry are very significant. Not only have these innovations helped fuel job growth and contributed to the nation's energy security, but they have done so while achieving continual environmental improvements.

B. The Role of Trade Secret Protection in Encouraging Innovation

This level of innovation simply would not occur without trade secret protection. The innovative technologies described above have taken years and millions of dollars to develop. For example, HESI spent $588 million on research and development in 2013 alone, including millions spent annually on developing fluid additives to enhance the production of new and existing wells. In the absence of trade secret protection, competitors could simply copy HESI's new ideas without having to spend the time and resources to invent or develop the technology. The dollars, time, and human resources invested by HESI would essentially be lost.

For example, the UniStim™ fluid system, the environmental and economic benefits of which are described above, uses conventional fracturing fluid components enhanced with new and innovative chemistry to create a crosslinked gelled water system that is tolerant of the high salt concentration of total dissolved solids found in HF wastewater. Its development required many months of research by technology personnel. Although other industry competitors have access to information regarding the additives in the fluid system, they do not know the innovative materials in the fluid that are critical to its performance. If this information were made public, HESI would lose the opportunity to recoup its investment in capital, personnel, and technology, because it would be unable to charge a premium for the use of a product that has significant environmental, technological and production benefits. If companies like HESI do not have a reasonable prospect of seeing a return on their investment, there is little incentive to invest substantial sums in product innovation.

[39] *Id*.

HESI has estimated that the worldwide loss of competitive advantage from disclosure of trade secrets would result in annual losses to the company of approximately $375 million. Because a trade secret is only valuable if it remains a trade secret, if proprietary information could not be protected from disclosure HESI would have to replace its most innovative products (which include its most effective and environmentally beneficial products) with non-proprietary products the makeup of which could be fully disclosed to the public, with the resulting loss of the environmental and economic benefits described above.

In seeking trade secret protection, service companies such as HESI are not requesting unique treatment from regulators. In fact, trade secret protection is common and has been historically provided for a variety of products and technologies. For example, the make-up of many products that people routinely eat, drink, and use in their homes are protected as trade secrets. This includes products such as Coca-Cola[40] and Dr. Pepper, KFC's fried chicken, Bush's baked beans, McDonald's special sauce, designer perfume fragrances, mosquito repellants, and household products such as WD-40. The makers of these products are afforded trade secret protection so that their valuable recipes and formulas are not disclosed to the public and their competitors, while at the same time the public knows enough details about the make-up of the product to assess its function, characteristics and health effects as necessary. Given the lack of any significant risk associated with the use of HF chemicals and the benefits they provide, there is no basis for granting trade secrets for HF chemicals any less protection than the trade secret protection enjoyed by a wide range of other industries.

C. The Legitimacy of Trade Secret Claims

HESI agrees with the Task Force that protection should be provided for genuine trade secrets. However, HESI strongly takes issue with the suggestion that trade secret claims asserted by industry members are "of uncertain technical merit" and that there should be "few, i[f] any trade secret exemptions."[41] The innovative products described above, including new fracturing fluids, involve components that qualify as trade secrets under any definition of the term. HESI provides robust justifications for its trade secret claims in those states that require it, such as Colorado and Wyoming. These justifications cover many different factors to substantiate the trade secret claim, such as the extent to which the information is known by employees and outside the company, the value of the trade secret information and harm that would result if the information were made public, the resources invested to develop the proprietary information, and the difficulty of acquiring and/or duplicating the information. No regulator has ever questioned these justifications.

Moreover, there are systems in place that are designed to ensure that trade secret claims made for HF chemicals are legitimate. In some jurisdictions like Wyoming, regulatory officials review trade secret claims as part of the process for approval for HF activities at well sites and have the authority to reject claims they conclude are not sufficiently supported. In other

[40] There is a popular misconception that all of the ingredients of Coke are listed on the product label. In fact, a glance at the label on a Coke can will quickly show that one of the listed ingredients is "natural flavorings." Exactly what these flavorings are is a trade secret that has been closely guarded for over 100 years by the Coca-Cola Company, which keeps the formula locked in a vault. *See Coca-Cola Bottling Co. v. Coca-Cola Co.*, 107 F.R.D. 288 (D. Del. 1985).

[41] Draft Report at 10.

jurisdictions such as Texas and Colorado, mechanisms are in place for public challenges to trade secret claims made for HF chemicals, up to and including court proceedings in which a judge would review the evidence and determine whether a trade secret claim is valid.[42]

HESI cautions the Task Force against concluding that some trade secret claims are unmerited or that there is only a certain portion of trade secrets being protected that are "genuine" trade secrets. Any such statement would be based on incomplete knowledge regarding the trade secret claims that are being made. To undermine the protection of valuable American trade secrets based on unfounded assumptions about the merits of trade secret claims is inadvisable and irresponsible.

In short, all of HESI's claims are made for legitimate trade secrets. HESI does not agree with the Task Force's suggestion that there can be an arbitrary limit on the number of trade secrets that are protected from public disclosure. If a trade secret is genuinely a trade secret it should be protected, no matter how many other legitimate trade secret claims are made.

D. Trade Secret Claims for HF Chemicals Should Not be Subject to a Higher Standard

At the same time it indicates a desire not to limit innovation, the Task Force seeks to do just that by suggesting that trade secret claims for HF chemicals should somehow be subject to a different standard than all other trade secret claims, one that is "very high" and "stringent." Such a heightened standard could not be imposed by GWPC and IOGCC for FracFocus; at this juncture most trade secret claims that are asserted in connection with FracFocus reports are subject to state standards.

Rather, the Task Force suggests that the states and the federal government – through STRONGER – adopt a "standard for claiming [a trade secret] exemption" for HF chemicals reported through FracFocus that is uniform and more restrictive than the standards that apply to other types of trade secrets. As discussed above, there is simply no basis for singling out trade secret claims for HF chemicals in this manner and the Draft Report does not offer one other than an effort to address concerns among some members of the public regarding HF chemicals that the Task Force recognizes may not be justified.[43] In effect, the Task Force is asking the states and the federal government to depart from existing, generally applicable standards for trade secret protection and force the oil and gas industry to give up otherwise legitimate trade secret claims when the risks associated with HF chemicals are in fact minimal. This recommendation is inappropriate and unwarranted.

Moreover, a uniform standard is not necessarily appropriate. While the Task Force is correct that trade secret laws are similar in many states and are based upon the same legal standards, state trade secret law ultimately varies based on the particular wording of state statutes

[42] HESI is currently involved in one such case in Wyoming.

[43] The Task Force must recognize that even if its recommendation were to be adopted, it would not end the opposition of some groups to HF. A number of groups oppose HF for reasons having nothing to do with the particular chemicals involved (such as larger concerns regarding all fossil fuel production and use as they relate to climate change), and even 100% public disclosure of all chemicals used in HF operations will not address those concerns.

and regulations and on case law, and cannot be reduced to a one-size-fits-all standard. In addition, such an approach would require states – particularly those such as Colorado, Pennsylvania and Texas that have already adopted disclosure requirements based on current state law – to modify existing statutes and/or regulations.

Even as applied to state procedures for verifying trade secret claims, the Task Force's recommendation is problematic. In many cases the processes that have been adopted by states are a reflection of existing, generally applicable state law.[44] While the processes may differ from state to state, there is no indication that these variations are causing hardship to anyone. There is no basis for insisting that states devote resources to changing their laws in the interest of uniformity.

In addition, it is outside the scope of the Task Force's charge (i.e., understanding the extent of information reported to FracFocus that is claimed to be proprietary) to recommend that states interpret and/or modify their own trade secret laws (which apply to a variety to industries and products) in accordance with a uniform standard for the purposes of disclosure to FracFocus. The Task Force should withdraw this recommendation.

V. The Systems Approach to Disclosure Does Not Eliminate or Reduce the Need for Trade Secret Protection of the Identities of Proprietary Chemicals

The Task Force's solution for facilitating the disclosure of the identities of all chemicals in a fracturing fluid while still protecting trade secrets is the "systems approach," *i.e.*, an approach to reporting whereby the ingredients in a fluid system are not tied to the additives in which they are found. The Draft Report claims that the use of this disclosure method should be sufficient to protect any trade secrets because it would make it "extremely difficult to reverse engineer to determine which chemicals and in what proportions these chemicals are present in a particular additive . . .."[45] The report sets forth no basis for these conclusions other than noting that this approach to disclosure is used by one service company.[46]

HESI agrees with the Task Force that a "systems approach" is a good way to provide HF ingredient information to the public. HESI itself uses a variation of the systems approach in the disclosure forms it completes for every well it hydraulically fractures. The systems approach – or something close to it – is the foundation for the disclosure scheme currently used for FracFocus 2.0. It is also reflected in the disclosure methods adopted in a number of states such as Colorado and Texas.

However, the systems approach to disclosure does *not* obviate the need for the ability to withhold the identities of certain proprietary chemicals from public disclosure in order to protect trade secrets. In fact, those states that use some form of "systems" reporting also allow

[44] For example, the process adopted in Texas – involving ultimate determinations by the State Attorney General's Office – reflects the way challenges to trade secret claims are handled under the state's Public Information Act. In contrast, the Colorado regulations themselves do not set forth a specific process for challenging trade secret claims, but rely instead on pre-existing mechanisms under Colorado law for challenging actions of the COGCC.
[45] Draft Report at 13.
[46] There is no indication that other service companies were consulted on this critical issue; HESI certainly was not.

operators, service companies and vendors to withhold the specific identities of particular chemicals where those identities qualify as trade secrets.[47]

The fundamental flaw in the Task Force's reasoning is its presumption that the use of a systems approach would make it "extremely difficult" to reverse engineer a product formula. *That is simply not the case*. Even if chemical ingredients are not listed with the additives in which they are found, an experienced chemist for a sophisticated competitor – knowing the types of chemicals used in different types of additives – would be able to discern which chemicals are found in which additives.

For example, a chemist who has experience in the industry will be familiar with the types of chemicals typically used in different types of additives. Given a list of HESI products used in hydraulically fracturing a well and a separate aggregate list of the ingredients in those products, a knowledgeable individual from one of HESI's competitors who is involved in developing new products would be able to determine with a reasonable degree of certainty which products most if not all of the ingredients were associated with based on the functions of the various products and the functions that could be served by a chemical given its molecular structure. For example, based on over 30 years of experience in the industry (including experience in the development of new fracturing fluid additives), HESI's former Technology Director for Production Enhancement provided sworn testimony that he has been able to review an aggregate list of ingredients in the fluids proposed to be used by another company to hydraulically fracture a well and identify the ingredients in – and therefore the nature of – the crosslinker the company proposed to use.[48]

This problem is made more acute by two factors. First, the Safety Data Sheets for all additives list the ingredients in the additive that are considered hazardous and that are present in the additive at a concentration of greater than 1% (0.1% for carcinogens) or that meet certain other criteria. Thus, simply by consulting the SDSs on HESI's website, a competitor would be able to link many ingredients with a particular additive.

Second, the ingredients of various HESI fracturing fluids are now set forth in thousands of FracFocus disclosure reports. It would not be difficult to compare the fluids reflected in these reports to gain valuable information regarding the makeup of individual additives. For example, it would undoubtedly be possible to find two fluid systems that differed only as the result of the inclusion of a particular additive in one fluid but not in the other. By reviewing the ingredient lists for the two fluids, it would be a simple matter to pick out the ingredients listed for the first fluid but not for the second. In this way, a competitor could identify all of the ingredients in the additive in question notwithstanding the fact that a systems approach to disclosure had been used for both fluids.

For these reasons, no state that uses the systems approach (or some variation thereof) forecloses trade secret claims for individual chemical identities. HESI strongly cautions the Task Force against claiming that a "systems approach" would obviate or reduce the need to make trade secret claims without further investigation, including discussions with experts within the

[47] *See, e.g.*, 2 Colo. Code Regs. 404-1 §205A; 16 Tex. Admin. Code § 3.29; WOGCC Rules Ch. 3 § 45(f).
[48] *See* Affidavit of Ron Hyden at 6-7 (Attached Exhibit C).

industry who have experience with these issues and the companies most affected by the Task Force's proposals.

VI. Recommendations for FracFocus Should Be Consistent with U.S. Efforts to Protect Trade Secrets

The skepticism and lack of regard for trade secret protection as it applies to HF chemicals that is evident in the Draft Report is wholly at odds with the Administration's clearly expressed position that it is critical to protect the fruits of American innovation. As the Administration has recognized, in an increasingly globalized and technologically interconnected world, trade secrets are at a greater risk than ever before. In response to increased threats to American innovation, the U.S. is focusing its efforts to protect trade secrets around the globe.

For example, President Obama has stated that "[w]e are going to aggressively protect our intellectual property" because it is "essential to our prosperity" and has implemented federal initiatives that aim to protect U.S. trade secrets.[49] The U.S. has recently outlined a strategic plan to address the global risk of trade secret theft and is seeking to build coalitions with other countries to ensure greater global protection for trade secrets.

A recent example is illustrative of the Administration's efforts to protect American trade secrets. Earlier this month two men were convicted of conspiring to sell trade secret information regarding methods used by E.I. du Pont de Nemours & Co. to manufacture titanium dioxide to state-owned companies in China.[50] The convictions came after an investigation by the FBI. There can be no doubt that the potential for similar targeting of trade secrets by foreign governments or entities working on their behalf extends to the oil and gas industry generally and to fracturing fluids in particular, as demonstrated by the fact that FracFocus has been subject to several attempts at hacking, two of them originating from China.[51]

Given these threats and the Administration policies to combat them, the Task Force should be leery of undermining U.S. efforts to protect American ingenuity by appearing to single out one industry as "less worthy" of trade secret protection. HESI believes FracFocus makes it possible to provide the public and regulators with adequate information regarding the make-up of HF fluids while protecting genuine trade secrets.

VII. HESI Has Concerns about Other Recommendations of the Task Force

HESI has concerns about a number of the other recommendations and statements set forth in the Draft Report.

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[49] The White House, Office of the Press Secretary, Remarks by the President at the Export-Import Bank's Annual Conference (Mar. 11, 2010), available at http://www.whitehouse.gov/the-press-office/remarks-president-export-import-banks-annual-conference.

[50] Convictions for Trade Secret Sales a 'Shot Heard Around the World,' Good Morning America (Mar. 7, 2014), available at http://gma.yahoo.com/oreos-center-global-espionage-conviction-170829729--abc-news-personal-finance.html?vp=1.

[51] As indicated by GWPC at the Task Force hearing on January 6, 2014.

A. The Proposed Audit Appears to Assume Access to Trade Secrets

HESI is concerned that the proposed independent audit of the accuracy of trade secret claims appears to assume that the auditor would have access to trade secret information. In particular, the Draft Report recommends that the auditor "examine . . . trade secret exemption claims."[52] The Draft Report also recommends that a study of trade secret claims (presumably the "examination" to be undertaken by the auditor) include a review of "how commonly particular chemicals claimed as trade secret are used," a determination that could be made only if the auditor has access to trade secret information.[53]

Any such audit would raise a host of issues for the companies that might be asked to turn over proprietary information to the auditor. Even if industry members were willing to provide trade secret information to a non-governmental third party, a number of critical details would need to be worked out. For example, the companies from which trade secret information was sought would need to understand how the auditor would protect the trade secret information. In addition, the companies would need to be assured that any reporting would be done in a way that would not reveal trade secrets. These issues would undoubtedly take some time to resolve, particularly given the number of service companies and vendors that would need to be involved if the auditor were to be in a position to answer the question posed by the Task Force.

Given the difficult issues involved, HESI urges the Task Force to reconsider the scope of the proposed audit.

B. "Protocols for Data Transfer Across the Supply Chain" Will Not Eliminate the Need for Trade Secret Protection

The Draft Report states that "[t]he Task Force believes that if the leading operators and oil field service companies establish practical protocols for data transfer across the supply chain, and clear requirements for their suppliers, then supplier insistence [on] trade secrets will be greatly reduced and possibly disappear."[54] It is unclear exactly what the Task Force means by "establish[ing] practical protocols for data transfer across the supply chain" or how it will reduce or eliminate "supplier insistence [on] trade secrets."[55] HESI does not understand how some type of arrangement between operators and service companies along the supply chain would reduce or eliminate trade secret claims. Trade secrets are unique to certain entities up and down the supply chain, and companies must maintain the secrecy of the information because it is a condition of being a trade secret. If entities in a supply chain made certain arrangements regarding a trade secret, in no circumstance would they involve the public disclosure of the trade secret, because then the trade secret would no longer exist.

Therefore, HESI fails to understand what the Task Force is suggesting or how arrangements between supply chain entities will result in a reduction or elimination of trade secret claims. Of course, operators could establish a "clear requirement for their suppliers" that those suppliers simply not make any trade secret claims, but then continued innovation would be

[52] Draft Report at 9.
[53] *Id*. at 14.
[54] *Id*. at 13.
[55] *Id*. at 10.

severely curtailed, contrary to the Task Force's stated desire not to "constrain innovation." Surely this cannot be what the Task Force has in mind.

C. The Proposed BLM Rule Effectively Incorporates a Procedure for Assessing and Challenging Trade Secret Claims

The Draft Report is critical of the HF disclosure rules proposed by the Bureau of Land Management ("BLM") in May 2013 because it claims that the proposed rules do not specify a process by which BLM would assess or deny trade secret claims nor a procedure for public challenges to claims. This criticism is unfounded. The proposed BLM regulations would require the submission of an affidavit similar to the one required by regulations in Colorado.[56] BLM would then have the discretion to require further justification or require the operator to submit the trade secret information for the BLM's review, and BLM would retain the discretion to adjudicate whether the trade secret chemicals are exempt from public disclosure.[57] Once the information was in BLM's possession, it would become subject to the Department's Freedom of Information Act ("FOIA") regulations, found at 43 C.F.R. Part 2, Subpart F.[58] If BLM determined that the information is exempt from disclosure, it would be kept confidential to the extent allowed by law.[59] Any member of the public could request access to the information in accordance with the FOIA regulations and challenge any denial of access.

In light of the process reflected in the proposed regulations, the Task Force should revise its assertion regarding those regulations.[60]

D. Continued Efforts to Turn FracFocus Into an Easily Searchable Database Will Have Ramifications for the Security of American Technology

Finally, while enhancing searchability and organization is a laudable goal, the Task Force must be careful not to jeopardize the protection of proprietary information while working to achieve that goal. As described above, American ingenuity is increasingly threatened by corporate espionage. FracFocus has already been the subject of several piracy attempts, including two involving China.[61] HESI believes that while FracFocus should provide as much information as possible to the public and regulators regarding the make-up of HF fluids, at some point the accessibility of the information may not provide any added transparency benefit and instead may serve to threaten American innovation and global competitiveness. HESI requests that the Task Force consider this concern as it finalizes its recommendations in the Draft Report.

VIII. Conclusion

HESI has been a strong supporter of FracFocus and believes, like the Task Force, that FracFocus has been a big success. Over the course of the past three years, HESI has contributed information on HF operations at thousands of well sites to the FracFocus Registry and fully

[56] *See* Proposed 43 C.F.R. § 3162.3(j)(1); 78 Fed. Reg. 31636, 31659 (May 24, 2013).
[57] *Id*.
[58] *See* Proposed 43 C.F.R. § 3162.3(j)(3); 78 Fed. Reg. at 31660.
[59] *Id*.
[60] Draft Report at 15.
[61] As indicated by GWPC at the Task Force hearing on January 6, 2014.

expects that detailed information on the makeup of its fluids will continue to be uploaded to the site as it continues to hydraulically fracture wells across the country.

HESI believes that FracFocus is working well and has effectively addressed the desire for information regarding the chemicals being used in HF operations. At the same time, HESI is always open to ways to further improve the operation of FracFocus and provide greater transparency. In fact, HESI generally supports the basic recommendations made by the Task Force concerning chemical disclosure on FracFocus, i.e., (1) no "trade secret disclaimers" unless documented and attested to as they do in Wyoming or Arkansas, (2) report the complete list of chemicals by their CAS numbers and quantities added (subject to properly documented and attested trade secret claims), and (3) report a complete list of products without linking to the list of chemicals.

However, HESI takes strong exception to the suggestion in the Draft Report that industry members are asserting too many trade secret claims and that these claims are somehow illegitimate. Moreover, the method that the Task Force advocates for resolving the trade secret issue – the "systems approach" to disclosure – simply will not protect proprietary information in the way the Draft Report suggests, and the Draft Report does not provide an adequate basis for concluding otherwise. The other means that the Task Force appears to contemplate for minimizing trade secret claims for individual chemical identities – adopting a particularly stringent standard for making such claims – unfairly and inappropriately singles out one type of product used by one industry when the trade secret claims being asserted for that class of products are fundamentally no different from similar claims for a wide variety of other products that people come in contact with every day.

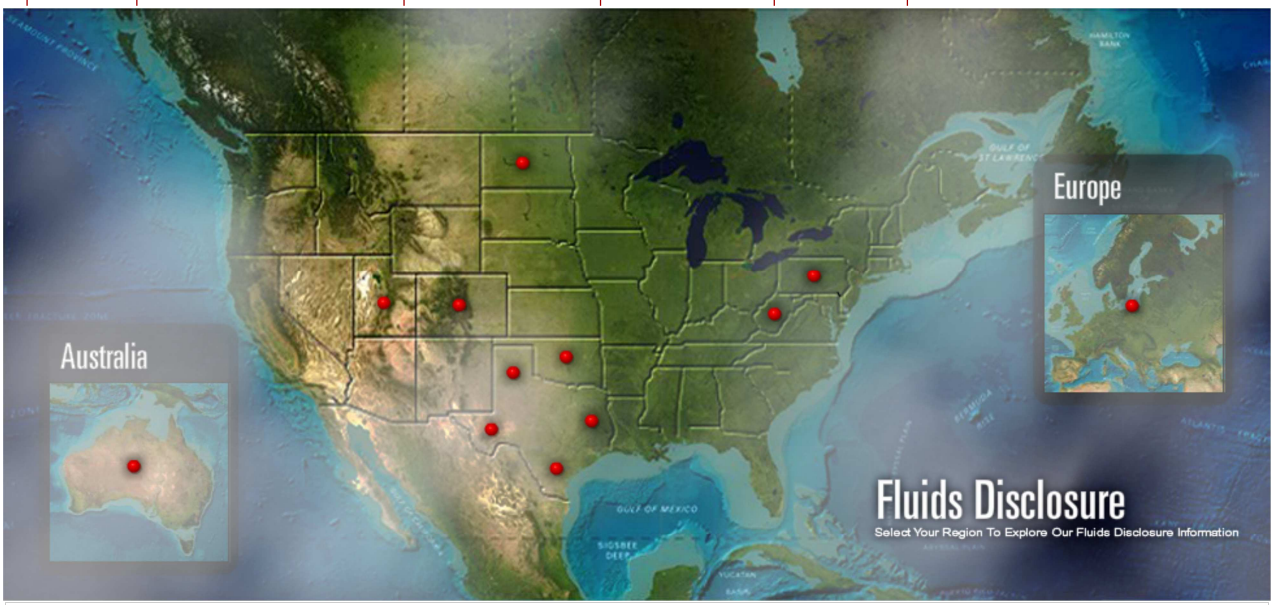
Finally, in focusing so heavily on trade secret issues in the Draft Report, the Task Force has gone beyond its mandate from the Secretary, which was limited to examining the extent of trade secret claims being made in FracFocus reports. Rather than determining the extent of trade secret claims and reporting back to the Secretary, the Task Force has apparently decided to opine on the propriety of and need for trade secret claims and offer its own solutions for perceived problems that would require extensive changes to state law. The fact is that FracFocus itself is not the arbiter of trade secret claims; GWPC and IOGCC defer to state programs applying state law to determine what trade secret claims are appropriate. It is inappropriate for a Task Force devoted to examining FracFocus issues to delve so heavily into issues that are beyond the purview of FracFocus, particularly without a much more careful review of the trade secret issues the Task Force seeks to influence in such a critical manner.

HESI appreciates the opportunity to submit these comments on such an important issue, and respectfully requests that the Task Force consider its comments when revising the Draft Report. HESI would be happy to discuss any of the issues raised above with members of the Task Force.

EXHIBIT A

HALLIBURTON Hydraulic Fracturing

Home | CleanSuite™ Technologies | Fluids Disclosure | Fracturing 101 | Glossary



Halliburton pioneered fracturing technology in the mid-1940s, and has always supported and complied with state and federal requirements promoting disclosure of our additives. Much of this information has been available to the public for quite a while – although it tends to be hard to find and even tougher to understand. This site aims to change that: by naming the additives in our fracturing solutions, listing the constituents, and explaining some of their other, more common household and industrial uses.

We tailor our fracturing fluids to different geologies, so the composition will vary by location. Over time, we'll be populating these pages with information from every state and selected countries in which our services are in use. For now, we present information on several different fluid systems from a number of states and Australia. Check back often: Much more information to come.

last updated 01/08/2013

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HALLIBURTON Hydraulic Fracturing

Home | CleanSuite™ Technologies | Fluids Disclosure | Fracturing 101 | Glossary

Halliburton pioneered fracturing technology in the mid-1940s, and has always supported and complied with state and federal requirements promoting disclosure of our additives. Much of this information has been available to the public for quite a while – although it tends to be hard to find and even tougher to understand. This site aims to change that: by naming the additives in our fracturing solutions, listing the constituents, and explaining some of their other, more common household and industrial uses.

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last updated 01/08/2013

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Pennsylvania WaterFrac Formulation

Close X

The Marcellus Shale is a 390-million-year-old rock formation that underlies more than 34,000 square miles of Pennsylvania, in addition to extending into a number of neighboring states.

Estimated to house hundreds of trillions of cubic feet of natural gas, the Marcellus shale play is currently under development primarily in the southwest and north-central regions of the state. Typical fracturing operations in Pennsylvania take place at a depth of between 4,000 feet and 8,500 feet below the ground surface.

Additives

Additives | Overall Percentage | Constituents

Product Name	Additive	Purpose	Concentration	U.S. MSDS
BE-9™	Biocide	Prevents or limits growth of bacteria that can cause formation of hydrogen sulfide and can physically plug flow of oil and gas into the well	0.3 gal/1000 gal	
FE-1A™	Acid Additive	Prevents precipitation of iron oxides during acid treatment	5 gal/ 1000 gal of HCl acid volume	
FR-66™	Friction Reducer	Allows fracture fluid to move down the wellbore with the least amount of resistance	0.5 – 1 gal/1000 gal	
HAI-OS™	Corrosion Inhibitor / Acid Inhibitor	Prevents acid from causing damage to the wellbore and pumping equipment	0.1-2.0 gal/1000 gal of HCl acid volume	
7.5% Hydrochloric Acid (HCl)	Acid / Solvent	Removes scale and cleans wellbore prior to fracturing treatment	1000-4000 gal run ahead of frac	
LP-65™	Scale Inhibitor	Prevents build up of certain materials (i.e. scale) on sides of the well casing and the surface equipment	0.25 – 0.5 gal/1000 gal	
Sand – Common White 100 Mesh	Proppant	Holds open fracture to allow oil and gas to flow to well	0.5 – 1.0 lbs	
Sand – Premium White 40/70 Mesh	Proppant	Holds open fracture to allow oil and gas to flow to well	0.75 – 3.0 lbs	
Sand – Premium White 30/50 Mesh	Proppant	Holds open fracture to allow oil and gas to flow to well	2.0 - 3.0 lbs	
Water	Base Fluid	Base fluid creates fractures and carries proppant, also can be present in some additives	N/A	Supplied by Customer

Pennsylvania WaterFrac Formulation

Close X

Constituents

Additives | Overall Percentage | Constituents

Constituents are the individual components used to form the additives described above.

In the table below, we identify these associated components, disclose their specific Chemical Abstracts Service (CAS) identification numbers, and list several prominent common uses for each.

Constituent Name	Generic Name	CAS Number	Common Use	Hazardous as Appears on MSDS
Acetic Anhydride	Organic Acid	108-24-7	Agricultural Microbiocide Agent	Yes
Acetic Acid	Organic Acid	64-19-7	Processed Fruit, Cheese, Meat and Poultry	Yes
Acetophenone, Thiourea, Formaldehyde Polymer	Modified Thiourea Polymer	68527-49-1	Industrial Acid Corrosion Inhibitor for Cooling Towers and Boilers	No
Alcohol C12-C16 Ethoxylated	Alcohols, Ethoxylated	68551-12-2	Car Wash Liquid, Laundry Stain Remover, Air Freshener	No
Alcohol, C14-C15 Ethoxylate	Polyoxyalkylene	68951-67-7	Liquid Detergent, Disinfectant Toilet Cleaner, Stain Remover	No
Alpha Olefin Blend	Olefins	64743-02-8	Industrial / Commercial Metal Cutting Agent	No
Ammonium Chloride	Inorganic Salt	12125-02-9	Hand Wash, Shampoo, Breakfast Cereal	No
Crystalline Silica, Quartz	Silica	14808-60-7	Hand Cleaner, Laundry Cleaner, Cat Litter	Yes
Fatty Acid Tall Oil Blend	Fatty Acids, Tall Oil	61790-12-3	Car Polish, Industrial Hand Cleaner	No
Formaldehyde	Aldehyde	50-00-0	Liquid Detergent, School Glue, Hand Soap	No
Hydrochloric Acid	Inorganic Acid	7647-01-0	Table Olives, Unripened Cheese, Cottage Cheese	Yes
Hydrotreated Light Petroleum Distillate	Hydrocarbon • Petroleum	64742-47-8	Oil Wood Stain, Air Freshener, Surface Cleaner Aerosol	Yes

EXHIBIT B

ANALYSIS OF ECONOMIC IMPACTS RESULTING FROM FRACTURING STIMULATION 'ADVANCED TECHNOLOGY' WITHIN THE MARCELLUS BASIN

Executive Summary

This study evaluates the likely impacts of 'advanced technology' within the Marcellus Shale Gas Basin. The findings indicate that fracturing stimulation 'advanced technologies' create a significant uplift to natural gas production through the year 2030. The 'advanced technology' impact may be as high as $41 billion (2008$) coming directly from increased production. Additionally the benefit is tantamount to an 'efficiency' stimulus. By applying the appropriate economic and environmental technologies originally or during the life of the well 'advanced technologies' result in an estimated economic benefit of $41 billion (2008$) through the year 2030 or upwards of $2 billion (2008$) per year.

This is equivalent to an economic 'efficiency' stimulus which will: 1) increase lease bonuses, royalties, state and local taxes; 2) partially be reinvested into further development of the Marcellus Shale and potentially allow this area to become a net exporter of natural gas thereby saving funds normally spent on imported fuels; 3) partially show up as improved 'retained earnings' for large and small shareholders and reinvested into the economy through normal economic activity; 4) allow for security and stability of indigenous supply for regional populations that is cost competitive; and 5) most importantly, create sustainable local economic stimulus and local jobs.

This analysis does not quantitatively provide an estimate of the number of jobs created locally, regionally, and nationally or estimate the direct, indirect, and induced multiplier impact to the local economies. However, it does provide the basis to consider the positive 'advanced technology' impact on local jobs created and local economic impacts.

Methodology and Assumptions

To determine the impacts of the permit conditions proposed by the New York State Department of Environmental Conservation on natural gas production this analysis models the difference in natural gas production over time with and without adoption of proven fracturing 'advanced technology' for the time period 2009 through 2030 across the Marcellus Basin (including New York, Pennsylvania, West Virginia and Ohio).

No effort is made to extend this analysis across multiple alternative future scenarios and compare them with the base case. The analysis did not attempt to disaggregate the estimated impacts by state. The study focused only on Marcellus shale natural gas.

Typical Marcellus shale decline curves for horizontal wells were utilized. Some of these decline curves have already been published by TPH[1]. This study utilized natural gas prices as estimated by IHS and published by API[2]. Natural gas prices used were represented in 2008 dollars. The API study only published prices through 2018. This study held prices in real terms constant beyond 2018. Income and employment multipliers were available from PWC[3] but were understood to be not specific to the upstream oil and gas industry.

The study assumed a growth market for the Marcellus shale over time, *i.e.*, normal growth in wells drilled commensurate with expected natural gas economics. Given these assumptions cumulative volumes resulting from fracturing stimulation 'advanced technology' were estimated.

This analysis was based upon an estimated 500 TCF of natural gas with a conservative 10% recovery factor. Initial production per well was estimated to be 4.5 MMCFD. First year declines were estimated to be about 75% and re-fracturing was estimated to occur approximately every 11 years. Detailed well decline curves were accumulated to produce a Marcellus shale basin decline curve. The analysis was terminated in 2030.

The study determined the segment of the Marcellus shale that would likely be served by energy service companies which can deliver advanced fracturing stimulation technology. The analysis also assumes the portion of the market served by energy service companies with 'advanced technology' is also the market

where proprietary chemicals are currently used. We have conservatively estimated this portion of the market to be 50%.

Once the portion of the Marcellus gas production likely impacted by 'advanced fracturing technology' was identified, the impact was evaluated. To demonstrate the uplift or increase in production due to the use of 'advanced technologies,' two examples of 'advanced fracturing technologies' are described below.

The first case incorporates studies compiled in four reservoirs comparing the use of proprietary micro-emulsion surfactant fracturing fluids (including Halliburton's GasPerm 1000) vs. alternative fracturing fluids. Micro-emulsion frac fluids mitigate fracture face damage caused by phase trapping, wettability, and relative permeability issues. This advanced fluid system helps create longer effective fracture lengths, returning greater volumes of fracture fluids to the surface and increasing well productivity and reserves. The following list outlines the location and number of wells studied in each area.

Proprietary Micro-Emulsion Benefits vs. Alternatives – Cited Reservoir Studies

Table 1

Formation	Basin	State	Wells	Micro-emulsion Benefits Derived
Lance[4]	Green River	WY	24	Normalized estimated 20 year gas recovery increase of 31% Increase of normalized fracture half length of 59%
Codell[5]	Denver-Julesburg	CO	66	12 month increase in gas production of 25%
Barnett[6]	Ft. Worth	TX	250	6 month increase in gas production of 30% 180 day water recovery increase of 52% Estimated EUR increase of 41%
Marcellus[7]	Appalachian	PA/WV	83	3 month increase in gas production of 20% Normalized estimated 20 year gas recovery increase of 51%

The second 'technology' case history information is presented below in Figures 1 and 2. Figure 1 compares the results of three offset wells with those achieved in wells fractured using Halliburton's Mono-Prop. Mono-Prop is a high conductivity-inducing proppant placed in the formation as a partial monolayer during fracturing operations. In this example, Mono-Prop is considered to be the optimized fracturing stimulation 'technology' (proprietary stimulation) vs. the conventional fracturing stimulation treatments employed on the offset wells (non-proprietary stimulation).

The horizontal axis of the graph shows the % reduction in per well production. In essence the results show a 19%, 22%, and 29% reduction in production when wells are fractured without 'advanced fracturing technology and design' as compared to wells fractured with 'advanced fracturing technology and design'. In addition, another case history provides results that approach a 40% loss.

Figure 1 goes further to show on the vertical axis the % increase in wells required without 'advanced fracturing technology' case in order to provide the same level of natural gas production as with the 'advanced fracturing technology' case. The results indicate that to keep the same production using non-propriety fracturing fluids would require that 24% to 41% more wells to be drilled.

This analysis in no way suggests or assumes that a reduction in production per well would cause an increase in drilling activity. It simply points out the gain in 'economic efficiency' by using 'advanced fracturing technology' for the Marcellus shale.

Figure 1

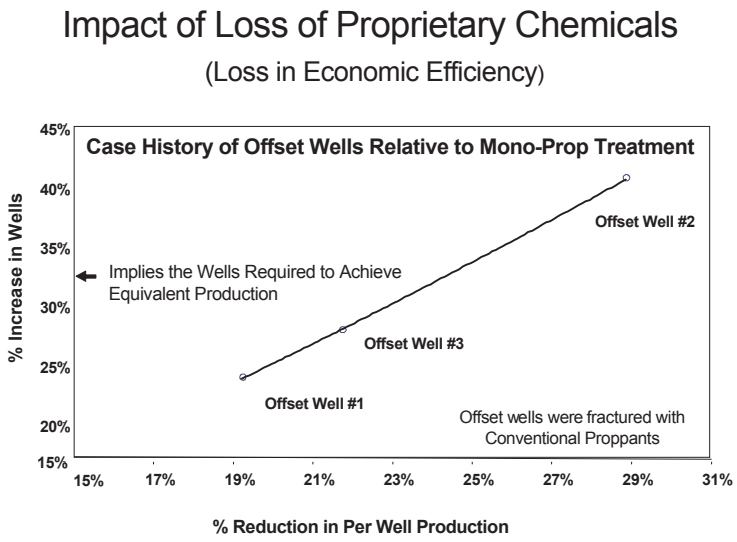
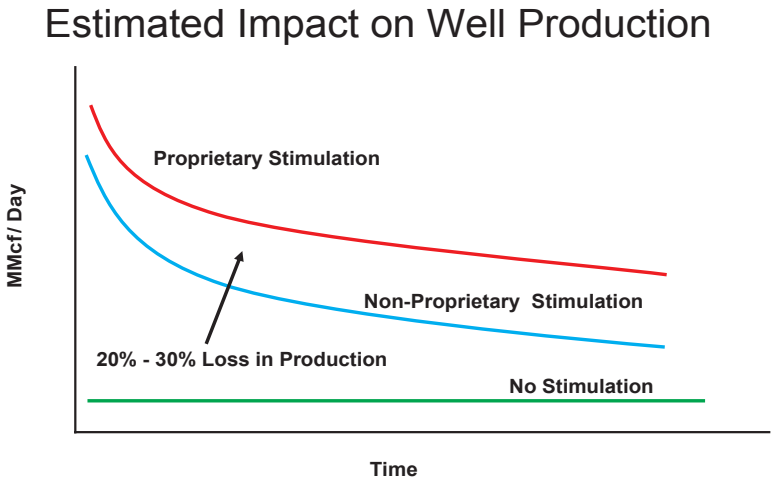


Figure 2 simply summarizes the above fracturing case histories within the context of production both with and without fracturing 'advanced technology' design and treatment. The area of the curve between proprietary stimulation and non-propriety stimulation represents the economic impact of 'advanced technology'. This area ultimately becomes an economic benefit; in other words, fracturing stimulation 'advanced technology' will provide economic uplift to the citizens of Pennsylvania, New York, Ohio, and West Virginia through increased natural gas production and economic efficiency of optimizing reservoir drainage.

Figure 2



Based on the case histories described above it is reasonable to use an average 25% loss in production in this market when fracturing stimulation 'advanced technology' is not leveraged. This implies a 33% additional

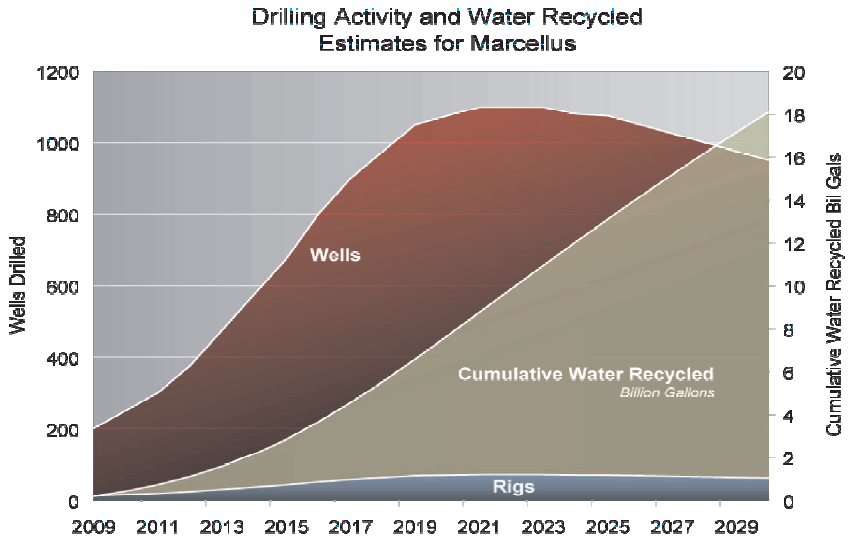
economic uplift for the portion of the market utilizing 'advanced technology' and provides positive benefits for the 'with advanced technology' case.

Figure 3 represents the estimated activity regarding drilling and completing wells and provides the basis of the field decline curve. Based on this level of drilling activity, approximately 38 TCF would be recovered in the 'with advanced technology' case from 2009 through 2030 as compared to 33 TCF in the 'without advanced technology' case. In addition, the 'with advanced technology' case includes technologies that allow for water used in the fracturing process to be reclaimed and reused during the fracturing of subsequent wells. Examples of these technologies include proprietary micro-emulsion surfactants and Opti-KleenWF (Water Frac). Opti-KleenWF is a breaker for existing friction reducers which aids in water recovery. Wells within the Barnett Shale utilizing proprietary micro-emulsion surfactants provided a 52% increase in water recovery. Both micro-emulsion chemicals and Opti-KleenWF have been determined to not only increase production and reserves, but they also facilitate greater frac water recoveries from the well. These additional water recoveries are re-used in the sense that they are combined with additional fresh water in order to serve as the base fluid for fracturing additional wells. While not included in this analysis, new friction reducers are being developed that will also benefit the environment by allowing the re-use of a greater percentage of produced water with higher brine concentrations than previously possible. This technology has the same positive effect as proprietary micro-emulsion surfactants and Opti-KleenWF (less fresh water needed) plus it further reduces the amount of water that must be disposed of.

Accordingly, these 'advanced technologies' yield important non-monetized benefits in the form of enhanced opportunities to recycle flowback fluid. These benefits are quantified in Figure 3. This portion of the analysis is based upon an average of 400,000 gallons of water used per frac stage, 10 frac stages per well drilled, and a 25% recovery factor. (While an 18% average flowback recovery rate is expected for most of Marcellus Shale Gas Basin located in New York, the anticipated average flowback recovery rate for all of the Marcellus Shale Gas Basin (e.g., Pennsylvania, New York, West Virginia and Ohio) is expected to be closer to 25%.)

Given these parameters, Figure 3 shows that the cumulative recycled water from this drilling plan would amount to about 18 billion gallons or about 60,000 acre feet of water that would be available for reuse in lieu of withdrawing fresh water from surface water sources.

Figure 3



Analysis

This analysis shows the impact relative to two cases: with and without fracturing 'advanced technology'. Estimated gas production for the year 2009 through 2030 is shown below for the Marcellus basin.

Table 2 represents the 'with advanced technology' case, Table 3 represents the 'without advanced technology', and Table 4 represents the economic benefit resulting directly from increased production. The Total numbers represent the sum across all years. Since production is represented in BCFD then the figure for each year would need to be multiplied by 365 to convert to a yearly total.

Table 2

With Technology Growth Market Environment			
Year	Gas Production BCFD	Gas Price 2008$/MCF	Est. Wellhead Revenue Per Day for Natural Gas Marcellus (Mil $2008)
2009	0.49	4.41	2.14
2010	0.73	6.11	4.45
2011	0.96	6.87	6.60
2012	1.26	7.29	9.16
2013	1.63	7.78	12.70
2014	2.04	8.33	16.99
2015	2.47	8.53	21.08
2016	2.98	8.67	25.87
2017	3.47	8.63	29.93
2018	3.90	8.64	33.72
2019	4.70	8.64	40.58
2020	5.17	8.64	44.67
2021	5.61	8.64	48.43
2022	6.01	8.64	51.89
2023	6.43	8.64	55.59
2024	6.81	8.64	58.84
2025	8.64	8.64	74.69
2026	7.60	8.64	65.63
2027	7.93	8.64	68.53
2028	8.21	8.64	70.90
2029	8.46	8.64	73.09
2030	8.61	8.64	74.36
	104.10		889.86

Table 3

Without Technology Growth Market Environment			
Year	Gas Production BCFD	Gas Price 2008$/MCF	Est. Wellhead Revenue Per Day for Natural Gas Marcellus (Mil 2008$)
2009	0.43	4.41	1.88
2010	0.64	6.11	3.90
2011	0.84	6.87	5.78
2012	1.10	7.29	8.01
2013	1.43	7.78	11.11
2014	1.79	8.33	14.87
2015	2.16	8.53	18.45
2016	2.61	8.67	22.64
2017	3.04	8.63	26.19
2018	3.42	8.64	29.51
2019	4.11	8.64	35.50
2020	4.52	8.64	39.09
2021	4.90	8.64	42.37
2022	5.25	8.64	45.40
2023	5.63	8.64	48.64
2024	5.96	8.64	51.49
2025	7.56	8.64	65.35
2026	6.65	8.64	57.42
2027	6.94	8.64	59.96
2028	7.18	8.64	62.04
2029	7.40	8.64	63.95
2030	7.53	8.64	65.07
	91.09		778.62

Table 4

Estimated Impact of Technology			
Year	Gas Production BCFD	Gas Price 2008$/MCF	Est. Wellhead Revenue Per Day for Natural Gas Marcellus (Mil 2008 $)
2009	0.06	4.41	0.27
2010	0.09	6.11	0.56
2011	0.12	6.87	0.83
2012	0.16	7.29	1.14
2013	0.20	7.78	1.59
2014	0.26	8.33	2.12
2015	0.31	8.53	2.64
2016	0.37	8.67	3.23
2017	0.43	8.63	3.74
2018	0.49	8.64	4.22
2019	0.59	8.64	5.07
2020	0.65	8.64	5.58
2021	0.70	8.64	6.05
2022	0.75	8.64	6.49
2023	0.80	8.64	6.95
2024	0.85	8.64	7.36
2025	1.08	8.64	9.34
2026	0.95	8.64	8.20
2027	0.99	8.64	8.57
2028	1.03	8.64	8.86
2029	1.06	8.64	9.14
2030	1.08	8.64	9.30
	13.01		111.23
Est. Value of Foregone Gas Production Billion 2008$			41

Conclusion

This study provides insight into the significance of the economic impacts resulting from fracturing stimulation 'advanced technology'. The results suggest a 'major and significant' economic impact will likely occur when 'advanced technology' is adopted and implemented. It also points out the importance of protecting the intellectual property rights of the energy service companies that invest and develop new fracturing stimulation 'advanced technology'.

In particular, if state or federal regulation is adopted which requires complete disclosure of chemical formulas to the public at large, i.e., beyond what is required to ensure public safety, welfare, and environmental sustainability then loss of intellectual property will occur. Service Companies spend hundreds of million of dollars annually to develop proprietary chemicals that are designed to maximize the recovery of oil and gas resources. This analysis indicates the "economic impact" resulting from advanced

fracturing stimulation is highly significant. It also emphasizes the importance for operators, service companies, state and federal regulators, and all citizens to work together to find a pathway forward that protects the environment, the safety and welfare of citizens, and ensures the integrity of intellectual property rights.

The full estimated economic impact of $41 billion (2008$) resulting from the use of fracturing stimulation 'advanced technology' will provide incremental direct, indirect and induced economic impacts and provide employments opportunities for Pennsylvania, New York, Ohio, and West Virginia.

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1 TPH Energy Research, Exhibit 24: Horizontal Type Curve Data; Exhibit 25 COG Horizontal Marcellus Type Curve; Chesapeake Energy; Chesapeake General Type Curve – November 2008

2 IHS Global Insight on Behalf of API: Measuring the Economic and Energy Impacts of Proposals to Regulate Hydraulic Fracturing 2009

3 PWC PriceWaterhouseCoopers: The Economic Impacts of the Oil and Natural Gas Industry on the U.S. Economy: Employment, Labor Income and Value; September 2009

4 Crafton, J.W., Penny, G.S., and Borowski, D.M. 2009: Micro-Emulsion Effectiveness for Twenty Four Wells, Eastern Green River, Wyoming. Paper 123280 presented at the SPE Rocky Mountain Petroleum Technology Conference, Denver, CO, USA, 14-16 April.

5 Paterniti, M. 2009: ME Surfactant Increases Production in the Codell Formation of the DJ Basin. Paper 116237 presented at the SPE Rocky Mountain Petroleum Technology Conference, Denver, CO, USA, 14-16 April.

6 Zelenev, A.S., September 8, 2009: Essentials of Microemulsion Technology: Overview. Presentation based on updated data initially studied in SPE paper100434, authored by Penny, G.S., Pursley, J.T., and Clawson, T.D.: Field Study of Completion Fluids To Enhance Gas Production in the Barnett Shale presented at the 2006 SPE Gas Technology Symposium, Calgary, Alberta, Canada, 15-17 May 2006.

7 Crafton, J.W, October 31, 2009: MA844-W Micro-Emulsion Effectiveness for 83 Marcellus Shale Wells, Pennsylvania and West Virginia. Paper presented at the SPE Horizontal Well Stimulation Conference, Pittsburgh, PA, USA, 17-18 November 2009.

EXHIBIT C

IN THE SEVENTH JUDICIAL DISTRICT COURT OF THE STATE OF WYOMING
IN AND FOR THE COUNTY OF NATRONA

POWDER RIVER BASIN RESOURCE COUNCIL WYOMING OUTDOOR COUNCIL, EARTHWORKS, AND OMB WATCH	)	
Petitioners,	)	
vs.	)	Civil Action No. 94650-c
WYOMING OIL AND GAS CONSERVATION COMMISSION	)	
Respondent,	)	
and	)	
HALLIBURTON ENERGY SERVICES, INC.,	)	
Intervenor-Respondent	)	

AFFIDAVIT OF RON HYDEN IN OPPOSITION TO PETITIONERS' MOTION FOR SUMMARY JUDGMENT

I, Ron Hyden, being first duly sworn upon my oath, do depose and state as follows:

1. I am over 18 years of age. I am Technology Director – Product Enhancement for Halliburton Energy Services, Inc. ("Halliburton") and have acted in that capacity since 2010. My office address is 3000 North Sam Houston Parkway East, Houston, Texas. I received a Bachelor of Science degree in chemical

engineering from Texas A&M University in 1979. I have worked for Halliburton since that time.

2. My responsibilities include overseeing the development of new hydraulic fracturing products and technologies for the company. I submit this Affidavit in support of Halliburton's Memorandum in Support of Its Motion for Summary Judgment and Opposition to Petitioners' Motion for Summary Judgment in the above-captioned matter.

3. Hydraulic fracturing is a process used to enhance and stimulate the flow of oil and gas from production wells. The technology involves the pumping of fracturing fluids into a hydrocarbon-bearing geological formation at high enough pressures to create a crack in the formation. The crack becomes the conduit that increases the flow of hydrocarbons out of the formation. Hydraulic fracturing extends the productive life of existing oil and gas fields, and results in significant increases in production of oil and gas from new wells.

4. Initially developed in the late 1940s, hydraulic fracturing has evolved as the industry seeks to produce oil and gas from subsurface formations that present increasingly complex challenges. The fluids used, originally based on simple formulations of sand and a single fluid (a "base fluid") used to convey the sand down the well and into the formation being fractured, now include certain types

of additives to address specific issues presented by different conditions in any particular well or formation.

5. The overall fluid mixture (or "fluid system") used to hydraulically fracture a well typically consists mostly of water and sand, with several additives included to serve specific functions and make the fluid perform more effectively. For example, because water alone is not the most effective carrier of the sand into the well bore and the cracks, the water must be made more viscous or gel-like. The most common material used to gel the water is guar, a material made from guar beans which is also used as a gelling agent found in common foods. In addition to the guar, materials are added to the water to aid its ability to gel and to ensure its compatibility with the receiving formation fluids. Finally, since fracturing fluids are designed to be removed from the formation to allow for the free flow of the oil and gas, an enzyme or oxidizer (a "breaker") is used to help break the fluid back down from its gelled state to a more liquid state once the fracture is created and the sand is in place. By making the fluid less viscous, it can be removed more easily from the formation, thereby allowing the oil or gas to move more freely towards the well bore where it can flow to the surface and on to processing facilities.

6. The makeup of a fluid system can vary from formation to formation and even from well to well based on many factors, among them the depth of the formation to be hydraulically fractured, the type of formation (shale, sandstone,

etc.), its permeability and porosity, the geochemical composition of the formation, and the temperature and pressure. In response to these many variables, and based upon decades of research and development in laboratories, as well as the specialized expertise learned in the field, specific and specialized fracturing fluid systems are designed and used to respond to the particular needs of any given well, and new additives are developed to assist in meeting those needs.

7. The mix of ingredients found in an additive is critical because different ingredients will react with each other in different ways under different conditions of temperature, pressure, etc. Therefore, knowing the complete list of ingredients in a product would provide a competitor with valuable information about what makes the product effective, e.g., by allowing the competitor to test the same mix of ingredients under different conditions to learn how that mixture of ingredients performs.

8. The hydraulic fracturing services industry today is extremely competitive. Halliburton is constantly monitoring new product developments in the industry to understand what it can learn from them and its principal competitors do the same.

9. For a chemist or chemical engineer who is experienced in the industry, having a list of ingredients for a given additive product will greatly facilitate the

reverse engineering of the formula of the product. A chemist or chemical engineer who knows the industry and the hydraulic fracturing process will be familiar with the types of chemicals (usually a limited number) that have typically been used in a particular type of additive, such as a surfactant or a corrosion inhibitor. The chemist or chemical engineer will be able to determine in most cases what role each identified chemical plays in the overall product formulation.

10. The chemist or chemical engineer will also be able to determine the general proportions that each ingredient would constitute of the whole.

11. For example, an experienced chemist or chemical engineer would know that if a borate compound is included on the ingredient list, it would be part of a particular type of crosslinker (which links guar molecules together to create larger molecules that are more effective in increasing the viscosity of the fracturing fluid). Moreover, with their industry experience they would know that the borate concentration in the fluid system would be expected to be 0.1 to 0.3 % based on the conditions in the formation. The chemist or chemical engineer would then be able to calculate what the concentration of the borate in the crosslinker would need to be based on the solubility of the borate compound.

12. In addition, there are certain chemicals that are well known but which may be put to a new and unique use in a particular additive. If the identity of such a chemical were to be disclosed to Halliburton's competitors, it would allow them to copy the new use without having had to invest in the research to determine that the new use was even feasible.

13. For someone who has experience with the industry and the types of additives used and the chemistries involved, it is not necessary to have a sample of a product in order to determine its formula through reverse engineering if a list of the ingredients in the product is available.

14. Someone who has experience in the industry and the types of products that are used will be familiar with the types of chemicals typically used in different types of additives. Given a list of Halliburton products used in hydraulically fracturing a well and a separate aggregate list of the ingredients in those products, a knowledgeable individual from one of Halliburton's competitors who is involved in developing new products would be able to determine with a reasonable degree of certainty which products most if not all of the ingredients were associated with based on the functions of the various products and the functions that could be served by a chemical given its molecular structure. For example, based on over 30 years of experience in the industry (including experience in the development of new fracturing fluid additives), I have been able to review an aggregate list of ingredients in the fluids proposed to be used

by another company to hydraulically fracture a well and identify the ingredients in – and therefore the nature of – the crosslinker the company proposed to use.

15. In most cases, chemicals can be specifically identified based on the name of the chemical and its Chemical Abstracts Service Registry number ("CAS number"). For example, sodium chloride and CAS No. 7647-14-5 both specifically identify the same chemical.

16. Chemicals themselves typically do not have trade names, but additive products generally do have trade names.

DATED this 16 day of October, 2012.

Ron Hyden

The foregoing instrument was subscribed and sworn to before me by Ron Hyden on this 16th day of October, 2012. Witness my hand and official seal:

Notary Public

My Commission Expires:

2-16-2015

MARY WOOD
Notary Public, State of Texas
My Commission Expires
February 16, 2015

MARY WOOD
Notary Public, State of Texas
My Commission Expires
February 16, 2015