CONFIDENTIAL

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GREENE'S ENERGY GROUP, LLC,

Petitioner,

v.

OIL STATES ENERGY SERVICES, LLC,

Patent Owner.

Case IPR2014-00216

Patent No. 6,179,053

DECLARATION OF THOMAS W. BRITVEN

I, Thomas W. Britven, hereby declare as follows:

(1) I am an adult over the age of 18 and I make this declaration based on personal knowledge and under penalty of perjury.

(2) I am an affiliate expert of Duff & Phelps, LLC and have been asked by counsel for Oil States Energy Services, LLC, formerly known as Stinger Wellhead Protection, Inc. ("Stinger") (hereinafter "OSES" or "Patent Owner") to submit this declaration regarding the commercial success of products that practice the amended claims of United States Patent Number 6,179,053 ("the '053 patent"). I hereby submit the following expert witness disclosure.

(3) Based on my analysis, it is my opinion that the unique features and benefits associated with the '053 patented technology, which is incorporated into OSES' Stage Frac Tool, have enabled the Stage Frac Tool to achieve commercial success for at least the following reasons:

- Stinger/OSES' [redacted] percent to [redacted] percent estimated share of the stage frac tool marketplace;
- Stinger/OSES recorded total Stage Frac Tool net revenues of approximately [redacted], and approximately [redacted] more in related products and services, from [redacted] jobs, from May 1, 2006 through December 31, 2013;
- Stinger/OSES' net revenues for Stage Frac Tools and related products and services related to the '053 patented technology have enjoyed a compound average growth rate of approximately [redacted] percent from 2009 through 2013;
- For 2006 through 2013, the average price per job for jobs done using OSES' Stage Frac Tools was [redacted], which is much higher than the average price per job for OSES' casing savers of [redacted] for the same period. While prices for both have increased over time, the number of Stage Frac Tool jobs has increased and the number of casing saver jobs has decreased.
- Stinger/OSES' Stage Frac Tools continue to be highly utilized even as the number of available Stage Frac Tools has increased from [redacted] tools in 2007 to [redacted] tools in 2013 in addition to increases in revenues per job; and
- Stinger/OSES enjoyed an EBITDA margin of approximately [redacted] percent for Stage Frac Tools and related products and services for the period of 2012-

2013, while the rest of the company had an EBITDA margin that was significantly lower at approximately [redacted] percent.

A discussion of the bases for my opinion is set forth in the balance of this Declaration.

The "Fracking" Industry in General

(4) Hydraulic fracturing, commonly referred to as "fracing" or "fracking," is a technique that has been used to stimulate the production of oil and natural gas since the 1940s.[1] Currently, new developments in this technique allow access to low permeability formations that contain large quantities of oil and natural gas that had previously not been accessible, such as tight sands, shales, and coalbed methane formations.[2]

(5) The process begins with drilling a hole below fresh water underneath the surface.[3] Surface casing is next inserted to isolate the fresh water zone and provide structural support. Cement is then put in place between the hole and the casing to seal off the wellbore from freshwater and prevent contamination of the fresh water aquifer.[4] Additional vertical and horizontal drilling then continues until a target distance is met,[5] at which point, additional casing and cementing occurs.[6]

(6) After production casing has been run and cemented in place, a perforating gun is lowered into the well.[7] The perforating gun creates holes in the casing by shooting hardened

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1 "Hydraulic Fracturing Q & A's," American Petroleum Institute (accessed: http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/hydraulic-fracturing/hydraulic-fracturing-qa).

2 "Hydraulic Fracturing 101," Earthworks (accessed: http://www.earthworksaction.org/issues/detail/hydraulic_fracturing_101#.U8ANkPldX_E). See also "Hydraulic Fracturing Q & A's," American Petroleum Institute (accessed: http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/hydraulic-fracturing/hydraulic-fracturing-qa).

3 "Process of Fracking," Shale Stuff (accessed: http://shalestuff.com/education/fracking/fracking).

4 "Process of Fracking," Shale Stuff (accessed: http://shalestuff.com/education/fracking/fracking).

5 Vertical wells drilled in shale gas reservoirs may extend up to 5,000 to 8,000 feet beneath the surface with horizontal well extending up to two miles. See "Hydraulic Fracturing," Post-Gazette (accessed: http://old.post-gazette.com/downloads/20110227Drilling_process.pdf).

6 "Process of Fracking," Shale Stuff (accessed: http://shalestuff.com/education/fracking/fracking).

7 "Process of Fracking," Shale Stuff (accessed: http://shalestuff.com/education/fracking/fracking).

metal rods powered by explosive charges.[8] This then allows hydrocarbons within the formation to flow into the well.[9] The fracturing fluids are next injected into the well at a very high pressure.[10] Fracturing fluids typically consist of water, sand, and chemical additives.[11] The pressure created by injecting the fluids opens the fractures, and the sand holds open the fissures, allowing the oil or natural gas to flow up the well.[12]

(7) A single fracking job can increase the pathways available for fluid migration as much as 270 times in a vertical well, with even greater results in a horizontal well.[13] Horizontal drilling produces greater results than vertical drilling because horizontal drilling increases productivity in low permeability rocks by bringing the well bore much closer to the source of the fluid.[14] Horizontal drilling also allows operators to cover a greater area with a single well by drilling one or more horizontal branches.[15] This allows operators to develop a reservoir with

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8 "Perforating Gun," and "Perforate," Energy Glossary, Centre for Energy (accessed: http://www.centreforenergy.com/Glossary.asp?Template=&SortBy=&GlossSearch=perfora&glossary_search_submit1=&SearchType=0&EnergyType=).

9 "Perforating Gun," Energy Glossary, Centre for Energy (accessed: http://www.centreforenergy.com/Glossary.asp?Template=&SortBy=&GlossSearch=perfora&glossary_search_submit1=&SearchType=0&EnergyType=).

10 "Process of Fracking," Shale Stuff (accessed: http://shalestuff.com/education/fracking/fracking).

11 "Frequently Asked Questions About Hydraulic Fracturing," Colorado Oil and Gas Conservation Commission (accessed: https://cogcc.state.co.us/Announcements/Hot_Topics/Hydraulic_Fracturing/Frequent_Questions_about_Hydraulic%20Fracturing.pdf).

12 "Frequently Asked Questions About Hydraulic Fracturing," Colorado Oil and Gas Conservation Commission (accessed: https://cogcc.state.co.us/Announcements/Hot_Topics/Hydraulic_Fracturing/Frequent_Questions_about_Hydraulic%20Fracturing.pdf). See also "Hydraulic Fracturing Q & A's," American Petroleum Institute (accessed: http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/hydraulic-fracturing/hydraulic-fracturing-qa).

13 "State Oil and Natural Gas Regulations Designed to Protect Water Resources," U.S. Department of Energy, May 2009, p. 21 (accessed: http://www.gwpc.org/sites/default/files/state_oil_and_gas_regulations_designed_to_protect_water_resources_0.pdf).

14 "Directional and Horizontal Drilling in Oil and Gas Wells," Geology.com (accessed: http://geology.com/articles/horizontal-drilling/).

15 "Drilling Sideways – A Review of Horizontal Well Technology and its Domestic Application," Energy Information Administration, Office of Oil and Gas, U.S. Department of Energy, April 1993 at 4.

fewer wells.[16] While horizontal drilling combined with fracking can cost up to three times as much per foot than drilling a vertical well,[17] horizontal wells can produce at rates several times greater than a vertical well.[18] The use of fracking technology is expected to increase within the next decade with an estimated ■ percent of natural gas wells employing hydraulic fracturing.[19]

Wellhead Isolation Tools

(8) The high pressures and corrosive fluids used with fracking can degrade or damage important wellhead equipment. As a result, many oil companies use isolation tools that protect the wellhead and the blowout preventer. Oil companies view these isolation tools as a means to save money because isolation tools prevent damage to the wellhead, and some isolation tools increase efficiency when dealing with multiple fracturing stages. The wellhead can be damaged by fracking operations; including potential irreparable damage to the wellhead after being exposed to frac fluids, which are "frequently laden with corrosive acids and abrasive proppants such as sharp sand."[20] Various wellhead isolation tools such as casing savers, wellhead fracturing isolation sleeves, and Stage Frac Tools, have been used in the marketplace in an attempt to address these negative consequences. Each of these tools is discussed below.

(9) Before the '053 patented technology was invented, other tools known as "casing savers" were often used in an attempt to protect the wellhead components from corrosion, erosion, and abrasion.[21] I understand that a casing saver includes a mandrel that is inserted and

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16 "Drilling Sideways – A Review of Horizontal Well Technology and its Domestic Application," Energy Information Administration, Office of Oil and Gas, U.S. Department of Energy, April 1993 at 4.

17 "Directional and Horizontal Drilling in Oil and Gas Wells," Geology.com (accessed: http://geology.com/articles/horizontal-drilling/).

18 "Drilling Sideways – A Review of Horizontal Well Technology and its Domestic Application," Energy Information Administration, Office of Oil and Gas, U.S. Department of Energy, April 1993 at 4-5.

19 "Hydraulic Fracturing Q & A's," American Petroleum Institute (accessed: http://www.api.org/oil-and-natural-gas-overview/exploration-and-production/hydraulic-fracturing/hydraulic-fracturing-qa).

20 See '053 patent (Background of the Invention).

21 Interview of Dr. Gary Wooley.

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