Buffalo Law Review

Volume 65 | Number 2 Article 4

4-1-2017

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KELSEY L. HANSON†

INTRODUCTION

Hydrofracking, a technique that utilizes highly pressurized water to fracture deep-rock formations so hydrocarbons trapped within rock formations may be harvested,[1] has been utilized by the oil and gas industry for over fifty years.[2] However, recent technological advancements in hydrofracking have opened up numerous, previously inaccessible shale-rock formations for the

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1. *See* AM. PETROLEUM INST., HYDRAULIC FRACTURING: UNLOCKING AMERICA'S NATURAL GAS RESOURCES 7 (2014), http://www.api.org/~/media/Files/Policy/Exploration/HYDRAULIC_FRACTURING_PRIMER.ashx.

2. David Giller, *Implied Preemption and Its Effect on Local Hydrofracking Bans in New York*, 21 J.L. & POL'Y 631, 636 (2013).

extraction of natural gas.[3] These developments of hydraulic fracturing technology have advanced the natural gas industry in the United States to levels previously thought impossible.[4]

Despite the state's significant natural gas resources, as of this writing, New York has yet to benefit economically due to various state and municipal bans on hydrofracking. The history of hydraulic fracturing in New York and the effort to ban it, culminating in a statewide ban on high-volume hydraulic fracking, is summarized in Part I of this paper. Part II explains an alternative to this banned form of fracking–namely, fracking with liquefied petroleum gas–including a discussion of its history, development, advantages, and disadvantages. Part III considers whether this new method of fracking can serve as a viable alternative in New York given the existing statewide and municipal fracking bans, and concludes that: yes it can. Part IV argues that liquefied petroleum gas fracturing should be approved under current law. Finally, this Comment concludes by briefly looking forward to the political battles that will ensue should New York approve fracking by liquefied petroleum gas.

I. THE HISTORY OF HYDRAULIC FRACTURING IN NEW YORK STATE AND GOVERNOR ANDREW CUOMO'S MORATORIUM

By 2003, Texas oilmen had developed a new form of fracking, which relied primarily on water, and this method was found to be more effective in fracturing the shale.[5] This new process, called high-volume hydraulic fracturing (HVHF), "extract[s] natural gas from huge shale formations,

3. *Id.*

4. CORY ADAMS ET AL., HYDRAULIC FRACTURING: A REPORT AS TO THE IMPLICATIONS REGARDING NATURAL GAS 4 (2013), https://www.wpi.edu/Pubs/E-project/Available/E-project-022713-210232/unrestricted/IQP_Hydraulic_Fracturing_2-27-2013.pdf.

5. Giller, *supra* note 2, at 637.

formerly seabed, which are about a mile below the surface of the earth and embedded under thick bedrock."[6] HVHF is more effective than the previous standard process of vertical fracturing because a single well harvests from a wider area within the formation.[7] With vertical fracturing, water-based pressurized fracking fluid is pumped straight down from a well site, fracturing the rock immediately adjacent along the length of the well.[8] HVHF relies on horizontally drilled wells in order to create a large contact area within the target rock formations.[9] Specifically, during the current process of horizontal drilling, "a well is drilled from the surface to just above the gas reservoir[,] where it is 'curve[d] to intersect the reservoir . . . with a near-horizontal inclination' maximizing the amount of natural gas available."[10]

Compared to typical vertical hydraulic fracturing, which has been utilized in New York since the 1950s,[11] an HVHF well is an operation of significantly greater scale. A vertical well is typically drilled into the target formation, between 2000 to 8000 feet deep.[12] Conversely, a standard horizontal well is drilled vertically the same depth into the target formation, but is extended an average 4500 feet horizontally.[13] Additionally, vertical fracturing typically requires up to 100,000 gallons of water per well, compared to

6. Peter J. Kiernan, *An Analysis of Hydrofracturing Gubernatorial Decision Making*, 5 ALB. GOV'T L. REV. 769, 770 (2012).

7. *See* AM. PETROLEUM INST., *supra* note 1, at 7.

8. *See id.*

9. *See id.*

10. Giller, *supra* note 2, at 637 (quoting Lynn Helms, *Horizontal Drilling*, 35 DMR NEWSL. no. 1, at 1 (2008)).

11. Kiernan, *supra* note 6, at 775.

12. *See Depth of Marcellus Shale Base,* PENN ST. MARCELLUS CTR. FOR OUTREACH & RES., http://www.marcellus.psu.edu/images/Marcellus_Depth.gif (last visited Feb. 3, 2017).

13. *See* GARY S. SWINDELL, MARCELLUS SHALE IN PENNSYLVANIA: A 2,600 WELL STUDY OF ESTIMATED ULTIMATE RECOVERY (EUR) 3 (2016), http://gswindell.com/marcell.pdf.

HVHF, which can require millions of gallons of water per well.[14] These millions of gallons are combined with (1) chemicals that both assist in fracturing the rock and in reducing friction so that the hydrocarbons flow to the surface more freely, and (2) proppants, such as sand, which are used to hold the fractures open.[15]

This larger scale of HVHF, particularly the immense amount of chemically adulterated water that is needed and then must be disposed of, has raised significant concerns and resulted in hydrofracking becoming one of the hottest political, legal, environmental, and commercial debates throughout New York State.[16] Passions regarding the practice have run high since the technology was first utilized in Pennsylvania in 2007.[17] Both supporters and opponents have raged their battle "in the street, over the airwaves, and at the ballot."[18] These tensions were particularly consequential as the Southern Tier of New York is home to the Marcellus Shale, which contains the "second-largest volume of captured natural gas in the world."[19] Some studies have estimated that the Marcellus Shale holds as much as 489 trillion cubic feet (TCF) of natural gas.[20] As a matter of comparison, the total annual rate of gas consumption in the United States is only 25.5 TCF.[21]

As HVHF became more prevalent throughout the United States, particularly in neighboring Pennsylvania, former

14. *Water Use and Oil and Natural Gas Production in Michigan*, MICH. OIL & GAS PRODUCERS EDUC. FOUND., http://www.mogpef.org/Portals/0/docs/MOGPEF_Water_Use_Fact_Sheet_Final_High_Res.pdf (last visited Feb. 3, 2017).

15. Kiernan, *supra* note 6, at 770–71.

16. *Id.* at 771.

17. *Id.* at 772–74.

18. Giller, *supra* note 2, at 648.

19. Kiernan, *supra* note 6, at 773.

20. Giller, *supra* note 2, at 636.

21. *Id.*

Governor David A. Paterson directed the Department of Environmental Conservation (DEC), in July of 2008, "to update its 1992 GEIS [Generic Environmental Impact Statement] that regulates and governs oil and gas drilling in New York, including vertical hydrofracturing, to evaluate and expedite permitting for horizontal fracturing in the Southern Tier."[22] Governor Paterson took this action amid mounting pressure from both industry and environmentalists, who were seeking clarification on the legality of this practice. What ensued was a seven-year battle between landowners, industry, environmental groups, and political organizations, each with their respective, and oftentimes conflicting, goals.[23]

At the forefront of the concerns surrounding hydrofracking were those related to water wells and other water resources, including concerns that the chemically adulterated water injected into wells would contaminate drinking water.[24] While justified due to the Marcellus Shale's proximity to the New York City and Syracuse watersheds, the U.S. Environmental Protection Agency recently found that "[i]t is not possible for such [contamination] to occur for the simple reason that the gas, frack water, and other ancient sea salts and metals that may have radioactive elements . . . remain trapped beneath substantial bedrock more than a mile below the surface of the earth."[25]

After substantial findings, DEC released a draft supplemental analysis in October of 2008 and released a final scope in February of 2009, which defined the

22. Kiernan, *supra* note 6, at 774.

23. *See id.* at 774–81.

24. *See id.* at 776–78.

25. *Id.* at 777 (citing OFF. OF RES. & DEV., EPA, PROCEEDINGS OF THE TECHNICAL WORKSHOPS FOR THE HYDRAULIC FRACTURING STUDY: WELL CONSTRUCTION AND OPERATIONS 92, 94 (2011), http://water.epa.gov/type/groundwater/uic/class2/hydraulicfracturing/upload/hydraulicfracturingstudywellconstructionandoperation.pdf).

parameters of the Supplemental GEIS (SGEIS) DEC would thereafter develop.[26] A draft was released on September 30, 2009 for public comment, and, following the release, 13,000 public comments were received.[27] This draft SGEIS addressed a wide range of concerns raised by environmental groups, including safety measures, protection standards, well-bore leaks, casing requirements, flowback, chemical disclosure, trucking, and light and noise mitigation.[28] Importantly, "DEC found no substantive basis to believe that water quality [would] be degraded in the New York City watershed or any other watershed or aquifer."[29]

While DEC was analyzing the 13,000 public comments, the New York Legislature passed a bill in November of 2010 placing a moratorium on all vertical and horizontal hydrofracking until May 15, 2011.[30] During the ten-day period Governor Paterson had to sign or veto the legislation, industry and environmental groups heavily lobbied the Governor.[31] However, despite the environmentalists' efforts, the legislation was vetoed on December 13, 2010.[32] Governor Paterson's veto message specifically stated, "the bill was too broad and would halt hundreds of existing, productive vertical fracturing operations that were supporting many hundreds of jobs in New York."[33] Nevertheless, Governor Paterson went on to issue Executive Order No. 41, which not

26. *Id.* at 779.

27. *Id.*

28. *Id.*

29. *Id.* at 779 (quoting N.Y. STATE ASSEMBLY STANDING COMM. ON ENVTL. CONSERVATION, DRAFT SUPPLEMENT GENERIC ENVIRONMENTAL IMPACT STATEMENT GOVERNING NATURAL GAS DRILLING: TESTIMONY OF PETE GRANNIS, COMMISSIONER NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION 4 (2009), http://www.dec.ny.gov/docs/materials_minerals_pdf/dsgeistestim.pdf).

30. *Id.* at 780.

31. *See id.*

32. *Id.*

33. *Id.*

only ordered further environmental review on the issue of hydrofracking, but also "prohibited DEC from issuing permits for hydrofracturing projects until completion of the SGEIS and a regulatory regime specifically for such projects."[34]

When Governor Andrew M. Cuomo assumed office in January of 2011, he continued Governor Paterson's Executive Order.[35] While the final plan regarding hydrofracking was still being developed by Governor Cuomo's administration, there were indications that HVHF was going to be authorized in New York, although in a highly circumscribed manner.[36] In June of 2012, it was reported DEC was contemplating allowing HVHF, but limiting it to just five counties, all situated within the Southern Tier of New York: Chemung, Chenango, Steuben, Tioga, and Broome.[37] Additionally, HVHF was to be limited "to the deepest areas of the Marcellus Shale rock formation in an effort to reduce the risk of groundwater contamination."[38] Finally, the number of wells would be limited to fifty statewide.[39]

Notwithstanding these considerations, the Final Supplemental Generic Environmental Impact Statement (FSGEIS), released in June of 2015, ultimately banned HVHF within New York State.[40] DEC reached this

34. *Id.* at 780–81.

35. *Id.* at 781.; N.Y. COMP. CODES R. & REGS. tit. 9, § 8.2 (2011).

36. *See* Danny Hakim, *Cuomo Proposal Would Restrict Gas Drilling to a Struggling Area*, N.Y. TIMES (June 13, 2012), http://www.nytimes.com/2012/06/14/nyregion/hydrofracking-under-cuomo-plan-would-be-restricted-to-a-few-counties.html?_r=1.

37. *Id.*

38. *Id.*

39. Giller, *supra* note 2, at 645.

40. *See generally* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, FINAL SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM: FINDINGS STATEMENT 1, 5 (2015),

conclusion after determining that "due to the limited economic and social benefits that would be derived from high-volume hydraulic fracturing, the No-Action alternative [i.e., a ban] is the only reasonable alternative consistent with social, economic and other essential considerations."[41] Despite DEC applying this No-Action alternative state-wide (in contrast to the prior geographical limitations as laid out above), the FSGEIS's Finding Statement only banned one type of fracking—high-volume hydraulic fracturing, which was defined as "the stimulation of a well using 300,000 or more gallons of water as the base fluid for hydraulic fracturing for all stages in a well completion."[42]

II. RECENT TECHNOLOGICAL ADVANCEMENTS IN FRACKING AND POSSIBLE ALTERNATIVES FOR NEW YORK

Despite declining natural gas prices, "the industry maintains that hydrofracturing is a key to capturing natural resources that offer the United States energy independence."[43] At the same time, wastewater disposal remains a principal cost in developing a well. As a result, the oil and gas industry has continued to develop alternative methods for reducing wastewater through the utilization of new fracking techniques.[44] These developments have recently led some to ask "[w]hat if the majority of the environmental and health concerns surrounding the hydraulic fracturing . . . could be solved with one technological advancement?"[45] Such a technological advancement could be sweeping: the National Petroleum

http://www.dec.ny.gov/docs/materials_minerals_pdf/findingstatehvhf62015.pdf.

41. *Id.* at 5.

42. *Id.* at 2 n.1.

43. Kiernan, *supra* note 6, at 793.

44. *See* ADAMS ET AL., *supra* note 4, at 36–37.

45. B. Tyler Wilson, Note, *GasFrac: A Cost-Benefit Analysis of Hydraulic Fracturing with Liquefied Petroleum Gas Gel*, 14 PITT. J. TECH. L. & POL'Y 142, 142 (2013).

Council estimates that ninety-five percent of wells drilled within the United States are completed by fracking.[46] These fracked wells account for more than 43% of the total oil production and 67% of the natural gas production within the United States.[47]

One of the most promising technological advancements recently developed is fracking by liquefied petroleum gas (LPG). This novel method of natural gas extraction has been widely studied, and has since become a "bright prospect in oil and gas industry."[48] LPG fracking has emerged not only as a production-enhancing process that "can deliver both economic and environmental benefits for producers,"[49] but also presents a viable alternative to high-volume hydraulic fracturing (HVHF) in New York.[50]

A. *What Is Liquefied Petroleum Gas?*

Developed by former Chevron engineer Robert Lestz,[51] fracking with LPG has recently come to the forefront of the market.[52] LPG, commonly referred to as propane, "is the

46. *Id.*

47. *Id.*

48. Tanmay M. Soni, LPG-Based Fracturing: An Alternate Fracturing Technique in Shale Reservoirs 1 (2014) (unpublished manuscript) (available at https://www.onepetro.org/conference-paper/SPE-170542-MS).

49. *More Results. Less Impact. The Advantages of LPG Gel vs. Water*, GASFRAC ENERGY SERVS., INC. (Mar. 12, 2016), https://web.archive.org/web/20160312000419/http://www.gasfrac.com/lpg-vs-conventional.html.

50. Mark Thomas, *LPG Fracing Gains Acceptance as Viable Alternative*, E&P MAG. (Feb. 1, 2012), http://www.epmag.com/lpg-fracing-gains-acceptance-viable-alternative-637921.

51. *See* Anthony Brino, *Q&A: Inventor of Waterless Fracking on Why His Method Will Be a Game-Changer*, INSIDECLIMATE NEWS (Nov. 14, 2011), https://insideclimatenews.org/news/20111110/propane-fracking-gasfrac-natural-gas-robert-lestz-propane-water-lpg-canada-new-york.

52. Wilson, *supra* note 45, at 143.

most popular alternative fuel in the world."[53] In its natural state, propane is a gas.[54] However, when used as a fracking fluid, LPG is generally "converted into a gel with phosphate ester and iron sulfide."[55] Similar to the water used in hydrofracking, this gel is pumped down the well under high pressure. This high pressure causes the gel to "create multiple radial fractures in the vicinity of the wellbore."[56] Conversely, while the water utilized in HVHF must be disposed of after the completion of the well, LPG reverts to a gaseous state when the pressure is reduced,[57] eliminating the need to dispose of any wastewater. This unique attribute, which allows LPG to naturally convert to a gas, coupled with the fact that it can be stored relatively easily in a liquid state at an ambient temperature of 70˚F (with moderate pressure), makes LPG particularly suited for use as a fracking fluid.[58]

B. *Fracking with Liquefied Petroleum Gas*

In order to maximize the effectiveness of LPG as a fracturing fluid, magnesium oxide is often added to the LPG gel to delay its conversion to a gas.[59] The LPG then flows through a "sand blender,"[60] adding the proppant (typically sand), which serves to "'prop' open the fractures and allow gas to flow through them."[61] The proppant is particularly vital to the process, as it acts "as a support beam . . . for the

53. *Just the Basics: Liquefied Petroleum Gas*, U.S. DEP'T ENERGY: OFF. ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www1.eere.energy.gov/vehicles andfuels/pdfs/basics/jtb_lpg.pdf (last visited Feb. 5, 2017).

54. *See id.*

55. Wilson, *supra* note 45, at 151.

56. Soni, *supra* note 48, at 1.

57. *Id.* at 5.

58. *Id.* at 2.

59. Wilson, *supra* note 45, at 151.

60. *Id.*

61. ADAMS ET AL., *supra* note 4, at 20.

fractures."[62] Subsequently, the LPG and proppant "are then injected into the well-bore through 'specialized high pressure pumping units,' or 'stimulators.'"[63] Once the fracturing has been completed, and the pressure of the well lowered, the LPG gel reverts to a gaseous state, which is extracted and harvested along with the resultant natural gas.[64]

C. *GasFrac's Proprietary Liquefied Petroleum Gas System*

Founded in 2006, GasFrac Energy Services, based in Calgary, Canada, was the world's first provider of LPG fracking services and has utilized the technology over 1200 times throughout Canada and the United States.[65] Gasfrac utilizes a "waterless gel technology to stimulate reservoirs with the primary ingredient being propane."[66] This waterless technology, kept in a "closed blending system," allows operators to use a "nominal number of additives and proppant."[67] As stated by Zeke Zeringue, GasFrac's former President and CEO, the system "uses hydrocarbons to stimulate new hydrocarbons with no biocides or carcinogens in the gel. This creates a cleaner and more environmentally friendly reservoir stimulant."[68]

Under GasFrac's proprietary method, "LPG gel enters the well as a gel under high pressure and then gradually vaporizes into a gas. The company with rights to drill and frac [the] well . . . extracts the vaporized LPG along with the

62. *Id.*

63. Wilson, *supra* note 45, at 151 (quoting *Integrating Innovative Technology*, GASFRAC ENERGY SERVS., INC. (May 2, 2015), http://web.archive.org/web/20150502130745/http://www.gasfrac.com/equipment-profile.html).

64. *Id.*

65. Anthony Brino, *Waterless Fracking Technique Makes Its Debut in Ohio*, MIDWEST ENERGY NEWS (May 15, 2012), http://midwestenergynews.com/2012/05/15/waterless-fracking-technique-makes-its-debut-in-ohio.

66. Thomas, *supra* note 50.

67. *Id.*

68. *Id.*

natural gas and/or oil released through the fracking process."[69] Consequently, LPG (and GasFrac's method) has proved attractive for industry and environmental groups alike for a simple reason: "it leaves no residue and eliminates the need for the disposal of [wastewater]."[70]

In addition, GasFrac's closed-loop system means the fluid/propane is never exposed to the open air, which has ameliorated numerous environmental concerns.[71] Furthermore, GasFrac has recently partnered with industry leaders to work toward "a fully recycled system, where it would use . . . LPG gel to stimulate the fractures, recapture the propane in its gaseous state when it returns to the surface with the hydrocarbons with no flaring, and reuse it for the next stage or treatment."[72] The ability to fully recycle used LPG could prove to be an additional source of savings for operators, in addition to the elimination of wastewater treatment and recycling.

In comparison, particularly for HVHF wells within the Marcellus Shale, roughly twenty to fifty percent of fracturing fluid returns to the surface.[73] This wastewater, loaded with chemicals used to facilitate fracking, also contains radioactive elements, which are typically brought to the surface during the fracturing process.[74] As a result, industry must carefully dispose of the resultant wastewater at a

69. Wilson, *supra* note 45, at 143.

70. *Id.*

71. Thomas, *supra* note 50.

72. *Id. See* INT'L ASS'N OIL & GAS PRODUCERS, FLARING & VENTING IN THE OIL & GAS EXPLORATION & PRODUCTION INDUSTRY: AN OVERVIEW OF PURPOSE, QUANTITIES, ISSUES, PRACTICES AND TRENDS 1 (2000), http://www.ogp.org.uk/pubs/288.pdf (defining flaring as, "the controlled burning of natural gas in the course of routine oil and gas production operations. This burning occurs at the end of a flare stack or boom . . . A complete flare system consists of the flare stack or boom and pipes which collect the gases to be flared.").

73. ADAMS ET AL., *supra* note 4, at 51.

74. Wilson, *supra* note 45, at 146–47.

significant cost. To avoid these major costs, oil and gas companies across the United States have begun to develop wastewater-recycling programs.[75] Chesapeake Energy has recently reported an annual savings of $12 million dollars from the recycling of water within the Marcellus, and Range Resources reported a savings of $200,000 by recycling 100% of the wastewater just in southwestern Pennsylvania.[76] LPG fracking one-ups these recycling programs by completely eliminating the cost of recycling millions of gallons of wastewater, potentially resulting in considerable savings for companies like Chesapeake.[77]

D. *The Initial Rise of and Demand for Liquefied Petroleum Gas Fracturing*

In unconventional shale gas plays, traditionally fracked wells have often not met performance expectations.[78] Studies have shown that such decreases in production are the result of numerous contributing factors.[79] However, oftentimes the greatest contributor is the blockage resulting from water that remains trapped in fractures.[80] This blockage can be particularly detrimental to gas production.[81] Therefore, because the pressure "required to recover water can be very high in tight formations," it remains difficult, expensive, and oftentimes physically impossible to eliminate this water

75. *See* ADAMS ET AL., *supra* note 4, at 49–56.

76. *Id.* at 51.

77. *See infra* Section III.B.5.

78. *See* Soni, *supra* note 48, at 2.

79. *See id.* ("The reduction in fracture productivity can be a result of [a] combination of factors such as 1. Low reservoir pressure, 2. Poor proppant placement, 3. Limited fracture length and 4. Low proppant conductivity.").

80. *See id.*

81. *Id.* Of the millions of gallons utilized for HVHF, over fifty percent of the fluid used typically *does not* return to the surface. ADAMS ET AL., *supra* note 4, at 32.

blockage.[82] Additionally, because initial water saturation is often very low, clay swelling occurs as the water is absorbed within the formation, and "[t]he resulting decrease in rock permeability reduces the ability of the gas to flow from the reservoir to the fracture."[83] Because these conditions result in a net decrease of well productivity (and a loss of profits), industry leaders have recently turned to alternatives to the traditional water-based fracking fluids.[84] These alternatives have included energized fluids, such as carbon dioxide, nitrogen gas, and LPG.[85]

E. *Why Industry Might Adopt Liquefied Petroleum Gas Fracturing*

GasFrac argues that fracking by LPG has numerous advantages for operators and can substantially increase not only profits, but also boost recovery in numerous shale gas plays throughout the country.[86] One advantage touted by GasFrac is the increase in ultimate reservoir performance and certainty.[87] GasFrac argues that effective proppant transport, a lack of damage to the formation, and the recovery of all fracture fluids (except the proppant) results in a highly successful reservoir.[88] In both HVHF and LPG

82. *See* Soni, *supra* note 48, at 2.

83. *Id.*

84. *See id.*

85. *See Energized Fracturing*, FERUS WELLSITE CRYOGENIC SOLUTIONS, http://www.ferus.com/download/Energized%20Fracturing%20Information%20Sheet.pdf (last visited Mar. 14, 2016) ("Energized fracturing is the process of using one or more expansive fluids, such as nitrogen (N_2), as part of the stimulation. The fluid system works with conventional proppant, chemicals and equipment."); Soni, *supra* note 48, at 2.

86. *See Engineered Solutions*, GASFRAC ENERGY SERVS., INC. (Feb. 15, 2015), http://web.archive.org/web/20150215100652/http://www.gasfrac.com/energized-fluid-solutions.html.

87. *Id.*

88. *High Reid Vapour Pressure*, GASFRAC ENERGY SERVS., INC. (Feb. 15, 2015), http://web.archive.org/web/20150215182016/http://www.gasfrac.com/blended-

fracturing, sand is the most effective, and most widely used proppant.[89] Because proppants are suspended in LPG gel instead of simply mixed with liquid water, LPG fracking more evenly distributes the proppant within the fractures "thereby decreasing the chance of the proppant settling in odd inconvenient spots in the formation."[90] Consequently, the LPG gel results in "a higher pay zone height throughout pumping and subsequent long-term production."[91] In addition, the gel is able to carry more proppant, which allows more gas to flow from the fractures.[92] Furthermore, because LPG is completely soluble with natural gas, "[i]f natural gas formations are present, then propane and methane will combine . . . and return[] to the surface . . . [where they] can be separated easily."[93]

LPG also has advantages over water because it has lower surface tension, viscosity, and specific gravity and is a non-polar substance.[94] For example, the viscosity of water is 0.66 centipoise (cps), whereas the viscosity of LPG is 0.08 cps; the specific gravity of water is 1.02, compared to 0.51 for LPG;

fluid-solutions.html.

89. *See Mainstream Solutions*, GASFRAC ENERGY SERVS., INC. (Feb. 15, 2015), http://web.archive.org/web/20150215100640/http://www.gasfrac.com/conventional-fluid-solutions.html.

90. Brian Westenhaus, *A New Way to Fracture Oil and Gas Wells*, OILPRICE.COM (July 31, 2012, 5:21 PM), http://oilprice.com/Energy/Energy-General/A-New-Way-To-Fracture-Oil-and-Gas-Wells.html.

91. *Id. See* Sharon Dunn, *Fracking 101: Breaking Down the Most Important Part of Today's Oil, Gas Drilling*, THE TRIBUNE (Jan. 5, 2014), http://www.greeleytribune.com/news/9558384-113/drilling-oil-equipment-wellbore# (defining the "payzone" as when the drill bit hits the bottom of the desired formation, before the horizontal drilling begins).

92. *See* ADAMS ET AL., *supra* note 4, at 21.

93. Soni, *supra* note 48, at 6.

94. Lower surface tension refers to the cohesion with a liquid, viscosity refers to a substance's internal friction, and specific gravity refers to a substance's density. *See Industry Leading Technology*, GASFRAC ENERGY SERVS., INC. (Feb. 15, 2015), http://web.archive.org/web/20150215182122/http://www.gasfrac.com/proven-proprietary-process.html.

and the surface tension of water is 72 dynes/cm, compared to 7.6 dynes/cm for LPG.[95] Water can also cause formation damage as a result of its reaction with the salts and clay within a formation, and can bring these substances to the surface as flowback.[96] These reactions occur because H_2O is a polar molecule that attracts and is attracted to other polar molecules, such as the molecules in clay and all forms of salt, and acts as a solvent for these materials.[97] However, LPG does not react with any of the clays or salts within the formation because "it is made up of non-polar molecules."[98] As a result, LPG does not damage formations in a manner that impedes gas recovery, such as causing clay swelling.[99] More importantly, LPG also does not dissolve the naturally occurring salts and clay within the formation.[100] This results in an overall reduction of substances that mix with the fracking fluid or the harvested oil and gas; therefore, the amount of waste brought to the surface is minimal or non-existent.[101]

Typical fracking fluids "generally consist of about 95% non-toxic constituents by volume."[102] However, wastewater contains the chemicals added prior to the injection into the well, and "brines, which may include naturally occurring radioactive materials (NORMs), picked up during extraction."[103] While NORMs are unusual throughout most major shale plays in the United States, they are particularly

95. Each of these characteristics serve to reduce flowback by blocking gas flow since it is more difficult to move through a cohesive, frictious, or dense liquid. *Id.*

96. *See* Soni, *supra* note 48, at 2.

97. *See* ADAMS ET AL., *supra* note 4, at 92.

98. *Id.*

99. *See* Soni, *supra* note 48, at 2.

100. *See* ADAMS ET AL., *supra* note 4, at 92.

101. *See* GASFRAC ENERGY SERVS., INC., *supra* note 86.

102. Wilson, *supra* note 45, at 145.

103. *Id.* at 147.

prevalent in Pennsylvania and New York.[104] Additionally, large volumes of wastewater can carry high levels of total dissolved solids (TDS), which can make it five times saltier than seawater.[105] This wastewater is typically disposed of through treatment and discharge into deep injection wells[106] or by discharge into surface water sources.[107] Unfortunately, "[t]he toxicity and radioactivity of chemical additives and brines and the amount of TDS contained in wastewater makes processing it at water treatment facilities very difficult."[108] Conversely, with LPG fracking, the need to treat flowback water and the dangers imposed by deep injection wells is effectively eliminated.

In addition, there is a monumental difference in the pressure needed to move LPG gel through porous media. The gel's lower viscosity greatly reduces the pressure needed for the same volume of fluid.[109] This improves post-fracture fluid recovery and maximizes fracture lengths.[110] By selecting LPG, operators can greatly reduce the pressure necessary to mobilize the fracturing fluid for cleanup purposes.[111] Consequently, due to the significant differences in the surface tensions between water (72 dynes/cm) and LPG (7.6 dynes/cm), numerous studies have observed that better

104. *See* ADAMS ET AL., *supra* note 4, at 49.

105. Wilson, *supra* note 45, at 147.

106. *General Information About Injection Wells*, U.S. ENVTL. PROTECTION AGENCY, https://www.epa.gov/uic/general-information-about-injection-wells (last visited Mar. 14, 2016) ("An injection well is used to place fluid underground into porous geologic formations. These underground formations may range from deep sandstone or limestone . . . . Injected fluids may include water, wastewater, brine (salt water), or water mixed with chemicals.").

107. Wilson, *supra* note 45, at 147.

108. *Id.*

109. *See* GASFRAC ENERGY SERVS., INC., *supra* note 86.

110. *Id.*

111. *See* Soni, *supra* note 48, at 5.

cleanup efficiency has been achieved with LPG.[112]

Finally, the absence of water necessary to stimulate a well, a significant advantage of LPG, is particularly attractive in the Marcellus Shale. In the Marcellus Shale, the typical well requires twelve stages of fracturing treatments, which is among the highest of all the major shale plays.[113] In addition, the Marcellus also requires one of the higher amounts of proppant per well: 4,425,600 pounds on average.[114] This compares to 1,998,000 pounds for the Bakken; 1,515,000 pounds for the Barnett; 4,304,000 pounds for the Eagle Ford; and 4,675,500 pounds for the Haynesville.[115] While these differences are the result of geological variations across the major plays, they reflect the importance of successful fracturing and placement of proppant to maximize gas flow, both of which have been proven advantages of LPG.[116]

F. *Additional Advantages of Fracking with Liquefied Petroleum Gas*

As LPG has taken hold as a viable alternative within the energy industry, multiple studies have noted its obvious advantages. For example, Penn State has documented "gelled propane would replace the use of water, thereby reducing fresh water use and the associated environmental

112. *Id.*

113. The Bakken Shale requires thirteen stages of fracturing treatments, the Barnett Shale requires six stages, the Eagle Ford requires sixteen, the Haynesville requires just over thirteen, and the Marcellus requires twelve on average. KIMMERIDGE ENERGY, GREEN TECHNOLOGY AND FRACCING: CLOSER BEDFELLOWS THAN YOU MIGHT IMAGINE 2, 13 (2013), http://www.kimmeridgeenergy.com/Kimmeridge-Green-Technology-Fraccing.pdf.

114. *Id.* at 13.

115. *Id.*

116. *Id.*

concerns."[117] The greatest advantage to LPG fracturing is that virtually all of the fluid can be recovered.[118] Consequently, due to the nature of LPG, the propane that is used for fracturing can be recovered and reused, "therefore eliminating the need to treat or dispose of large volumes of wastewater that may have high concentrations of naturally occurring salts, metals, radionuclides and other constituents commonly found in shale reservoirs."[119] This fact is vital because, "[a] four million gallon supply of fluid would require anywhere from 80 to 330 tons of chemicals. This results in an insurmountable amount of contaminated waste water that needs to be disposed of safely."[120] Additionally, eliminating these sources of contaminated water has been a major area of concern not only for environmental groups, but also for residents in and around the major shale plays. This elimination has been a major selling point for landowners and citizens—Robert Lestz, former Chief Technology Officer of GasFrac, recently explained: "[w]e describe the process to landowners as 'not even a drop [of water] is needed' . . . We're using a natural gas byproduct to produce more natural gas."[121]

117. *Liquefied Petroleum Gas Fracturing: Will It Replace Hydraulic Fracturing?*, PENN STATE EXTENSION (July 29, 2012), http://extension.psu.edu/natural-resources/natural-gas/news/2012/07/liquified-petroleum-gas-fracturing-will-it-replace-hydraulic-fracturing.

118. GASFRAC ENERGY SERVS., INC., *supra* note 94.

119. *Liquefied Petroleum Gas Fracturing: Will It Replace Hydraulic Fracturing?*, *supra* note 117.

120. Nathan Janiczek, Waterless Fracking: A Clean Substitute 1–2 (Oct. 30, 2012) (unpublished manuscript) (available at http://www.ourenergypolicy.org/wp-content/uploads/2013/09/WA3.pdf).

121. Diane Langley, *Technology Advances Push Greener Side of Fracing*, DRILLING CONTRACTOR (May 4, 2011), http://www.drillingcontractor.org/technology-advances-push-greener-side-of-fracing-9329.

G. *Disadvantages of Fracking with Liquefied Petroleum Gas*

The use of LPG for horizontal fracking also has obvious disadvantages. Compared to easily accessible fresh water, LPG presents a higher up-front cost to the operator.[122] Some reports have noted GasFrac charges a fifty percent premium on its services compared to the costs typically associated with traditional fracking methods, such as HVHF.[123] While operators generally can "make use of local water sources to create traditional fracing fluids . . . the LPG gel fracing method would require the transportation of LPG . . . to the well to create LPG gel."[124] However, while substantially fewer truck trips are required compared to HVHF, the trucks would potentially have to travel further to reach a drill-site.[125]

In addition, "increased explosion hazards, and limited capacity to utilize this technology on a wide commercial basis" are clear disadvantages of LPG.[126] This stems from the fact that LPG is extremely flammable, increasing the risk of explosion or fire during the fracturing process.[127] However, this risk can be mitigated if an "[i]nert gas such as nitrogen is used for pumping system components of LPG."[128] Although, while many states have not enacted safety regulations in regards to LPG fracking, GasFrac has taken numerous steps to ensure the process is conducted safely.[129]

122. *Liquefied Petroleum Gas Fracturing: Will It Replace Hydraulic Fracturing?*, *supra* note 117.

123. Westenhaus, *supra* note 90.

124. Wilson, *supra* note 45, at 155.

125. *Id.*

126. *Liquefied Petroleum Gas Fracturing: Will It Replace Hydraulic Fracturing?*, *supra* note 117.

127. Wilson, *supra* note 45, at 152.

128. Soni, *supra* note 48, at 1–2.

129. Wilson, *supra* note 45, at 152.

Many of these steps have included the development of "new technologies, including computerized and remotely controlled fracing systems, to minimize the need for on-site workers."[130]

Despite these risks, GasFrac has an impeccable safety record. Of the thousands of wells drilled throughout North America, GasFrac has had only one documented incident. In 2011, a fire ignited during the LPG fracking process.[131] This incident "involved a flash fire at a well in Alberta, Canada, operated by Husky Energy, where three workers suffered non-life threatening burns. The cause of the incident was an undetected propane leak. In response, GasFrac raised the number of propane sensors used during the fracking process from three to twenty."[132] However, while this incident may raise concerns, the proponents of LPG have convincingly noted, "the oil and gas business is about flammable liquids and gases and as a practical matter no one else is better able to incorporate a propane technology."[133]

Overall, while LPG may present a higher up-front cost, "[t]he price of propane, the chief component of LPG gel, is currently low as a result of the growing supply in the U.S. . . . [C]heap propane prices, the ability to sell or reuse LPG, and the elimination of wastewater disposal costs" make LPG fracking much cheaper for operators in the long run.[134]

III. CAN LIQUEFIED PETROLEUM GAS SERVE AS AN ALTERNATIVE TO HVHF IN NEW YORK?

Despite the FSGEIS's ban on HVHF, in July of 2015, the Synder Farm Group, along with Tioga Energy Partners, held a joint press conference, announcing their official application

130. *Id.* at 153.

131. *Id.*

132. *Id.*

133. Westenhaus, *supra* note 90.

134. *Id.* at 156.

to drill wells utilizing GasFrac's LPG technology.[135] First, the application calls for drilling a vertical "well into the Utica formation at approximately 9500 feet . . . to evaluate the potential for natural gas in all geological formations that the well bore passes through."[136] Second, the application proposes backing out of this first well "to the Marcellus formation at about 4000 feet and turn[ing] horizontally into that formation."[137] This horizontal well "will be stimulated with gelled propane to release the natural gas."[138] The application further states drilling the LPG wells would be completed within seventeen days,[139] and any waste would be disposed of in the Chemung County Landfill, which already accepts waste from the drilling of HVHF wells in Pennsylvania.[140]

Despite an initial projected commencement date of July 1, 2015,[141] as of this writing, the project has yet to break ground, over a year and a half later. A New York Freedom of Information Law (FOIL) request showed that on June 26, 2015, DEC conducted a standard on-site inspection, which indicated "no problems [were] apparent" with the

135. *See* Tom Shepstone, *More on That NY Waterless Fracking Proposal*, NATURAL GAS NOW (July 10, 2015), http://naturalgasnow.org/more-on-that-ny-waterless-fracking-proposal. At the request of Tioga Energy Partners, GasFrac prepared a "Frac Treatment Proposal" to lay out their plan to stimulate both proposed wells with "GASFRAC's Vantage Fracture Treatment." *See* GasFrac Energy Services, Inc., Frac Treatment Proposal: Prepared for Tioga Energy Partners, LLC (Mar. 28, 2015) (on file with author).

136. Shepstone, *supra* note 135.

137. *Id.*

138. *Id.*

139. Tioga Energy Partners, LLC, Application for Permit to Drill, Deepen, Plug Back or Convert a Well Subject to the Oil, Gas and Solution Mining Law (undated) (application to the New York State Department of Environmental Conservation) [hereinafter Tioga Application] (on file with author).

140. Jim Willis, *NY Plans to Use GasFrac Technology to Frack*, NATURAL GAS NOW (Oct. 5, 2015), http://naturalgasnow.org/ny-plans-to-use-gasfrac-technology-to-frack/.

141. Tioga Application, *supra* note 139.

application.[142] However, on April 15, 2016, DEC contacted Tioga Energy Partners, notifying them of "incomplete applications" for the proposed wells.[143] In order to move forward, DEC requested the information on several aspects of the proposal, including the identification of any on site fuel-fired stationary combustion equipment, on site gas venting if applicable, and the location of storage tanks during drilling.[144] In addition, DEC requested an update on Tioga's storm-water permitting from DEC's Division of Water,[145] and an update on the required permits from the Susquehanna River Basin Commission.[146] Significantly, DEC acknowledged "[a]ll items . . . must be addressed . . . for the Department to continue processing the applications, and to be able to make a determination if this relatively unique fracturing technology that has not heretofore been subject to a full environmental analysis has the potential to cause significant adverse environmental impacts."[147]

142. N.Y. State Dep't of Envtl. Conservation, Pre-Site Inspection Report (July 14, 2014) (report on inspection of well named Snyder, E. #1) (on file with author).

143. Letter from N.Y. State Dep't of Envtl. Conservation to Adam Schultz, Esq. & Tioga Energy Partners (Apr. 15, 2016) (on file with author).

144. *Id.*

145. A letter from DEC to Tioga Energy Partners notified Tioga that the project requires a Storm-Water Pollution Prevention Plan that would "include[] a post-construction stormwater management practice component" in order to move forward with the permitting process. Letter from N.Y. State Dep't of Envtl. Conservation to Adam Schultz, Esq. & Tioga Energy Partners (May 31, 2016) (on file with author).

146. N.Y. State Dep't of Envtl. Conservation, *supra* note 143. Tioga Energy Partners filed a Notice of Intent for Consumptive Use at Synder E1 and E1A with the Susquehanna River Basin Commission on September 8, 2015. *See* Letter from Adam Schultz, Esq. & Tioga Energy Partners, LLC to N.Y. State Dep't of Envtl. Conservation (Sept. 16, 2015) (on file with author).

147. N.Y. State Dep't of Envtl. Conservation, *supra* note 143.

A. *Utilizing Liquefied Petroleum Gas Sidesteps the 2015 FSGEIS's Ban on HVHF*

As previously noted, the 2015 FSGEIS only bans one type of fracking: high volume hydraulic fracturing, which DEC defined as "the stimulation of a well using 300,000 or more gallons of water as the base fluid for hydraulic fracturing for all stages in a well completion, regardless of whether the well is vertical or directional, including horizontal."[148] Specifically, DEC found that

> [w]ells using less than 300,000 gallons of water for hydraulic fracturing per completion do not have the same magnitude of impacts. Indeed, wells hydraulically fractured with less water are generally associated with smaller well pads and . . . fewer truck trips, and do not trigger the same potential water sourcing and disposal impacts as HVHF wells.[149]

DEC's decision to ban fracking operations purely on the basis of the amount of water that is required is critical for efforts to utilize LPG technology in New York because LPG fracturing does not use any water.

As such, the landowners in Tioga County and the Southern Tier of New York can sidestep the 2015 FSGEIS ban by utilizing LPG instead of HVHF. The permits recently submitted to DEC, requesting to engage in LPG fracking, would have to be evaluated under DEC's 1992 GEIS, according to Emily DeSantis, DEC's Director of Public Information, and not under the 2015 FSGEIS.[150] While DeSantis noted that the request for LPG fracturing may require a separate, site-specific evaluation under New York's Environmental Quality Review Act, this pronouncement is striking because it clearly acknowledges that New York is not completely closed to the practice of horizontal fracking,

148. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 2 n.1.

149. *Id.*

150. Anthony Brino, *Waterless Fracking Method Could Sidestep NY Gas Drilling Ban*, INSIDECLIMATE NEWS (Apr. 16, 2012), http://insideclimatenews.org/news/20120415/waterless-fracking-method-propane-gasfrac-bypass-new-york-ban-hydraulic-fracturing-tioga-county.

despite popular belief.[151]

B. *The Unique Features of Liquefied Petroleum Gas Fracturing Make It Unlikely to Be Banned Under a New Supplemental GEIS*

While LPG fracking is not banned by the 2015 FSGEIS, this technicality would provide little benefit to those who would like to utilize this technology if LPG fracking were indistinguishable from HVHF. If this were the case, history could merely repeat itself: Governor Cuomo could issue an executive order prohibiting DEC from issuing permits for LPG fracturing until a new SGEIS could be prepared. This new SGEIS could result in identical findings, and LPG fracking could end up being subject to the same ban as HVHF. Fortunately, for those who wish to utilize LPG, this is not the case. As explained above, LPG fracking differs substantially from hydrofracking. Critically, many of these differences mitigate or eliminate the concerns raised by DEC in the 2015 FSGEIS, which banned HVHF.[152]

1. Why DEC Banned HVHF Under the 2015 FSGEIS

According to DEC, a new supplemental GEIS was necessary to evaluate HVHF because HVHF "raise[d] new, potentially significant, adverse impacts that were not studied in the 1992 GEIS."[153] These new impacts included "concerns about potential significant adverse impacts to water supplies, wastewater treatment and disposal;" "greater volumes of drilling waste;" and "additional concerns relating to air quality, truck traffic, noise, habitat, cultural, historic and natural resources, agriculture, community character and socioeconomics."[154] Under New York's

151. *Id.*

152. *See id.*

153. *Id.* at 3.

154. *Id.*

Environmental Conservation Law (ECL), DEC was required to: (1) assess which of these potential impacts of HVHF would be significantly adverse; (2) evaluate mitigation measures that may reduce such significant adverse impacts; and (3) determine whether imposing certain mitigation efforts would reduce HVHF's adverse impacts enough that HVHF could be performed consistent with the ECL and applicable New York Regulations.[155] Specifically, Article 1 of the ECL required DEC to permit HVHF if it could be done in a manner that did not conflict with DEC's mission "to conserve, improve and protect its natural resources and environment and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well being."[156]

In accordance with this multi-step evaluation, DEC selected the "No-Action alternative," banning HVHF, after determining this was the only alternative consistent with DEC's legal mandate.[157] According to DEC, adverse impacts to (1) ecosystems and wildlife; (2) air and water resources; (3) community character; and (4) public health could not be avoided or minimized to an extent where they could be acceptable in light of the limited economic or social benefits of HVHF.[158]

In reaching this decision, DEC found HVHF could adversely impact ecosystems and wildlife by exposing additional areas of New York to intense industrial activity.[159] The average disturbance, including access roads and other infrastructure, associated with an HVHF well pad is 7.4

155. *See* N.Y. COMP. CODES R. & REGS. tit. 6, § 617 (McKinney 2016); N.Y. ENVTL. CONSERV. LAW § 8-0109 (McKinney 2006).

156. N.Y. ENVTL. CONSERV. LAW § 1-0101 (McKinney 2005).

157. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 5.

158. *Id.* at 34.

159. *Id.* at 35.

acres, compared to 4.8 acres for a traditional vertically fracked well.[160] In addition, because horizontal fracking allows viable and economical access to formations that would otherwise not be fracked, legalizing HVHF would likely result in widespread construction in areas within the state that previously were not subject to gas and oil development.[161] Further, because HVHF wells use and produce more fracking fluids requiring disposal, there is an "increased likelihood of spills from accidents occurring during the storage and transportation of [fracking] waste."[162]

Beyond the risk of accidental spills, DEC was concerned about wastewater disposal.[163] The scarcity of existing facilities with the capacity to accept the large volumes of wastewater resulting from HVHF, specifically the absence of any publically owned treatment facilities permitted to accept HVHF wastewater, caused DEC to worry there would be "improper or illegal disposal."[164] Such improper disposal has the potential to endanger both the environment and public health.[165]

DEC also found establishing an HVHF permitting program would have significant impacts on community character, especially in the rural areas of the state.[166] DEC acknowledged that recent New York Court of Appeals rulings allow communities to prohibit fracking within their

160. *Id.* at 3. A well pad is the location on which the natural gas developer utilizes the industrial processes necessary to effectively drill a vertical or horizontal well. Jim Ladlee, *Multi-Well Pads in the Marcellus Shale*, PENNSTATE EXTENSION (Oct. 23, 2011), http://extension.psu.edu/natural-resources/natural-gas/news/2011/10/multi-well-pads-in-the-marcellus-shale.

161. *Id.* at 3–4.

162. *Id.* at 35.

163. *Id.* at 36.

164. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 36.

165. *Id.* at 15.

166. *See id.* at 4.

borders.[167] Thus, any industrialization that would result from HVHF could be prohibited if this were the desire of the local residents. However, DEC remained concerned that the ancillary and transporting activities associated with HVHF would still have significant impacts on areas of the state where HVHF was permitted.[168] Thus, even if a municipality banned HVHF within its borders, its community character could still be impacted due to greater truck traffic and ancillary activities associated with HVHF wells in neighboring communities.[169]

Finally, DEC noted several public health concerns associated with HVHF.[170] These concerns included soil and water contamination from accidental spills and improper wastewater treatment, air quality impacts resulting from heavy vehicle traffic to and from well pads, and increased rates of traffic fatalities and major injuries.[171]

These negative impacts were found to outweigh the "limited economic and social benefits that would be derived from high-volume hydraulic fracturing."[172] While the economic and social benefits of HVHF have been tremendous on the national stage, DEC reached the conclusion that these impacts would not be as significant on the state level because numerous municipalities throughout New York can prohibit hydrofracking within their borders.[173] Specifically, there are at least ninety-eight municipalities in New York that have some form of hydrofracking prohibition and dozens of other

167. *Id.* at 22.

168. *Id.* at 39.

169. *Id.*

170. *Id.* at 40.

171. N.Y. STATE DEP'T OF HEALTH, A PUBLIC HEALTH REVIEW OF HIGH VOLUME HYDRAULIC FRACTURING FOR SHALE GAS DEVELOPMENT 4 (2014), http://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf.

172. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 5.

173. *Id.* at 22.

municipalities are considering similar prohibitions.[174] The legality of these prohibitions, which cover approximately sixty-three percent of the mineral rich land in New York State,[175] was recently upheld by the New York State Court of Appeals in 2014.[176]

2. Recent New York Decisions Regarding Municipal Bans on Hydrofracking

Before the 2015 FSGEIS banned HVHF statewide, municipalities throughout New York concerned about the possible negative impacts of hydrofracking banned the practice through municipal zoning laws. In June of 2015, the New York Court of Appeals held in *Wallach v. Town of Dryden* that New York's Oil, Gas and Solution Mining Law (OGSML) did not "preempt the home rule authority vested in municipalities to regulate land use."[177] The main issue in *Wallach* was whether two municipalities, the Town of Dryden and the Town of Middlefield, could legally ban oil and gas production activities (including hydrofracking).[178]

In 2006, Norse Energy Corporation began obtaining leases from numerous landowners within the borders of Dryden.[179] Subsequently, in August of 2011, the Dryden Town Board voted unanimously, banning all extraction, storage, and gas exploration within the town's borders.[180] In addition, this ban also invalidated oil and gas permits previously issued by state and federal agencies.[181]

174. *Fracking Bans and Moratoria in NY State*, FRACTRACKER ALLIANCE, http://www.fractracker.org/map/us/new-york/moratoria/ (last visited Oct. 6, 2016).

175. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 38.

176. *See* Wallach v. Town of Dryden, 23 N.Y.3d 728, 739 (2014).

177. *Id.*

178. *Id.* at 739, 740.

179. *Id.* at 740.

180. *Id.*

181. *Id.*

Similarly, in the Town of Middlefield, the Cooperstown Holstein Corporation (CHC) entered into two leases with a landowner in 2007, to develop the natural gas underneath the property.[182] Although the Town argued that their existing zoning ordinance "prohibited natural gas exploration on the basis that it was not listed as a permissible land use, it undertook a lengthy and detailed review of the issue in 2011."[183] Thereafter, the Town Board voted unanimously to amend its master plan adopting "a zoning provision classifying a range of heavy industrial uses, including oil, gas and solution mining and drilling, as prohibited uses."[184]

Before the Court of Appeals, Norse and CHC argued that the statewide OGSML required "a uniform approach and cannot be subject to regulation by a mélange of the state's 932 towns."[185] Additionally, based on the language of the OGSML, they argued it was clear that the language contains an express preemption clause.[186] Specifically, the OGSML states: "[t]he provisions of this article shall supersede all local laws or ordinances relating to the regulation of the oil, gas and solution mining industries; but shall not supersede local government jurisdiction over local roads or the rights of local governments under the real property tax law."[187]

However, before addressing the preemption issue, the court looked for direction from the "home rule" provision in the New York Constitution.[188] This provision provides, "every local government shall have power to adopt and amend local laws not inconsistent with the provisions of this

182. *Id.* at 741.

183. *Id.*

184. *Id.*

185. *Id.* at 742.

186. *Id.*

187. N.Y. ENVTL. CONSERV. LAW § 23-0303(2) (McKinney 2017).

188. *Wallach*, 23 N.Y.3d at 742.

constitution or any general law . . . except to the extent that the legislature shall restrict the adoption of such local law."[189] The court further noted this mandate is implemented through section 10 of the Municipal Home Rule Law, "which empowers local governments to pass laws both for the 'protection and enhancement of [their] physical and visual environment' and for the 'government, protection, order, conduct, safety, health and well-being of persons or property therein.'"[190] In addition, under section 51, home-rule powers "shall be liberally construed" by the courts.[191]

Despite the broad language of the apparent express preemption clause located in the OGSML, the court recognized that the regulation of land use through zoning ordinances is one of the core powers of local government.[192] In addition, the court emphasized, "municipalities may 'enact land-use restrictions or controls to enhance the quality of life by preserving the character and desirable aesthetic features of [the community].'"[193] Conversely, while this power is broad, municipalities simply "may not enact ordinances that conflict with the State Constitution or any general law."[194] However, in order for a local ordinance to be invalidated by the court under preemption, there must be a "clear expression of legislative intent to preempt local control over land use."[195]

In determining whether a supersession clause expressly preempts a local zoning law, the court turned to the three-

189. N.Y. CONST. art. IX, § 2(c).

190. *Wallach*, 23 N.Y.3d at 742 (quoting N.Y. MUN. HOME RULE § 10(1)(ii)(a)(11)–(12) (McKinney 2017)).

191. *Id.* § 51.

192. *Wallach*, 23 N.Y.3d at 743 (quoting Trs. of Union Coll. v. Members of Schenectady City Council, 91 N.Y.2d 161, 165 (1997)).

193. *Id.*

194. *Id.*

195. Matter of Gernatt Asphalt Prods. v. Town of Sardinia, 87 N.Y.2d 668, 682 (1996).

part test established in *Frew Run Gravel Products v. Town of Carroll*.[196] This three-part balancing test considers, "(1) the plain language of the supersession clause; (2) the statutory scheme as a whole; and (3) the relevant legislative history."[197] Under the first factor, the court determined the plain language of the OGSML "does not support preemption with respect to the Towns' zoning laws."[198] In reaching this conclusion, the court emphasized the statute "is most naturally read as preempting *only* local laws that purport to regulate the actual operations of oil and gas activities, not zoning ordinances that restrict or prohibit certain land uses within town boundaries."[199]

Next, the court turned to the relevant statutory scheme surrounding the OGSML, specifically the responsibilities assigned to DEC.[200] In particular, the court noted these responsibilities clearly relate to the "regulation and authority regarding the safety, technical and operational aspects of oil and gas activities across the State."[201] As a result, in relation to the second factor, the court found that while the supersession clause

> invalidates local laws that would intrude on the Department's regulatory oversight of the industry's operations, thereby ensuring uniform exploratory and extraction processes related to oil and gas production . . . we perceive nothing in the various provisions of the OGSML indicating that the supersession clause was meant to be broader than required to preempt conflicting local laws directed at the technical operations of the industry.[202]

196. *See Wallach*, 23 N.Y.3d at 744; Matter of Frew Run Gravel Prods. v. Town of Carroll, 71 N.Y.2d 126 (1987).

197. *Wallach*, 23 N.Y.3d at 744.

198. *Id.* at 749.

199. *Id.* at 746 (emphasis added).

200. *See id.*

201. *Id.* at 750.

202. *Id.*

Finally, the court evaluated the third factor, looking to the legislative history for further guidance.[203] Most importantly, the court noted the legislature's amendment of the OGSML in 1978, which modified

> its policy by replacing the phrase '*to foster, encourage and promote* the development, production and utilization of natural resources of oil and gas in this state in such a manner as will prevent waste' with '*to regulate* the development, production and utilization of natural resources of oil and gas in this state in such a manner as will prevent waste.'[204]

This change from encouraging oil and gas development to regulating development was found to bolster the argument that local bans did not directly conflict with the purpose of the OGSML.[205] Furthermore, the court emphasized that the legislative history never mentioned zoning, "much less evince an intent to take away local land use powers."[206]

After an evaluation of all three factors from *Frew Run*, the court concluded "the Towns appropriately acted within their home rule authority in adopting the challenged zoning laws."[207] In the wake of this decision, municipalities across the state of New York can prohibit hydrofracking within their borders as a valid exercise of their local police power in order to protect the health, safety, and public welfare of their residents.

3. The Unique Characteristics of Liquefied Petroleum Gas Mitigate or Avoid Many of the Concerns Raised by the 2015 FSGEIS

HVHF was banned by the DEC in the 2015 FSGEIS after a finding that (1) the HVHF was associated with numerous potential significant adverse environmental and health impacts and (2) HVHF would only result in limited economic

203. *See id.* at 751–52.

204. *Id.* (quoting N.Y. ENVTL. CONSERV. LAW § 23-0301 (McKinney's 1978)).

205. *Id.* at 753.

206. *Id.*

207. *Id.*

benefits.[208] While the DEC does not explicitly evaluate options using a cost-benefit test, NY ECL § 1-0101(1) required that DEC weigh various factors when evaluating whether to issue a permit, including whether HVHF would further DEC's mission of

1) Conserving, improving, and protecting the State's environment;
2) Preventing, abating, and controlling water, land and air pollution;
3) Enhancing the health, safety, and welfare of the people; and
4) Improving the overall economic and social well-being of the people.[209]

Because these factors will often counsel for different courses of action, approval or disapproval will require weighing these factors against one another. As analyzed above, DEC found that HVHF would negatively impact the first three factors because HVHF would result in environmental disturbances from larger well pads (contravening factor 1);[210] soil and water contamination from accidental spills and improper wastewater treatment (factors 1, 2, and 3);[211] air quality impacts resulting from heavy vehicle traffic to and from well pads (factors 2 and 3);[212] increased rates of traffic accidents and major injuries (factor 3);[213] and unwanted industrialization (factor 3).[214]

Relying on the *Dryden* decision, DEC found that municipal bans would make it "impractical to recover certain

208. *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 4–5.

209. N.Y. ENVTL. CONSERV. LAW § 1-0101(1) (McKinney's 2005).

210. *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 42, at 3.

211. *Id.* at 35.

212. *Id.* at 21.

213. *See id.* at 21.

214. *See id.* at 4.

natural gas reserves in the state."[215] In light of this, DEC found "the expected positive socioeconomic impacts on employment, income, and tax generation associated with high-volume hydraulic fracturing would be substantially less" than the original projections.[216] Thus, DEC found significant adverse impacts, and concluded that allowing HVHF would not be acceptable under its multi-pronged mission.[217]

The unique attributes of LPG would result in a substantially different evaluation under DEC's multi-pronged mission vis-à-vis HVHF. By eliminating the use of water, LPG fracturing completely eliminates "the toxic 'flowback' water" that DEC feared might be spilled or improperly disposed of.[218] DEC estimated that on average, anywhere from 216,000 to 2.7 million gallons of flowback water returns to the surface after drilling an HVHF well.[219] This water cannot simply be disposed of in municipal wastewater plants, as "[s]alts and dissolved solids may not be sufficiently treated by municipal biological treatment and/or other treatment technologies which are not designed to remove pollutants of this nature."[220] Fortunately, with LPG fracking, this is not a concern because water is not utilized in the fracking process, and thus, there is no flowback of wastewater.[221] The LPG used in fracking merely converts back to gaseous propane, which can be harvested with the natural gas at the wellhead.[222]

215. *Id.*

216. *Id.*

217. *See id.* at 34.

218. Brino, *supra* note 150.

219. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 14.

220. *Id.*

221. *See* Soni, *supra* note 48, at 6.

222. *See id* at 5–6.

The complete elimination of water with LPG fracking also eliminates other concerns raised in the 2015 FSGEIS. First, no water needs to be extracted from the environment. DEC noted, "2.4 million to 7.8 million gallons of water may be used for a multi-stage hydraulic fracturing procedure."[223] Extracting such large volumes of water on a daily basis, "could cause modifications to groundwater levels, surface water levels, and stream flow that could result in significant adverse impacts."[224] More importantly, the use of LPG instead of water—particularly since it eliminates the need to transport wastewater to treatment and disposal facilities—reduces truck traffic to and from wells by seventy-five percent.[225] This would greatly mitigate the concern over air quality and traffic expressed by DEC.[226]

Additionally, LPG wells feature smaller well pads than those necessary for HVHF.[227] Specifically, eCorp, an LPG fracking operator, has noted each LPG well pad would need to be about three to five acres in size in order to service a drilling operation covering 3200 acres of Marcellus-rich land.[228] These smaller well pads eliminate one element giving rise to DEC's concern that LPG fracking would create substantial environmental disturbances.

DEC was also concerned that environmental disturbances would result from a widespread increase in the number well pads because HVHF opened many new areas of New York to fracking.[229] However, DEC acknowledged in the 2015 FSGEIS that this concern could be adequately

223. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 10.

224. *Id.*

225. Westenhaus, *supra* note 90.

226. *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 17, 21.

227. Brino, *supra* note 150.

228. *Id.*

229. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 3–4.

mitigated by a phased permitting alternative.[230] Despite this finding, DEC rejected approving HVHF under a phased permitting alternative because such permitting would not address the risks arising from "accidents, spills, and unforeseen events" (such as improper wastewater disposal).[231] Thus, even if DEC found an increased risk of environmental disturbances that would result from the construction of numerous LPG wellpads, a phased permitting alternative for LPG fracking could not be rejected along the same reasoning as it was for HVHF, because LPG's water-free operation already adequately mitigates all of the risks DEC claimed would persist in spite of a phased permitting approach.[232]

DEC also found that a phased permitting alternative would mitigate adverse impacts to community character from unwanted industrialization, including "visual, noise, and transportation impacts that are anticipated to occur as a result of development."[233] Thus, even if DEC were to find the ability of a municipality to ban LPG fracking within its borders was inadequate to provide sufficient protection from unwanted changes to community character, with a phased permitting program, any adverse impacts to community character would be adequately mitigated.[234]

a. *It Is Less Likely LPG Fracking Would Be Opposed at the Local Level*. In addition to mitigating the concerns related to the first three factors of DEC's mission as outlined above, LPG fracking is less likely to be opposed and prohibited at the local level. Because of this, the fourth factor of DEC's

230. *Id.* at 41.

231. *Id.*

232. *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, FINAL SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM 9-9 (2015), http://www.dec.ny.gov/docs/materials_minerals_pdf/fsgeis2015.pdf

233. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 40, at 41.

234. *See id.*

mission, improving the overall economic and social well-being of the people, may weigh more in favor of allowing LPG fracking than it did for HVHF.[235]

First, many of the municipal bans in place would not apply to LPG fracking. For example, the municipal ban in the Town of Wales, in Erie County, makes it

> unlawful for any individual or corporation to engage in the extraction of natural gas or oil utilizing in whole or in part the process commonly known as and herein defined as "hydraulic fracturing" within the Town of Wales, with the exception of gas wells installed and operating at the time of enactment of this article.[236]

"Hydraulic fracturing" was defined by the Town of Wales as

> [a]n operation in which water, chemicals and a solid proppant are pumped into a wellbore at a rate sufficient to increase the pressure downhole to a value in excess of the fracture gradient of the formation rock, causing the formation to crack, thus allowing the fracturing fluid to enter and extend the crack farther into the formation, forming passages through which natural gas or oil can flow.[237]

Thus, this municipal ban, while totally prohibiting HVHF, would not prohibit LPG fracking.[238]

Second, even if municipal bans are written so broadly as to cover both HVHF and LPG fracking, there are strong arguments for amending these bans to exclude LPG fracking given the statements of findings provided in the legislative history of these bans. For example, the Town of Dryden's fracking ban states

> [n]o land in the Town shall be used: to conduct any exploration for natural gas and/or petroleum; to drill any well for natural gas; to transfer, store, process or treat natural gas; or to dispose of natural gas exploration or production wastes; or to erect any derrick, building, or other structure; or to place any machinery or equipment for any such

235. *See* N.Y. ENVTL. CONSERV. LAW § 8-0101 (McKinney 1975).

236. TOWN OF WALES, N.Y., PROTECTION OF NATURAL RESOURCES art. 1, § 162-5(A) (2015).

237. *Id.* § 162-3.

238. *But cf. id.* § 162-5(B) (prohibiting all horizontal fracking; thus, only vertical LPG would be permissible under the Town of Wales' Code).

purposes.[239]

This would prohibit both LPG and HVHF. However, in deciding to adopt this wide-ranging ban on natural gas exploration, the Dryden Town Board first concluded that such exploration would endanger residents' health and the town's environment due to such things as "concentrated traffic;" "potential spillage of flowback water;" and "pollution of local surface waters."[240] As illustrated above, these concerns are either substantially reduced or eliminated due to LPG's lack of wastewater. Therefore, while some municipalities may maintain bans that prohibit all forms of fracking in order to preserve their rural character or achieve other land use goals, towns which banned fracking mainly because of concerns with wastewater and/or traffic may very well revisit these bans.

b. *Local Support for LPG Fracking*. In fact, contrary to the DEC's finding that the economic benefits of HVHF would be severely limited by municipal bans on HVHF, municipalities have already noted their support for LPG fracking. Both the Town of Barton and Tioga County have passed resolutions supporting the application by the Snyder Farm Group to frack using LPG.[241] In addition, while the decision in *Wallach* may limit the net acreage available for drilling, many municipalities throughout New York would welcome and encourage fracking within their borders. As of this writing, at least forty-five municipalities have instituted or proposed resolutions in favor of hydrofracking.[242]

239. TOWN OF DRYDEN, N.Y., ZONING ORDINANCE, art. XXI § 2104(1) (2011).

240. *Special Board Meeting*, TOWN OF DRYDEN 9 (Aug. 2, 2011), http://dryden.ny.us/Board_Meeting_Minutes/TB/2011/TB2011-08-02.pdf .

241. *See NY Town Supports, Antis Fundraise Against, Waterless Fracking*, MARCELLUS DRILLING NEWS (Nov. 25, 2015), http://marcellusdrilling.com/2015/11/ny-town-supports-antis-fundraise-against-waterless-fracking/.

242. *Fracking Bans and Moratoria in NY State*, *supra* note 174.

4. The Economic Effects of LPG Fracking Would Be Significant

While DEC dismissed the widespread economic impacts of fracking in the 2015 FSGEIS, several studies have shown that oil and gas development creates not only a significant amount of economic activity, but also new jobs, and increased tax revenue.[243] A study by the Public Policy Institute of New York found that if New York allowed hydrofracking, "by 2018 just 2,500 wells (500 per year) . . . would create 62,620 jobs."[244] Additionally, a study released by Penn State in 2009 found that "the Marcellus gas industry in Pennsylvania generated $2.3 billion in total value added, more than 29,000 jobs, and $240 million in state and local taxes during 2008."[245] These effects, combined with the fact that numerous communities seem willing to embrace fracking—including LPG fracking—require DEC not to write off the fourth part of its multi-pronged mission, especially in light of the reduced negative impacts associated with LPG fracking as noted above.

5. Acceptance of LPG by the World's Leading Energy Companies

These hypothetical economic benefits from LPG fracking would not weigh in favor of permitting it in New York if the oil and gas industry were unlikely to adopt LPG. However, this is not the case. In 2011, one of the world's leading energy producers, Chevron, used LPG technology to frack several natural gas wells located within the Piceance Basin in Colorado, home to some of the most lucrative oil, coal, and natural gas deposits in the world.[246] In Chevron's 2011

243. Kiernan, *supra* note 6, at 795.

244. *Id.*

245. TIMOTHY J. CONSIDINE ET AL., THE ECONOMIC IMPACTS OF THE PENNSYLVANIA MARCELLUS SHALE NATURAL GAS PLAY: AN UPDATE, at ii (2009).

246. *See* Westenhaus, *supra* note 90; CHEVRON CORPORATION, 2011 SUPPLEMENT TO THE ANNUAL REPORT 17 (2011), http://www.chevron.com/

Supplement to the Annual Report, the company noted that LPG fracking "significantly increases production while minimizing water use."[247] This project was a significant step for Chevron, which currently has 67,000 acres of property leased within the play and expects to recover 3.5 *trillion* cubic feet of gas.[248]

In addition to Chevron, San Antonio based BlackBrush Oil and Gas signed a two-year contract with GasFrac to utilize the technology within the Eagle Ford Shale.[249] At the time, co-CEO of BlackBrush, Phil Mezey stated that "LPG brought 'oil production at a sustainable rate weeks earlier than with the standard water frac and we are seeing huge savings on disposal of frac fluids."[250] Consequently, due to the widespread success in utilizing LPG, BlackBrush agreed to a long-term partnership with GasFrac to continue using the technology.[251] Additionally, in October of 2012, the second-largest natural gas producer in the United States, Chesapeake Energy Corporation,[252] teamed up with GasFrac to test the technology in the Utica Shale in Tuscarawas County, Ohio.[253] Finally, several sources have noted, "[t]he adoption of LPG fracking would be in accordance with the code of ethics laid out by the Society of Petroleum Engineers. One of their canons specifically states 'engineers seek to

documents/pdf/chevron2011annualreportsupplement.pdf.

247. CHEVERON CORPORATION, *supra* note 246, at 56.

248. *Id.* at 17.

249. Westenhaus, *supra* note 90.

250. *Id.*

251. *GasFrac Signs Long Term Agreement with Blackbrush for the Eagle Ford and Other Unconventional Oil Plays in South Texas*, MARKETWIRED (Feb. 28, 2012), http://www.marketwired.com/printer_friendly?id=1625699.

252. Joe Carroll, *Chesapeake Testing 'Green' Fracking Fluids in Shale Wells*, BLOOMBERG (Oct. 2, 2012), http://www.bloomberg.com/news/articles/2012-10-02/chesapeake-testing-green-fracking-fluids-in-u-s-shale-wells.

253. *Chesapeake Tries Waterless Fracking at OH Utica Shale Well*, MARCELLUS DRILLING NEWS (Mar. 11, 2015), http://marcellusdrilling.com/2015/03/chesapeake-tries-waterless-fracking-at-oh-utica-shale-well.

adopt technical and economical measures to minimize environmental impact.'"[254]

Understandably, many companies have been slow to test LPG technology, particularly with natural gas prices falling rapidly and with many companies declaring bankruptcy or ceasing operations within certain plays.[255] In that regard, Jody C. Jones, Chesapeake's Manager of Environmental and Regulatory Affairs recently stated, "[t]he main concern with testing something like this is you just spent $4 to $6 million to drill a well and taking an untested frack system and shooting it down a well could ruin a reservoir and you'd be throwing away all that money."[256]

Despite this concern, it is clear that using LPG is an efficient and economically viable way to frack, provided natural gas prices are not extraordinarily low. Thus, DEC should not write off the economic benefits of LPG fracking just because it might not be embraced immediately. In fact, if DEC were to do this it would be acting in an unjustifiably idiosyncratic way. While current natural gas prices may reduce the net economic benefit in the short term by limiting the number of wells drilled,[257] fewer wells would also reduce the adverse impacts of LPG fracking, such as truck traffic. Thus, when DEC is evaluating LPG under its four-part mission, the fact that fewer wells might be drilled until

254. Janiczek, *supra* note 120, at 2 (quoting *Ethics and Integrity Matter in the Workplace, Part 1*, SOC'Y OF PETROLEUM ENG'RS (Sept. 15, 2013), https://www.spe.org/en/print-article/?art=552%20or%20http://blogs.bakerhughes.com/reservoir/2013/07/26/petroleum-engineering-professionalism-and-ethics).

255. *See* Matt Piotrowski, *In the Shale Patch: 42 Bankruptcies, and Counting*, THE FUSE (Jan. 22, 2016), http://www.energyfuse.org/in-the-shale-patch-42-bankruptcies-and-counting (noting that in 2015 alone, 42 oil and gas companies filed for bankruptcy, totaling $17 billion in debt).

256. Carroll, *supra* note 252.

257. *See Somber Milestone—US Rig Count Hits Lowest Level in 68 Years*, MARCELLUS DRILLING NEWS (Mar. 14, 2016), http://marcellusdrilling.com/2016/03/somber-milestone-us-rig-count-hits-lowest-level-in-68-years.

natural gas prices recover should, at worst, be considered a wash.

6. The Current Use of Liquefied Petroleum Gas Storage Fields in New York

An objection may be raised that LPG fracking presents new dangers, different to those posed by HVHF, because it involves injecting a flammable substance into the earth. The reality is such injections of LPG were specifically ratified in the 1992 GEIS.[258] The 1992 GEIS noted that New York had three LPG underground storage facilities, located in the Medina and Oriskany sandstone formations.[259] The Oriskany sandstone formation, where trillions of McF (1000 cubic feet) of LPG is currently stored, is the formation *directly below* the Marcellus Shale.[260] Therefore, since the Marcellus is a relatively thin formation, averaging between 50 and 100 feet wide[261] in New York, storing the gas in the Oriskany shows that the presence of LPG at that depth, only yards below the Marcellus (which is itself 2000–4000 feet below the surface in New York)[262] is a safe, and time-tested practice. DEC further notes "the ideal cavern storage rock [for LPG] is an impervious granite, shale, or a deep salt bed with no permeability."[263] Consequently, because the

258. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS, AND SOLUTION MINING REGULATORY PROGRAM 14-13, 14-14 (1992), ftp://ftp.dec.state.ny.us/dmn/download/geismaster.pdf.

259. *Id.* at 14-1.

260. *Geologic Formations of New York State*, TIOGA COUNTY LANDOWNERS GROUP, http://www.tiogagaslease.org/gasformations.html (last visited Jan. 15, 2016). *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 258, at 14-16 (noting that Watkins Glen, New York is the largest LPG storage facility, holding 50.6 million gallons).

261. *Marcellus Shale Thickness*, PENN ST. MARCELLUS CTR. FOR OUTREACH & RES., http://www.marcellus.psu.edu/images/Marcellus_thickness.gif (last visited Mar. 8, 2016).

262. *Depth of Marcellus Shale Base*, *supra* note 12.

263. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 258, at 14-3.

Marcellus Shale formation is also impermeable,[264] injecting LPG into the Marcellus would be as safe as injection into the Oriskany. The gas could not permeate into other formations and is, therefore, unlikely to infiltrate water sources.[265] Finally, in the 1992 GEIS, DEC noted that LPG must only be injected into "solid rock [formations] at depths usually greater than 400 feet."[266] As such, any injection of LPG into the Marcellus would be at least five to ten times deeper than the minimum prescribed depth issued by DEC.[267]

C. *DEC's Recent Statement Regarding the Use of LPG in New York*

In the 2015 FSGEIS, DEC specifically addressed LPG as an alternative to HVHF and the potential benefits of the technology.[268] The relevant statement reads:

> The use of LPG, consisting primarily of propane, has the advantages of carbon dioxide and nitrogen cited above; additionally, LPG is known to be a good carrier of proppant due to the higher viscosity of propane gel. Further, mixing LPG with natural gas does not 'contaminate' natural gas; and the mixture may be flowed directly into a gas pipeline and separated at the gas plant and recycled. LPG's high volatility, low weight, and high recovery potential make it a good fracturing agent. Use of LPG as a hydraulic fracturing fluid also inhibits formation damage that can occur during hydraulic fracturing with conventional fluids. Using propane not only minimizes formation damage, but also eliminates the need to source water for hydraulic fracturing, recover flowback fluids to the surface and dispose of the flowback fluids. As a result of the elimination of hydraulic fracturing source water, truck traffic to and from the wellsite would be greatly reduced. In addition, since LPG is less reactive with the formation matrix, it is therefore less likely to mobilize constituents which could increase NORM levels in the flowback fluid.[269]

264. *See* ADAMS ET AL., *supra* note 4, at 13.

265. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 258, at 14-3.

266. *Id.* at 14-14.

267. *See id.*

268. *See* N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 232, at 9-9.

269. *Id.*

This statement clearly shows DEC recognizes the advantages of LPG fracking over HVHF. In addition, this statement serves as important precedent and a reliable indicator from New York's top environmental agency that LPG is a viable and environmentally friendly alternative to HVHF.

IV. DEC SHOULD APPROVE THE SNYDER FARM GROUP'S APPLICATIONS TO FRACK WITH LPG

Thus far, this Comment has shown that (1) LPG fracking is not banned in New York under the 2015 FSGEIS and (2) that LPG fracking is unlikely to be banned under a subsequent FSGEIS because its unique characteristics mitigate and/or eliminate the concerns raised in the 2015 FSGEIS that led DEC to ban HVHF. Further, as noted in the 2015 FSGEIS, and by Emily DeSantis, DEC's Director of Public Information,[270] proposed LPG fracking operations would be evaluated under the 1992 GEIS. This Part argues that unless there are site-specific issues that would cause an application to frack using LPG to be denied on other grounds, LPG fracking applications should generally be approved under the 1992 GEIS.

A. *The 1992 GEIS and Findings Statement*

Under the 1992 GEIS and Findings Statement, "[t]he permitting of any standard, individual oil, gas . . . or gas storage well, pursuant to the Oil, Gas and Solution Mining Law and its current regulations . . . is considered to be a *non-significant action* under the State Environmental Quality Review Act [SEQR]."[271] This non-significant action status means that under a SEQR review for any wells drilled, a

270. *See* Brino, *supra* note 150.

271. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 258, at FGEIS12 (emphasis added).

negative declaration will be issued for the proposal.[272]

The importance of this finding cannot be overstated. Once DEC has issued a negative declaration, no further environmental review is required.[273] This decision saves not only valuable time, but also potentially thousands of dollars in studies that must be performed when a positive declaration is issued. Therefore, only under specific sets of circumstances will DEC "require detailed site-specific environmental assessment (i.e. long-form EAF) and may require site or project specific environmental impact statements."[274]

These circumstances in which DEC will require a long-form EAF include

> [o]il and gas drilling permits in Agricultural Districts if more than two and one-half acres will be altered including the access road[,] [o]il and gas drilling permits in State Parklands[,] [o]il and gas drilling permits when other DEC permits are required[,] [o]il and gas drilling permits less than 2,000 feet from a municipal water supply well[,] [n]ew major waterflood or tertiary recovery projects[,] [n]ew underground gas storage projects or major modifications[,] [n]ew solution mining projects or major modifications[,] [b]rine disposal drilling or conversion permits[, and] [a]ny other project not conforming to the standards, criteria or thresholds required by the draft and final GEIS.[275]

Therefore, DEC will find an LPG fracking project to be a significant action *only* if they deem other permits from DEC are required, or that the project does not conform to the "standards, criteria or thresholds required."[276]

272. *See How Does SEQR Work?*, N.Y. STATE DEP'T OF ENVTL. CONSERVATION, http://www.dec.ny.gov/permits/6199.html (last visited Mar. 8, 2016).

273. *SEQR Handbook: Type II Actions*, N.Y.S. DEP'T OF ENVTL. CONSERVATION, http://www.dec.ny.gov/permits/39800.html (last visited Mar. 8, 2016).

274. N.Y. STATE DEP'T OF ENVTL. CONSERVATION, *supra* note 258, at FGEIS12.

275. *Id.* at 12-13.

276. *Id.*

B. *The Wells Drilled by Baker Hughes Provide Precedent in Favor of Approving the Liquefied Petroleum Gas Permits*

Further bolstering the argument that LPG fracking applications should be approved is the fact that DEC has approved a similar, gas-based fracking application. Baker Hughes, "one of the three largest oil service companies in the world," recently utilized their VaporFrac system to drill wells in New York.[277] The VaporFrac system

> pumps an ultralightweight proppant mixture directly into a high-pressure nitrogen or carbon dioxide gas stream that goes into the wellbore. Unlike the traditional hydraulic process, the technique creates a flow stream that is 94 to 96 percent gas, which significantly reduces freshwater requirements, the use of chemical additives, postfrac cleanup time and water disposal costs.[278]

A report by Kimmeridge Energy noted that Baker Hughes' system had been tested in New York *under* the moratorium in 2012.[279] DEC granted permits

> to use the technique on a vertical well with just 80,000 gallons of fluid . . . The operation in New York, although only conducted on a vertical well, focused on two zones more than 2,000 ft. (609 m) deep in the Marcellus [S]hale, using 40,000 lb. of LiteProp ultralightweight proppant, 7 MMcf [one million cubic feet] of nitrogen and less than 20,000 gallons of water. The operator reported the results exceeded expectations, with initial production, limited by the vertical nature of the hole.[280]

Therefore, it would seem if DEC evaluated the two wells reported by Kimmeridge under the 1992 GEIS, there is not only precedent, but strong precedent for granting of the Snyder well permits under the 1992 GEIS, particularly because the Snyder well will be fracked completely without water.

277. KIMMERIDGE ENERGY, *supra* note 113, at 7.

278. *Id.* at 7.

279. *Id.*

280. *Id.* at 7–8.

CONCLUSION

While a total ban on HVHF in New York may have gotten the "*Ithaca Journal* off of the governor's back,"[281] LPG fracking offers an environmentally sound way to eliminate the often-cited environmental concerns of contaminated flowback water and the problem of subsequent disposal of that wastewater. Overall, LPG is not only environmentally sound, but proves that despite popular belief, New York is not completely closed to horizontal fracking. Rather, "[t]he continued use and ultimate success of the LPG gel fracing method depends upon the outcome of a simple cost-benefit analysis."[282] Based on the submitted permits and the move to sidestep the 2015 FSGEIS, it is clear landowners within the Southern Tier of New York are not only frustrated, but will continue to look for loopholes to utilize their property as they see fit, as the rightful mineral owners of one of the largest shale gas formations in the country.

The reality is that despite the declining cost of natural gas, it is indisputable "that the tremendous amount of shale gas in New York is not going to go anywhere. The deposits have been in place perhaps as long as 400 million years, so a [seven]-year debate on whether and how to extract the gas is not very long."[283] Although the Governor is an elected official, influenced by the will of the electorate, he is not elected to affect macroeconomics.[284] Therefore, while politics develops and changes with the electorate's will, industry will continue to develop new technologies to frack that may be more environmentally advantageous. These developments will be particularly vital in states like New York and Pennsylvania, which are concerned with the contamination of water sources and long-term disposal issues. Fortunately, LPG could prove

281. Kiernan, *supra* note 6, at 798.

282. Wilson, *supra* note 45, at 156.

283. Kiernan, *supra* note 6, at 808.

284. *See id.* at 784, 809.

to be a major force of change for industry norms.[285]

More immediately, within the next several months, DEC will be forced to take action on the permit request from Tioga Energy Partners and the Snyder Farm Group. DEC's decision will once again reawaken the political battle over fracking in Albany, especially if—as this Comment argues it should—DEC approves the permit. Those who will undoubtedly protest if DEC approves LPG fracking should heed current U.S. Senator Jim Inhofe from Oklahoma, who recently stated:

> Using shoddy science to pursue an agenda that prevents America from responsibly using our own energy resources is unacceptable. It damages our own energy independence at a time when the nation is on the verge of outpacing countries like Saudi Arabia with the natural gas industry leading the way. These wrong-headed efforts to over regulate this important sector of our economy would mean lost jobs, lost revenues, and increased costs for every American family.[286]

New York landowners will continue to look for ways to utilize their property in ways they see fit, and industry continues to look for ways to make the practice of hydraulic fracturing increasingly environmentally sound. The future of the American energy industry and of American energy independence will remain "in the hands of the voters and the politicians that will seek to eliminate . . . control, or expand the use of hydraulic fracturing in the years to come."[287]

285. Wilson, *supra* note 45, at 154–55.

286. Press Release, U.S. Senate Comm. on Env't & Pub. Works, Vitter, Inhofe Call EPA's Report on Hydraulic Fracturing in Wyoming a Failure (Jan. 17, 2013), https://www.epw.senate.gov/public/index.cfm/press-releases-republican?ID=4964EF96-C550-A429-40BC-488BC859D41A.

287. ADAMS ET AL., *supra* note 4, at 111.