



Warnings for Appalachia in Texas Ethane Storage Hub

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Communities in Appalachia are at risk from a plan for an aggressive expansion of the petrochemical and plastic production industry, including construction of a massive new ethane storage hub. Area decision-makers and residents need to consider the serious hazards that have arisen at a similar development complex in Mont Belvieu, Texas.

Background

When natural gas is extracted from the ground, liquids generally also are produced. These liquid hydrocarbons, called natural gas liquids (“NGLs”), may be used as raw materials for manufactured products such as petrochemicals and plastics. The original product, termed “Y-grade,” must be “fractionated” into so-called “purity products,” (meaning that 90% of the product consists of one type of chemical) such as ethane, propane, isobutane, normal butane or pentanes plus, for use.¹ Many players in the fracking industry hope that expanding the petrochemicals and plastics industries will enable them to sell NGLs at a high price, which would enable the fracking industry to reap sustained profits.² The Midstream Energy Group noted in 2012 that, “in a low gas price environment, NGL value is a key component of cash flow for gas producer.”³ The pressure to exploit NGL is even greater today, because fracking of natural gas is financially troubled.⁴

The fossil fuel industry currently is planning a heavy buildout of the petrochemical and plastic production industry in an area of Appalachia comprised of parts of Ohio, Pennsylvania and West Virginia. Much of this buildout appears to depend on construction of a massive new ethane storage hub “intended to be a catalyst for further mid- and downstream development” by providing a long-term supply of raw materials for petrochemicals and plastics. The Trump Administration has expressed strong support for development of such a hub in Appalachia.⁵

¹ See U.S. Energy Information Administration (“EIA”), *Natural Gas Weekly Update* (Oct. 4, 2018) (available at https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2018/10_04/).

² The Midstream Energy Group reported in 2012 that NGLs were becoming “a growing source of revenue for gas producers.” A. Keller, Midstream Energy Group, “NGL 101: The Basics,” EIA conference presentation (June 6, 2012) (available at https://www.eia.gov/conference/ngl_virtual/eia-ngl_workshop-anne-keller.pdf), slide 16.

³ *Id.*, slide 18.

⁴ See, R. Elliott, “Frackers Face Harsh Reality As Wall Street Banks Back Away,” *Wall Street Journal* (Feb. 24, 2019) (available at <https://www.wsj.com/articles/frackers-face-harsh-reality-as-wall-street-backs-away-11551009601>) (“Frequent infusions of Wall Street capital have sustained the U.S. shale boom. But that largess is running out.”); Institute for Energy Economics and Financial Analysis (IEEFA), News Release: “Fracking Companies in Appalachia Struggle Financially” (July 17, 2019).

⁵ See U.S. Department of Energy, Report to Congress, *Ethane Storage and Distribution Hub in the United States* (Nov. 2018) (available at:

Details on the Proposed Appalachia Ethane Hub and Petrochemical Industry Build-Out

The Appalachia Development Group, LLC (“ADG”) has proposed to build a giant ethane storage hub in Appalachia to store 75 million to 100 million barrels of ethane.⁶ The site for this facility has not yet been finalized, but it would be located in either Pennsylvania, Ohio, or West Virginia. The storage project would require construction of pipelines and other infrastructure to collect and distribute feedstocks from all three states, and possibly Kentucky,⁷ serving fracking operations in the Marcellus, Utica and Rogersville shale areas.⁸ It is projected to cost approximately \$10 billion.⁹

ADG has applied to the U.S. Department of Energy (“DOE”) for a \$1.9 billion loan guarantee for the project, as noted in a DOE report advocating for an ethane storage hub.¹⁰ The move is controversial. Environmental groups argue that the Title XVII program – which is intended to support projects that avoid, reduce or sequester air pollution or greenhouse gas emissions through new or significant improved technologies¹¹ – has never before been used to finance a fossil fuel storage project, but they fear the Trump administration will approve it.¹²

Meanwhile, Energy Storage Ventures, LLC, is developing a smaller ethane storage facility, the Mountaineer Natural Gas Liquid storage project, in Monroe County, Ohio (also part of the Appalachian region), with a permitted capacity of 3.25 million barrels.¹³ The Mountaineer hub is projected to be much smaller, at least initially, than the ADG proposed facility. Energy Storage Ventures plans to spend \$500 million on the Mountaineer hub.¹⁴

Based on the track record of the industry as a whole, these projects pose safety risks for communities in the affected areas of Appalachia.

History of Explosions, Fires and Groundwater Contamination

NGLs are costly to manage, store, and transport compared to refined products. As one industry expert explains, they require “high pressure and/or low temperature to maintain liquid state for shipment and handling” and are “highly flammable.” A plume of NGLs poses a particular risk because the vapor is heavier than air: It “‘crawls’ instead of rising.” Controlling NGLs requires

<https://www.energy.gov/sites/prod/files/2018/12/f58/Nov%202018%20DOE%20Ethane%20Hub%20Report.pdf>) (hereafter, *USDOE 2018 Report on Ethane Storage and Distribution Hub*), pp. 8 and 30.

⁶ American Chemistry Council, Economics & Statistics Department, “The Potential Economic Benefits of an Appalachian Petrochemical Industry” (May 2017), p. 9.

⁷ K. Kowalski, “Appalachian Gas Storage Hub Seeks Federal Clean Air Loan Guarantee,” *Energy News* (May 31, 2019) (available at: <https://energynews.us/2019/05/31/midwest/clean-energy-loan-guarantee-could-be-a-stretch-for-natural-gas-liquids-hub/>).

⁸ *USDOE 2018 Report on Ethane Storage and Distribution Hub*), p. 30.

⁹ ShaleDirectories.com, “Pittsburgh Panel Discusses Importance of NGL Storage” (available at: <https://www.shaledirectories.com/blog/pittsburgh-panel-discusses-importance-of-ngl-storage/>)

¹⁰ *USDOE 2018 Report on Ethane Storage and Distribution Hub*), p. 30.

¹¹ 42 U.S.C. § 16513.

¹² K. Kowalski, *supra*.

¹³ *USDOE 2018 Report on Ethane Storage and Distribution Hub*, p. 30.

¹⁴ ShaleDirectories.com, *supra*.

“special trucks, ships and storage (thick steel, insulated tanks, or underground caverns for large volumes).”¹⁵

It was the heaviness of vapors that caused a horrendous incident connected with a salt cavern storage site in Texas. On April 7, 1992, a pipeline feeding a salt cavern storage site near the town of Brenham leaked gas. Because the gas was heavier than air, it accumulated at the base of a small valley overnight. The gas suddenly exploded, killing a five-year-old boy immediately, while a mother and her adult daughter died a few days later of their injuries.¹⁶

Currently, three ethane hubs exist in North America, two in the United States and one in Canada. By far the largest of the three is the one in Mont Belvieu, Texas, about 35 miles northeast of Houston.¹⁷ The Mont Belvieu hub, which began construction in 1950 and has expanded over time,¹⁸ includes several above-ground fractionators that separate Y-grade into purity NGLs before injecting large amounts of it into underground salt caverns.¹⁹ The hub has developed pipeline, rail and trucking systems for land transport of products as well as offshore systems for shipping.²⁰ The hub was storing 100 million barrels of petrochemicals in the Mont Belvieu salt caverns in 2011.²¹ Today, it covers 14 square miles and reportedly has 240 million barrels of NGL storage capacity in some 125 underground salt caverns.²² The Appalachian proposed storage hub, similarly, would sit atop large salt formations.

Ethane storage hubs escalate pollution risks by encouraging the development of other petrochemical industrial facilities and pipeline/transport systems. The Mont Belvieu hub is able to charge roughly three times more for its ethane than the hub in Conway, Kansas, largely because of its proximity to petrochemical industrial facilities and its transportation system.²³ The DOE praises the Mont Belvieu hub’s close proximity to petrochemical plants, oil refineries, and other industrial complexes, which has allowed it to become a major commodities trading hub. The DOE deems this substantially advantageous, if not essential.²⁴ The DOE report therefore strongly implies that it would likely support such development for the proposed ADG ethane hub which, like Mont Belvieu, would be a large-scale petrochemical complex.

¹⁵ A. Keller, Midstream Energy Group, *supra*, slide 27.

¹⁶ R. Suro, “Gas Explosion Tears Through Texas Pastures,” *New York Times* (April 8, 1992) (available at <https://www.nytimes.com/1992/04/08/us/gas-explosion-tears-through-texas-pastures.html>); and “Salt Dome Explosion 20 Years Later,” *The Eagle* (April 7, 2012) (available at https://www.theeagle.com/blogs/fajitas_for_one/salt-dome-explosion-years-later/article_cab6128c-019b-11e2-8e7e-0019bb2963f4.html).

¹⁷ *USDOE 2018 Report on Ethane Storage and Distribution Hub*, p. 39. The other two existing hubs in North America are in Conway, Kansas and in Sarnia, Ontario. The Conway hub’s capacity is about 21 million barrels. The Sarnia hub’s capacity is about 20 million barrels. *Id.*, pp. 42-45.

¹⁸ *USDOE 2018 Report on Ethane Storage and Distribution Hub*, p. 5.

¹⁹ R. Carson, “Texas Petroleum Plant Ablaze,” *Reuters* (Feb. 8, 2011) (available at http://www.nbcnews.com/id/41477580/ns/us_news-life/t/texas-petroleum-plant-ablaze/).

²⁰ *USDOE 2018 Report on Ethane Storage and Distribution Hub*, p. 40.

²¹ R. Carson, *supra*.

²² *USDOE 2018 Report on Ethane Storage and Distribution Hub*, pp. 39-40. See also D. Fehling, “On the Edge of Houston, Underground Caverns Store Large Quantities of Natural Gas Liquids,” *KUHT TV 8* (Houston) (Oct. 19, 2015) (available at <https://www.houstonpublicmedia.org/articles/news/2015/10/19/124674/on-edge-of-houston-underground-caverns-store-huge-quantities-of-natural-gas-liquids/>).

²³ U.S. Energy Information Administration, *Natural Gas Weekly Update* (Oct. 4, 2018), *supra*.

²⁴ *USDOE 2018 Report on Ethane Storage and Distribution Hub*, pp. 40 and 80.

While a great deal of cheerleading for the projects has taken place in Appalachia, few in the region know that the Mont Belvieu hub complex in Texas has been plagued with explosions, evacuations, company buyouts, and industrial accidents, as well as repeated chemical leaks and drinking water contamination issues. Hazardous conditions have been so severe that they have caused fatalities and forced the evacuation and even permanent relocation of local resident.

Residents of the Appalachian region should carefully review the history of the Mont Belvieu complex before they take a position regarding construction of a comparable facility. The following incidents are listed consecutively, starting from most recent publicized event:

June 20, 2018: firefighters were responding to a smaller tank fire on Sun Oil Road when the explosion of a larger tank occurred. No injuries were reported due to the explosion. The Farm-to-Market road (FM) 565 N near Winfree/Sun Oil was closed to through traffic during the response operations.²⁵

September 15, 2017: the Enterprise Plant reportedly experienced an explosion and fire in a brine pit. At the site of the fire, saltwater is injected into caverns to get natural gas and oil out. The fire was put out in about an hour.²⁶

June 26, 2016: evacuations were ordered, as a precaution, for parts of Mont Belvieu after a well fire at a Lone Star facility reportedly “sent flames shooting into the sky.”²⁷ On the same day, a pressure build-up in a well head, part of the Lyondell/Basell pipeline storage facility. Portions of Texas Highway 146 were closed as well.²⁸

Feb. 8, 2011, explosions and a fire “ripped through” a natural gas liquid fractionation plant and storage facility at Enterprise Products in Mont Belvieu, killing a worker. Flames reportedly consumed a large portion of the plant, belching “thick black smoke” and causing adjacent parked vehicles to catch fire.²⁹

The incidents listed above occurred after efforts had been made to improve safety in the industry.

The 1980s and 1990s had been characterized by multiple explosions and fires in the Mont Belvieu area as well as fatalities and forced evacuations – so much so that in 1988, *The New York Times*

²⁵ Fox 26 Houston staff, “Tank Fire Contained in Mont Belvieu,” *Fox 26* (June 20, 2018) (available at www.fox26houston.com/news/oil-tank-fire-in-mont-belvieu).

²⁶ “No Threat to Public From Mont Belvieu Industrial Plant Fire,” *ABC News 13* (Sept. 15, 2019) (<https://abc13.com/no-threat-to-public-from-mont-belvieu-plant-fire/2421785/>).

²⁷ B. Balch, “Mont Belvieu Under ‘Precautionary Evacuation’ Because of Leak,” *Houston Chronicle* (June 26, 2016) (available at <https://www.chron.com/news/houston-texas/article/Mont-Belvieu-area-under-precautionary-8326036.php>).

²⁸ L. Lee, “Chemical Plant Incidents Prompt Evacuations in Mont Belvieu,” *ABC News 13* (June 26, 2016) (available at <https://abc13.com/news/plant-incident-prompt-evacuations-in-mont-belvieu/1402363/>), including a statement issued by Lyondell/Basell at the time.

²⁹ “Texas Petroleum Plant Ablaze,” *NBC News* (2/8/2011) (available at http://www.nbcnews.com/id/41477580/ns/us_news-life/t/texas-petroleum-plant-ablaze/#.XTc4RHspDIU). While the worker originally was reported as missing, it was later determined that he had been killed. See <https://rmqlawfirm.com/mont-belvieu/>.

published an article chronicling the disruption of this small Texas town caused by the pollution and safety hazards stemming from the industrial site.³⁰ Those earlier incidents occurred under conditions of weak regulation and enforcement – a condition that was somewhat improved about five years after the 1992 death of the child in a pipeline leak described above, when the U.S. Department of Transportation Pipeline & Hazardous Materials Safety Administration issued an advisory to operators of gas and hazardous liquid underground storage facilities requiring them to create design and operation guidelines.³¹

Nevertheless, as oversight agencies continue to be weakened by budget cuts and pressure to water down regulations, one cannot assume that the Appalachian region would be protected by vigorous monitoring and enforcement. The following earlier incidents therefore continue to be a warning:

In July 1986, it was discovered that brine from the storage facility (water with five times the saltiness of ocean water) had leached into the drinking water supply.³² Thirteen petrochemical companies bought out about 200 homes in the Barbers Hill community in Mont Belvieu later in 2016 as families relocated to escape the danger in their town.³³ Mont Belvieu shifted its town center about 2 miles east.³⁴

On November 5, 1985, two workers were killed in a triple explosion in Mont Belvieu when they cut into an underground pipeline at the Warren Petroleum Company refinery and storage facility, which was owned by Chevron USA, merely to conduct routine maintenance. About 1800 people were evacuated.³⁵ This explosion occurred in the underground salt caverns. The fire's intensity prevented workers from reaching valves to shut off propane feeding the blaze until 2:30 p.m., and the bodies of the two men were not found until 5:00 p.m.³⁶

In October, 1984, two fires occurred in underground storage wells in Mont Belvieu, causing \$7.6 million in damages.³⁷

In 1984, a Dow Chemical Co. pipeline rupture caused an explosion and fire that leveled one home and damaged four other buildings.³⁸

³⁰ P. Applebome, "Chemicals in Salt Cavern Hold Pain for Texas Town," *New York Times* (Nov. 28, 1988) (available at: <https://www.nytimes.com/1988/11/28/us/chemicals-in-salt-caverns-hold-pain-for-texas-town.html>).

³¹ R. Suro, *supra*, and "Salt Dome Explosion 20 Years Later," *supra*.

³² S. Warren, "Safety Questions Pepper Salt Domes," *Chicago Tribune* (May 10, 1992) (available at <https://www.chicagotribune.com/news/ct-xpm-1992-05-10-9202110568-story.html>); "Texas Petroleum Plant Ablaze," *NBC News*, *supra*.

³³ "Petrochemical Industry Buys Out Town," *Dallas Morning News* (Dec. 14, 1987) (available at https://www.joc.com/petrochemical-industry-buys-out-texas-town_19871214.html); P. Applebome, *supra*).

³⁴ R. Carson, *supra*.

³⁵ "Petrochemical Industry Buys Out Town," *supra*; "Human Error Caused Refinery Explosion, Officials Say," *AP* (Nov. 8, 1985) (available at <https://www.apnews.com/a256159a5518cb42c3c7d1f9f66106a6>).

³⁶ P. Dittrick, "Another Industry Disaster Strikes Texas Town," *UPI* (Nov. 6, 1985) (available at <https://www.upi.com/Archives/1985/11/06/Another-industry-disaster-strikes-Texas-town/2084500101200/>).

³⁷ P. Dittrick, *supra*.

³⁸ "Human Error Caused Refinery Explosion, Officials Say," *supra*; B. Balch, *supra*.

In 1980, about 829 million cubic feet of underground gases leaked. The leak, which was discovered when a woman’s dishwasher ignited fumes within her home, forced the evaluation of more than 70 families, some for over half a year.³⁹ **After this incident, the downtown area of Mont Belvieu was relocated.**⁴⁰

Uncontrolled Pollution from Sporadic, Often Unplanned Flaring of Gases

Today, NGL storage hubs have frequent, sporadic, uncontrolled air pollution emission events because of the practice of “flaring” (burning with no pollution control equipment) of product. In many petrochemical plants and storage systems, flaring is used to burn off gases released by pressure relief valves when over-pressuring conditions occur in plant equipment. Flaring is also used for planned startups and shutdowns of plant equipment. The gas is flared rather than incinerated with pollution control technology because it is simpler and cheaper to dispose of the gases that way.

Researchers note that gas flaring “is a prominent source” of carbon monoxide, carbon dioxide, sulfur dioxide, polycyclic aromatic hydrocarbons (“PAHs”), smog-forming volatile organic carbons (“VOCs”), nitrogen oxides and soot (black carbon).⁴¹

Natural gas liquid storage facilities and related petrochemical processing plants can have significant flaring episodes with excessive emissions. The Mont Bellevue complex experiences several such flaring episodes in a year. For examples:

From July 18 to July 21, 2019, a 72 hours-long “emission event” occurred which was actually authorized. A “process flare” at the Enterprise Mont Belvieu Complex exceeded its emission limit for carbon monoxide – actual emissions were nearly 15 times the emission limit (3,000 total pounds when the emission limit was 2.87 pounds per hour). Emissions of Propylene (Propene) were twice the emission limit (3,000 total pounds when the emission limit was 20.09 pounds per hour).⁴²

From July 11 to July 14, 2019, a 72-hours-long “emission event” occurred which was – again – actually authorized. Again, a “process flare” at the Enterprise Mont Belvieu Complex exceeded its emission limit for carbon monoxide – but this time the actual emissions were nearly 107 times the emission limit (22,000 total pounds when the emission limit was 2.87 pounds per hour). Emissions for ozone-forming

³⁹ “Human Error Caused Refinery Explosion, Officials Say,” *supra*; P. Applebome, *supra*.

⁴⁰ B. Balch, *supra*.

⁴¹ O.G. Fawole, *et al.*, “Gas Flaring and Resultant Air Pollution: A Review Focusing on Black Carbon,” *Environ. Pollution*, 216:182-197 (2016) (<https://www.sciencedirect.com/science/article/pii/S0269749116304638>); D. T. Allen, *et al.*, “Carbon Dioxide, Methane and Black Carbon Emissions From Upstream Oil and Gas Flaring in the United States,” *Curr. Opin. Chem. Engin.* 13:119-123 (2016) (available at <https://www.sciencedirect.com/science/article/pii/S2211339816300569>).

⁴² Texas Commission on Environmental Quality (“CEQ”), “Air Emission Event Report Database Incident 316259 (available at <https://www2.tceq.texas.gov/oce/eer/index.cfm?fuseaction=main.getDetails&target=316259>).

nitrogen oxides were 125 times the emission limit (4,500 total pounds when the emission limit was 0.5 pounds per hour).⁴³

From May 28 to June 2, 2019, a shutdown of a regeneration air compressor at the Enterprise Mont Belvieu Complex resulted in an authorized process flare that lasted 115 hours. The carbon monoxide emissions were 44 times the emission limit (14,584.18 pounds when the emission limit was 2.87 pounds per hour), and the Propylene (Propene) emissions were more than double the emission limit (5,107.75 pounds when the emission limit was 20.09).⁴⁴

The Texas Commission on Environmental Quality documents 17 emission incidents, whether authorized or unauthorized, in 2019 alone specifically for the Mont Belvieu complex. Additional pollution events are documented for facilities in close proximity to the Mont Belvieu facility, such as fractionator plants.

Conclusion

Appalachian communities around the proposed ethane storage facility in Pennsylvania, Ohio, or West Virginia would have little ability to monitor or take enforcement action to control the safety risks from the proposed facilities. And while many promises can be made about safety when the industry is making proposals, the community has little recourse for unfulfilled promises once a large petrochemical facility has already been established and has commenced operations.

⁴³ Texas CEQ, "Air Emission Event Report Database Incident 315557 (available at <https://www2.tceq.texas.gov/oce/ee/index.cfm?fuseaction=main.getDetails&target=315557>).

⁴⁴ Texas CEQ, "Air Emission Event Report Database Incident 309612 (available at <https://www2.tceq.texas.gov/oce/ee/index.cfm?fuseaction=main.getDetails&target=309612>).