December 23, 2021

VIA FEDERAL RULEMAKING PORTAL
William S. Schoonover
Associate Administrator for Hazardous Materials Safety
Pipeline and Hazardous Materials Safety Administration
Department of Transportation
1200 New Jersey Avenue SE
Washington, DC 20590-0001

Re: Suspension of HMR Amendments Authorizing Transportation of Liquefied Natural Gas by Rail
Docket No. PHMSA-2021-0058 (HM-264A); RIN 2137-AF55

Dear Mr. Schoonover,

Delaware Riverkeeper Network and Maya K. van Rossum, the Delaware Riverkeeper, (collectively, "DRN") submit these comments in support of the Pipeline and Hazardous Materials Safety Administration's ("PHMSA's") proposal to amend the Hazardous Materials Regulations to suspend authorization of liquefied natural gas ("LNG") transportation in rail tank cars. The suspension, however, should not include an automatic termination date in the event that the rulemaking process under RIN 2137-AF54 takes longer than expected. DRN also urges PHMSA to cease special permit authorization of LNG by rail on an *ad hoc* basis pending completion of PHMSA's rulemaking process under RIN 2137-AF54.

PHMSA's proposal to suspend authorization of LNG transportation in rail tank cars should be finalized because it addresses the threat to public health and safety as well as the environment.

DRN supports the proposed suspension with limited modifications detailed below. When the original LNG by Rail Rule was finalized in July 2020, PHMSA did not have sufficient information to conclude that LNG could be transported safely in rail tank cars, and indeed the record had ample evidence that the activity was too dangerous to authorize. DRN attaches and hereby incorporates its original comments in that rulemaking.[1]

DRN requests that PHMSA implement the proposed suspension as expeditiously as

[1] Attachment "A".

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possible to guarantee that no transport of LNG by rail will occur prior to the completion of the rulemaking process.

An automatic termination date should not be included in the suspension, as it is not reasonably related to the risks of transporting LNG by rail.

Throughout the preamble to the proposed suspension, PHMSA highlights uncertainty regarding potential benefits and safety and environmental risks of rail transportation of LNG, and how this level of uncertainty was not foreseen at the time the LNG by Rail Rule was finalized. It is now clear that the LNG by Rail Rule was prematurely finalized, and DRN commends PHMSA for proposing a suspension of LNG by rail to protect the public and the environment. However, by including an arbitrary date by which the suspension will terminate, PHMSA creates the risk that LNG by rail will be authorized nationwide despite continued or increased uncertainty. Instead, the temporary suspension should continue until completion of the rulemaking process in RN 2137-AF54.

PHMSA explains that it chose June 30, 2024, "to give PHMSA adequate time to incorporate the results of the forthcoming TRB Phase II Report—expected in mid-2022—within its companion rulemaking under RIN 2137-AF54." 86 Fed. Reg. at 61,737. This rationale begs the question–why not wait until PHMSA *actually* incorporates the results of the Phase II Report and concludes the rulemaking process? Waiting until the completion of the rulemaking process achieves all of the purposes of the proposed suspension without any of the risks of harm to communities and the environment that a "drop-dead" date would entail.

Throughout the preamble to the proposed suspension, PHMSA cites the disruptive and unforeseen effects of the COVID-19 pandemic on its ability to obtain the necessary information to evaluate LNG by rail. As we enter the second year of this global pandemic, we are grappling with a new variant that is spreading rapidly and further disrupting all aspects of society. The unpredictability of the COVID-19 pandemic indicates that timelines are not as predictable as they were pre-2019. PHMSA would provide more certainty to the public and communities faced with the possibility of LNG by rail through their neighborhoods if it continued the suspension until the conclusion of the rulemaking process, without the inclusion of a "drop dead" date based on when PHMSA *hopes* to be far enough along in the process. Given the lack of reliance interests in transporting LNG by rail, there is little to no justification for prematurely resurrecting the LNG by Rail Rule.

PHMSA should suspend consideration of LNG by rail on an *ad hoc* basis under its special permit program pending the outcome of the rulemaking process.

Once the suspension goes into effect, any company[2] seeking to transport LNG by rail tank car would need to seek specific relief from new special provision 439 through the special permit process. *See* 49 § C.F.R. 107.105(c)(1). DRN supports and appreciates

[2] Including Energy Transport Solutions, who is currently seeking renewal of its expired special permit DOT-SP 20534. That permit provided specific relief from 49 C.F.R. § 172.101 Column (8C), which, at the time of the special permit application, did not authorize rail tank cars as packaging for LNG.

PHMSA's proposal to hit "pause" on *all* currently-authorized LNG by rail transport while it undertakes the necessary information gathering and analysis needed to reach its decision about LNG by rail transport nationwide. For the same reasons outlined in the preamble of the notice of proposed suspension, PHMSA should not consider *any* special permit applications seeking relief from the suspension unless on an emergency basis necessary to prevent significant injury to persons or property or for immediate national security purposes. *See* 49 C.F.R. § 107.117(a)(1), (2).

Authorization of LNG by rail on an *ad hoc* basis for non-emergency purposes creates a risk that a decision by PHMSA regarding a special permit will contradict findings and conclusions reached in the rulemaking process under RIN 2137-AF54. Piecemeal approval of LNG by rail operations would likely result in a patchwork of operators subject to different standards, and will unfairly subject certain communities to the risks of LNG by rail transport prior to PHMSA's final safety and environmental analyses. These communities targeted by industry are often already overburdened with health, safety, and environmental risks. Additionally, the attention from the public devoted to special permit applications, as opposed to a nationwide rule, is substantially diminished. Thus, a special permit application commenting period is unlikely to generate the same level of engagement and information-sharing that the nationwide rulemaking process will, which could result in PHMSA missing out on important public input that would improve safety and environmental protection.

As made clear by the timeline detailed in the preamble to the proposed suspension, when PHMSA issued a special permit to Energy Transport Solutions in the midst of its LNG by rail rulemaking process,[3] it resulted in conflicting standards as to what model of tank car was adequate. Especially now, when PHMSA is recognizing the need for additional study and proposing to suspend all LNG by rail transport, PHMSA should avoid making the same mistake twice and *also* hit "pause" on consideration of all non-emergency special permit applications seeking to transport LNG by rail pending the outcome of the rulemaking process.

In addition, the devotion of agency resources to evaluating a special permit application may create an administrative burden that further delays the rulemaking process, thus potentially extending the rulemaking process beyond the currently-proposed "drop-dead" date of June 30, 2024,[4] and allowing LNG by rail to prematurely commence nationwide.

Suspending consideration of non-emergency special permits will allow PHMSA to reach a comprehensive understanding of the risks and benefits associated with transportation of LNG by rail through its rulemaking process while protecting the public, property, and the environment from unreasonable and unnecessary harm. It will also promote the fair treatment of all communities, who equally deserve protection from safety and environmental hazards. Due to the practically nonexistent demand for transportation of LNG by rail and the industry's lack of means to do so, a temporary suspension of non-

[3] DRN submitted comments in opposition to the issuance of DOT SP 20534, attached hereto as Attachment "B".

[4] As discussed previously in these comments, DRN urges PHMSA to eliminate this date and terminate the temporary suspension only upon completion of the rulemaking process under RIN 2137-AF54.

emergency special permit authorizations will not result in any adverse impacts on reliance interests.

Conclusion

DRN supports the proposal to suspend authorization of LNG transportation in rail tank cars pending the completion of the rulemaking under RIN 2137-AF54. DRN requests, however, that PHMSA not allow the suspension to automatically terminate by a certain date, but rather keep it in effect until the rulemaking process has completed. In addition, PHMSA should not approve any special permit applications seeking relief from the suspension unless on an emergency basis necessary to prevent significant injury to persons or property or for immediate national security purposes.

Sincerely,

Maya K. van Rossum
the Delaware Riverkeeper

Tracy Carluccio
Deputy Director

Kacy C. Manahan
Senior Attorney

Enclosures

Attachment A

December 20, 2019

Re: Docket Number PHMSA–2018–0025 (HM–264)

Delaware Riverkeeper Network (DRN) submits this comment in opposition to the proposed rulemaking by the Pipeline and Hazardous Materials Safety Administration (PHMSA), with the Federal Railroad Administration (FRA), to change the Hazardous Materials Regulations to allow for the bulk transport of Methane, refrigerated liquid, commonly known as liquefied natural gas (LNG), in rail tank cars. The proposal would authorize the transportation of LNG by rail in the DOT-113C120W specification rail tank car. DRN opposes the proposed Hazardous Material Regulation changes and calls for the denial of the proposed rulemaking and the Proposed Alternative.

PHMSA received a Petition for rulemaking from the Association of American Railroads (AAR) and President Trump's April 10, 2019, "Executive Order on Promoting Energy Infrastructure and Economic Growth," which orders "The Secretary of Transportation shall propose for notice and comment a rule, no later than 100 days after the date of this order, that would treat LNG the same as other cryogenic liquids and permit LNG to be transported in approved rail tank cars."[1] According to the Executive Order (E.O.), the rulemaking is to be finalized within 13 months after April 10, 2019, the date of the E.O. (Sec. 4(b)).[2] DRN points out that neither the Petition nor the E.O. can violate current laws, rules, or regulations. Our nation's laws are in force to protect the public and the environment and the environmental rights of all, including generations yet to come.

PHMSA and the FRA jointly hold the mission "…to manage, and reduce, the risk to people and the environment by the transport of hazardous material by rail."[3] The current prohibition of transport of bulk LNG by rail car is based on the lack of necessary provisions in current regulations to provide for the safe transport of LNG by rail car and a lack of perceived need for the use of the railways for LNG transport. Neither of these circumstances has changed. Therefore, DRN

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[1] https://www.whitehouse.gov/presidential-actions/executive-order-promoting-energy-infrastructure-economic-growth/

[2] Ibid.

[3] NJDOT, Pipeline and Hazardous Materials Safety Administration, Docket No. PHMSA-2018-0025 (HM-264) RIN 2137-AF40, Hazardous Materials: Liquefied Natural Gas by Rail, NPRM Preliminary Regulatory Impact Analysis, October 2019, Executive Summary.

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concludes that LNG should not be allowed to be transported by rail car on the nation's railways; the proposed rulemaking and Proposed Alternative are unsubstantiated and must be rejected.

The rulemaking proposal is described by PHMSA as "deregulatory". PHMSA seems to use this description to avoid performing certain analyses, including those required by applicable environmental laws and regulations, such as a full Environmental Impact Statement under NEPA. In fact, PHMSA seems to bend over backwards to make no substantial changes to the current regulations such as operational controls for safety purposes and specific controls for the use of "unit trains" (20 rail cars or more of the same material), stating they lack information.[4] They state that there is not enough data on the transport of LNG by tank cars to inform what additional safety controls should be imposed. They also state that they do not know when "unit trains" would be used and initially expect only a few tank cars as part of manifest trains. This is then used as an excuse for not requiring further testing and regulatory controls on LNG in DOT-113C120W specification rail tank cars, which are proposed by PHMSA to be used to transport LNG.[5]

In comment submitted to PHMSA December 5, 2019, the National Transportation Safety Board (NTSB) questions this rationale and PHMSA's lack of specific operational controls in the proposed rulemaking, such as those used for high-hazard flammable trains.[6] NTSB states that President Trump's Executive Order suggests a need for a much greater deployment of LNG by rail than a few cars in manifest trains and references the application from Energy Transport Solutions (ETS) for PHMSA Special Permit SP 20534 that projects unit trains of 50-100 shipments (rail cars) per day.[7]

Additional evidence that unit trains would be employed as soon as possible is the economy of scale presented in PHMSA's Cambridge Systematics Risk Assessment ("Risk Assessment") issued in March 2019. In discussion of LNG Mode Choice, it is stated that rail delivery takes longer due to operational imperatives when rail cars are sorted into manifest trains. The Risk

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[4] Notice of Proposed Rulemaking, U.S. DEPARTMENT OF TRANSPORTATION, Pipeline and Hazardous Materials Safety Administration, 49 CFR Parts 172 and 173, [Docket No. PHMSA-2018-0025 (HM-264)], RIN 2137-AF40, Hazardous Materials: Liquefied Natural Gas by Rail, p. 21. "PHMSA recognizes that there may be other operational controls or combinations of controls to consider and encourages comments on such controls. However, for this rulemaking, PHMSA and FRA decided not to propose additional operational controls because there is not sufficient data about the potential movements of LNG by tank car."

[5] Ibid, p. 21-22. "While PHMSA expects LNG will initially move in smaller quantities (i.e., a few tank cars) as part of manifest trains, it is uncertain whether LNG will continue to be transported in those quantities or if LNG by rail will shift to be transported using a unit train model of service, and if so, how quickly that shift will occur."

[6] National Transportation Safety Board, letter to U.S.D.O.T., RE. Docket No. PHMSA -2018-0025 (HM-264), d. 12.5.2019.

[7] Ibid, p. 4. "The urgency provided by the President's Executive Order suggests that LNG transportation by rail as a viable alternative to highway transportation is envisioned to entail greater amounts than mere incidental numbers of tank cars in manifest trains. Additionally, the August 21, 2017, ETS application for a special permit to transport methane, refrigerated liquid in DOT-113 tank cars (just one potential LNG by rail shipper), states that it anticipates operating two LNG unit trains, 50 to 100 tank cars, per day. Therefore, the NTSB disagrees with PHMSA's assertion that the number of LNG shipments would be minimal and that proposing additional operational controls in this NPRM is unnecessary".

Assessment states, “This would be different if unit trains were employed, in which only LNG railcars were transported from origin to destination without required railyard sorting”.[8]

DRN agrees with the conclusion by NTSB that the evidence does not support PHMSA’s assertion that the volume and frequency of LNG transport by rail would be minimal to start and therefore does not require operational controls. NTSB points out that even if there is a gradual increase in the transport of LNG by rail in these tank cars, the risk of catastrophe is too great to justify not imposing operational controls.[9]

The proposed rulemaking allows unit trains with no new required operational controls and since PHMSA imposes no limits on ramp-up, the deployment of unit trains and frequent, large rail shipments will be allowed to occur before adequate safety controls. Without any LNG-specific operational controls, public safety, worker safety, and the environment are put at great risk. Similar to the speedy ramp-up of the use of rail cars for the transport of crude oil, communities along the railways will be used as guinea pigs to test in real time if the DOT-113C120W is safe to carry LNG.

This is an outrageous circumstance and cannot be allowed. We only have to witness the catastrophic loss of 47 people’s lives, devastating environmental damage, and tremendous economic harm of the train derailment in Lac-Mégantic, Canada in 2013 to recognize the consequences of the lack of adequate safety controls. Additionally, numerous derailments and disastrous incidents occurred on the railways across the U.S. when the industry deployed crude oil trains without adequate safety controls.

NTSB questions PHMSA’s determination that DOT-113C120W specification rail tank cars are safe for LNG transport without a comprehensive review of the cars regarding the potential for release of LNG in an accident. NTSB points out that puncture and thermal exposure resistance of these tank cars needs to be evaluated if they are to be used for LNG transport. Furthermore, they question PHMSA’a reference to the information presented in the Exponent Report submitted by ETS for PHMSA Special Permit SP 20534 as sufficient, stating that it is only “anecdotal” and that Exponent states that there is no loss of containment probability data available. Drawing conclusions about these essential questions based on reference or proxy data from other types of hazardous substances without knowing how the properties of these substances compare with LNG is not defensible. PHMSA also does not offer any applicable data.

In fact, PHMSA’s Risk Assessment states “when the probability of LNG tank car derailment is understood, better decisions can be made regarding crashworthiness, placement, and operation

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[8] Cambridge Systematics, Inc. *with* MaineWay Services, LLC, Rutgers University, Transport Analytics, LLC., ScienceSmith LLC., “Risk Assessment of Surface Transport of Liquid Natural Gas”, *prepared for* U.S. DOT Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, 3.20.2019, p. ES-5.

[9] Ibid, p. 4, “A gradual initial ramp-up of LNG rail transportation would likely occur because of the limited availability and high cost of DOT-113 tank cars. Nonetheless, we believe the risks of catastrophic LNG releases in accidents is too great not to have operational controls in place before large blocks of tank cars and unit trains proliferate.”

of rail cars and the potential consequences from an LNG release due to a derailment".[10] The National Association of State Fire Marshals (NASFM) has gone on the record with PHMSA opposing the Proposed Rulemaking based on "the lack of evidence and research that allowing such an action as proposed in the docket is safe either for America's first responders or the public".[11] Clearly, those who respond to incidents and events on the railways are in a position to know when safety is being adequately addressed and when it is not. Mr. Narva of the NASFM goes on to state, "The combination of a lack of information with no increased safety measures is a dangerous proposition. This only serves to put the public and our first responders at even greater risk."[12]

It is inarguable that testing of DOT-113C120W specification rail tank cars for transport of LNG must be required prior to their use. PHMSA does not have sufficient information to assert any findings regarding safety of DOT-113C120W specification rail tank cars for transport of LNG. Without this research, the use of DOT-113C120W rail cars must be denied.

NTSB urges PHMSA to require train crew separation from potential LNG release locations due to the particular properties of LNG. Odorless and colorless, those close to the source of release could be unaware of a release and could lack sufficient warning to protect themselves. Asphyxiation, freeze burn, and exposure to a fire and explosion can occur quickly and be fatal.[13] These properties mandate worker protections that cannot be ignored.

DRN points out that proximity to populations, occupied structures, sensitive environmental features and vulnerable operations/facilities must be considered based on LNG's properties. PHMSA's reference to some jurisdiction's codes that occupied structures can be as close as 50 feet from a railroad track illustrates the lack of adequate separation.[14] These features are all at risk due to the unique and highly dangerous properties of LNG releases, supporting the denial of the proposed rulemaking and PHMSA's Proposed Alternative.

NTSB states that large quantities of LNG can be released in a rail car derailment, warning "…such a release could be more severe than releases from cargo tank motor vehicles. Recent history with unit train shipments of ethanol and crude oil demonstrate how unprepared federal regulators were

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[10] Cambridge Systematics, Inc. *with* MaineWay Services, LLC, Rutgers University, Transport Analytics, LLC., ScienceSmith LLC., "Risk Assessment of Surface Transport of Liquid Natural Gas", *prepared for* U.S. DOT Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, 3.20.2019, p. ES-9.

[11] Comment submitted by James D. Narva, Executive Director, National Association of State Fire Marshals to PHMSA re. Docket Number PHMSA-2018-0025 (HM-264) – LNG by Rail.

[12] Ibid.

[13] Ibid, p. 6. "Given the potential hazards of LNG when released, as described in the Exponent, Inc. quantitative risk analysis report and the NPRM regulatory analysis as including fireballs, flash fire, and explosions from ground-level vapor clouds that may vigorously expand far beyond the point of release to an ignition source, cryogenic material thermal exposure hazards, and asphyxiation hazards for a colorless and odorless gas that lack sufficient warning properties, the NTSB urges PHMSA to implement appropriate train crew separation distance requirements…"

[14] NJDOT, Pipeline and Hazardous Materials Safety Administration, Docket No. PHMSA-2018-0025 (HM-264) RIN 2137-AF40, Hazardous Materials: Liquefied Natural Gas by Rail, NPRM Preliminary Regulatory Impact Analysis, October 2019, p.43.

to address the spate of fiery flammable liquids accidents that occurred between 2009 and 2015 until regulations for HHFTs were published."[15]

The NPRM, the Preliminary Regulatory Impact Analysis and PHMSA's Risk Assessment discuss the known hazards of LNG, should the liquid be released from a container. Also examined are operational and material challenges such as the stress that containers undergo to hold the super-cooled LNG and the embrittlement of the materials holding it. It is well documented that catastrophic events can result from release of LNG.

One problem with these described potential disasters is the lack of acknowledgement of the potential for explosion of the vapor cloud even without an ignition source, if containment is present. The evidence of a BLEVE is also compelling but is not acknowledged. That type of incident must be assessed and taken into consideration by PHMSA.

New information has shown that LNG can cause a catastrophic BLEVE or Boiling Liquid Expanding Vapor Explosion if the vessel is exposed to high temperatures or a fire. The expansion of the liquid LNG in a vessel causes the pressurized liquid to boil, and the gas takes up more room than the liquid, stressing the container as pressure builds. Relief valves are only designed to release pressure slowly to keep equilibrium in the pressurized container. Exposed to high heat, the valve will fail to keep up and the metal will weaken, cracks will result in the container, causing LNG to be released with an explosion. The result is a BLEVE and a catastrophic failure of the container. There are many incidents over the years of BLEVE catastrophes, some as recent as 2019, but the fact that a BLEVE can occur with LNG has only recently been established.

When the gas or vapor cloud in the container is released, because it is flammable it is likely to ignite after the BLEVE, typically causing a fireball that burns fast, hot and wide. A fuel air explosion can also occur, known as a "vapor cloud explosion". A vapor cloud explosion is the mechanism used in a thermobaric weapon that uses air to generate a high-temperature explosion, producing a long duration blast wave. These weapons are also termed a fuel-air bomb. A BLEVE where there is no liquid in the local environment to absorb the heat can rupture even faster than a vessel on water. This is the threat that transport brings, in a rail car, truck or other type of container.[16] The potential impacts of a BLEVE resulting from a release of LNG during transport in DOT-113C120W specification rail tank cars must be fully assessed for this proposed rulemaking.

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[15]National Transportation Safety Board, letter to U.S.D.O.T., RE. Docket No. PHMSA -2018-0025 (HM-264), d. 12.5.2019, p. 6.

[16] In 2002, an LNG truck in Spain flipped over, burned, then exploded into a 500-foot fireball that killed the driver and burned two others. 'The severity of this kind of explosion is something people haven't usually considered applicable to LNG trucks,' says Jerry Havens, former director of the Chemical Hazards Research Center at the University of Arkansas. 'But what happened in Spain changes that picture. It shows you've got the potential for a massive explosion'. In the accident in Spain, a BLEVE occurred, which resulted in death to the driver and burns to two people approximately 650 feet away, and threw large flaming debris, including the truck's diesel engine, for 853 feet. A similar LNG truck accident with a catastrophic fire occurred in Spain in 2011, killing the driver.

The DOT-113C120W rail tank car has a LNG capacity of ~30,680 gallons or up to 142,500 lbs. of LNG.[17] A typical "semi-truck" tank car holds 9,000 gallons and 80,000 lb. gross weight. [18] Tank trucks cars can hold up to 12,000 gallons of product.[19] According to PHMSA's Risk Assessment dated March 20, 2019, a truck with a cryogenic container can haul about 9,300 gallons of LNG; a rail car can hold approximately 30,000 gallons of LNG.[20] The Risk Assessment states in a different section of the report that a tank truck holds 10,943 gallons of LNG, which is equal to 0.9 million cubic feet of natural gas.[21] LNG expands to a gas 600 times larger than the volume of liquid that is contained. The potential for a large release with greater impact is more likely from a rail car carrying LNG than a truck carrying LNG. DRN does not support either of these modes of transport due to unresolved and unknown safety risks but there is no evidence presented to support PHMSA's conclusion that rail car transport is safer than truck transport.

One reason PHMSA offers for trucks being less safe is that there are reports made to PHMSA of truck accidents transporting LNG (8 reported between 2005 and 2017). PHMSA states, "While PHMSA understands there are limited rail shipments of Methane, refrigerated liquid, compared to highway transportation, PHMSA and FRA have no record of any reported incidents involving Methane, refrigerated liquid in portable tanks transported by rail since 2005."[22] It is patently ridiculous to conclude anything about the likelihood of derailments, accidents or releases of LNG transported by rail car without any meaningful statistical data. The fact is there is no data because there has been minimal transport of LNG by rail and no transport of LNG in DOT 113 rail cars is undeniable. The lack of data and research to support a conclusion that LNG can be safely transported by rail is a valid basis for denial of the proposed rulemaking and Proposed Alternative.

PHMSA has provided a look at the safety history of DOT 113 rail cars and discusses some incidents with other types of cargos or liquids. PHMSA concludes: "It is difficult to estimate the failure rate of the DOT-113 tank car in derailments because railroads are not required to report incidents to PHMSA or FRA unless they meet a baseline threshold. 49 CFR 171.16 and 225.19. Incident data suggests that incidents involving rail tank cars can lead to higher consequence incidents; however, PHMSA believes that rail transportation is advantageous considering the quantity transported compared to miles traveled."[23] The history is, by PHMSA's own admission, incomplete due to the threshold for reporting. PHMSA also admits higher consequence incidents can occur but dismisses that danger by saying less trips will be made. There is no factual basis presented for this conclusion, however.

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[17] http://files.chartindustries.com/14722936_LNG_Railcars.pdf

[18] https://en.wikipedia.org/wiki/Tank_truck

[19] CENAP-OP-R-2016-0181-39 -- Gibbstown Logistics Center Port Expansion, Supplemental Public Notice, 7.16.2019, p. 2.

[20] Cambridge Systematics, Inc. *with* MaineWay Services, LLC, Rutgers University, Transport Analytics, LLC., ScienceSmith LLC., "Risk Assessment of Surface Transport of Liquid Natural Gas", *prepared for* U.S. DOT Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, 3.20.2019, p. 24.

[21] Ibid, p. 40.

[22] Notice of Proposed Rulemaking, U.S. DEPARTMENT OF TRANSPORTATION, Pipeline and Hazardous Materials Safety Administration, 49 CFR Parts 172 and 173, [Docket No. PHMSA-2018-0025 (HM-264)], RIN 2137-AF40, Hazardous Materials: Liquefied Natural Gas by Rail, p. 34.

[23] Ibid, p. 35-36.

In examining truck transport frequency and volume today, PHMSA's Risk Assessment states that there is "limited ability to capture current truck movements".[24] DRN points out that this once again calls into question the substantive data that proves a need for LNG to be transported by rail. Section 4 of the Risk Assessment analyzes the LNG supply chain, showing that of the 65.1 MMCF moved in 2016, trucks moved 0.004 percent.[25] Trucks are the mode of transport currently being used to deliver LNG domestically and much of the need is seasonal and dependent on very cold weather when regions such as New England need supplemental heating fuel. This is a very limited demand that cannot justify the risks posed by the large scale transport of LNG by rail cars that would be allowed under the Proposed Rulemaking and Proposed Alternative.

The information provided seems to show that this seasonal, occasional need is being adequately met by small truck movements, undermining the argument that there is need for quantities of LNG to be moved by rail. In discussion about the economic competitiveness of LNG using rail versus road, PHMSA's Risk Assessment states, "Over distances greater than 300 miles, rail transport of bulk materials becomes competitive with road, provided that the shipments are not time sensitive".[26] That is hardly a reasonable rationale for the huge investment that would need to be made by industry to manufacture the rail cars, make the investments necessary in operations and management, and gear up in myriad ways necessary to use rail cars for LNG transport, especially considering that the use of LNG domestically is usually time-sensitive, struggling to meet changing and labile weather conditions that dictate that market.

Further, the shipments overseas of domestic natural gas are very large volumes that do not, as a rule, use intermodal transport of truck or rail but are exported directly from the liquefaction plant to shipping vessels; most LNG liquefaction plants are located on waterfronts and coasts. DRN does not support LNG export facilities at any location due to public health, safety, and environmental considerations, but certainly, PHMSA fails to prove a need for rail transport from liquefaction plants across the nation. In the Risk Assessment, it is stated that LNG by rail "could provide duplication and redundancy".[27] Such cursory and limited purpose cannot justify the dangers involved.

This expansion of LNG surface transportation entails substantial and unwarranted threats. There is no evidence presented that there is stranded LNG waiting for rail transport, no unmet demand. The proposed rulemaking can be more accurately described as an attempt to assist an ailing natural gas industry looking for markets and a fresh raison d'etre; another way to induce more gas drilling and natural gas development. Yet the favor being shown to the special interests who will profit imposes heavy burdens on the public and environment. These impacts are discussed later in this comment.

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[24] Ibid, p. 38-39.
[25] Ibid, p. 38.
[26] Cambridge Systematics, Inc. *with* MaineWay Services, LLC, Rutgers University, Transport Analytics, LLC., ScienceSmith LLC., "Risk Assessment of Surface Transport of Liquid Natural Gas", *prepared for* U.S. DOT Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, 3.20.2019, p. 50.
[27] Ibid, p. ES-5.

DRN has compiled a history of LNG accidents, shared in this comment as **Appendix A**.

Lack of Need, Weak Demand, Negative Economics

PHMSA has not provided a case for bona fide need for transport of LNG by rail. For instance, the framing of the proposed rulemaking assumes unbridled exponential growth of natural gas in the coming years to meet electricity generation demand. While the U.S. Energy Information Administration forecasts an increase of natural gas power plants and states such as Pennsylvania are permitting dozens of new natural gas-fired electric facilities, these forecasts are in many ways self-fulfilling prophecies. Many of the sources cited in PHMSA's Risk Assessment are "industry", who are certainly not independent analysts.[28] It is assumed by PHMSA that as other fossil fuels and nuclear generation are phased out, natural gas is the preferred, even inevitable, choice.

This is simply not true. This biased narrative by PHMSA ignores several realties: the growth and displacement of fossil fuel and nuclear energy sources by renewable, clean, less risky, greenhouse gas-free sources of energy; the lack of stability and reliability of the natural gas industry due to poor economic footing; and the increasing awareness by communities and decisionmakers of the enormous negative public health, safety, and environmental burdens imposed by natural gas development, making its future trajectory tenuous. These issues are outlined in the following section of comments.

Furthermore, the assumption that LNG exports will be in demand is also unfounded in light of the fierce competition for markets with foreign LNG generators and global politics that make these markets uncertain. The fact that there is currently an LNG glut and prices are "underwater" does not bode well for LNG's future viability as an export commodity.

Again, PHMSA's proposed rulemaking and their Risk Assessment frame the LNG market as an ever-expanding market, ignoring that there are highly competitive world resources that have been in place and in use for decades. In fact, that is why the U.S., until recently, was a net importer of LNG; the production of LNG by foreign nations is well developed. PHMSA's Risk Assessment verifies exports from Qatar, Australia, Malaysia, Nigeria, and Indonesia as top exporters, with the U.S. third from the bottom in terms of LNG export volumes.[29] Additionally, the proximity of point of origin/production to point of use is much more economically advantageous when overseas shipping is avoided or reduced, such as within continents. This is further discussed in these comments below.

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[28] For instance, The Cambridge Systematics Risk Assessment states, "Altogether, between exports and gas-fired generation, industry analysts predict just over 13 Bcf/d of new gas demand in 2022." Cambridge Systematics, Inc. *with* MaineWay Services, LLC, Rutgers University, Transport Analytics, LLC., ScienceSmith LLC., "Risk Assessment of Surface Transport of Liquid Natural Gas", *prepared for* U.S. DOT Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, 3.20.2019, p. 13.

[29] Cambridge Systematics, Inc. *with* MaineWay Services, LLC, Rutgers University, Transport Analytics, LLC., ScienceSmith LLC., "Risk Assessment of Surface Transport of Liquid Natural Gas", *prepared for* U.S. DOT Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, 3.20.2019, p. 20.

From OilPrice.com: Nick Cunningham, "Shale Pioneer: Fracking Is An 'Unmitigated Disaster', OilPrice.com, June 24, 2019.

"Fracking has been an 'unmitigated disaster' for shale companies themselves, according to a prominent former shale executive: 'The shale gas revolution has frankly been an unmitigated disaster for any buy-and-hold investor in the shale gas industry with very few limited exceptions,' Steve Schlotterbeck, former chief executive of EQT, a shale gas giant, said at a petrochemicals conference in Pittsburgh. 'In fact, I'm not aware of another case of a disruptive technological change that has done so much harm to the industry that created the change.'[30]

"The message is not a new one. The shale industry has been burning through capital for years, posting mountains of red ink. One estimate from the Wall Street Journal found that over the past decade, the top 40 independent U.S. shale companies burned through $200 billion more than they earned. A 2017 estimate from the WSJ found $280 billion in negative cash flow between 2010 and 2017. It's incredible when you think about it – despite the record levels of oil and gas production, the industry is in the hole by roughly a quarter of a trillion dollars.

The red ink has continued right up to the present, and the most recent downturn in oil prices could lead to more losses in the second quarter."[31]

"Meanwhile, as the financial scrutiny increases on the industry, so does the public health impact. A new report that studied over 1,700 articles from peer-reviewed journals found harmful impacts on health and the environment. Specifically, 69 percent of the studies found potential or actual evidence of water contamination associated with fracking; 87 percent found air quality problems; and 84 percent found harm or potential harm on human health."[32]

From Wall Street Journal: Bradley Olson and Rebecca Elliott, "Frackers Face Harsh Reality as Wall Street Backs Away", Wall Street Journal, Feb. 24, 2019.

"But in 2016, federal regulators concerned about banks' exposure to shale drillers tightened standards for lending to oil-and-gas companies after dozens went bankrupt amid the drop in commodity prices. The U.S. Treasury Department guidelines require lenders to regard loans as troubled if a company's total debt reaches more than 3.5 times a producer's earnings, excluding interest, taxes and other accounting items.
Many banks now prefer to keep operators below 2.5 times earnings, bankers and lawyers said. Still, 20 companies were at 2.5 times or higher in the third quarter, and the industry remained more indebted at that time than during the same period three years ago, according to S&P Global Market Intelligence."[33]

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[30] https://oilprice.com/Energy/Energy-General/Shale-Pioneer-Fracking-is-an-Unmitigated-Disaster.html
[31] Ibid.
[32] Ibid.
[33] https://www.wsj.com/articles/frackers-face-harsh-reality-as-wall-street-backs-away-11551009601

An E and E News article quoted the Wall Street Journal and industry analysts saying that a glut of natural gas with few customers was causing a downturn in 2017. "Many investors were betting that new gas-fired power plants and a historic level of exports would help take care of excess supply. But that hasn't been the case in a market whose main drivers are weather and massive new supplies of shale gas."[34] This undermines the claim that the natural gas industry is economically viable and in need of expansion through the transport of LNG by rail.

From FreightWaves, American Shipper: Greg Miller, Senior Editor, "A massive floating LNG stockpile has just been unloaded", Nov. 18, 2019.
The news article reported on weak demand for LNG and ships from the United States that have become "floating storage" sailing the seas, looking for a buyer. "Exceptionally weak demand for liquefied natural gas (LNG), coupled with a surge in U.S. exports, led to an unprecedented bottleneck in global shipping flows in late October, according to S&P Global Platts".[35] 60% of the shipping vessels were from the United States.

"The massive liquid cargo logjam — which spawned a flotilla of fully laden vessels hunting for somewhere to unload — is a bearish sign for LNG demand, said Josh Zwass, managing director of LNG Analytics at S&P Global Platts, in an interview with FreightWaves."[36] "For LNG shipping demand, it's more of a mixed bag. On one hand, slow steaming and floating storage are positives for spot rates because they remove ships from the market. On the other hand, weak global demand for LNG is a bad omen for future shipping demand."[37]

The article goes on to discuss the reason for the weak demand for LNG, ending with, "Finally, numerous market prognosticators have pointed to an oversupply of LNG that could last through at least 2020. This could fuel future floating LNG storage simply because there's no place left to put the cargo. "A vessel is expensive but available [storage] capacity,' said Zwass, who emphasized, 'The global gas market is oversupplied and there's a struggle to consume it.'"[38] This is evidence that the demand for LNG is being far outpaced by a glut of the product, undermining the claim that there is a need for rail transport of LNG for export. Certainly, it is clear there is no justification for PHMSA to rush to increase LNG shipments overseas.

From Bloomberg: Vanessa Dezem, Mathew Carr and Anna Shiryaevskaya, "A Natural Gas Glut Grows in Europe and Prices Hit 10-Year Low", Bloomberg, Sept. 3, 2019
This article examines the falling price of natural gas in Europe and the over-abundance of LNG that is flooding the market. "Supplies continue to exceed demand. Inventories across northwest

[34] EENEWS, NATURAL GAS, "Supply glut reverses profitable gas trade", March 15, 2017, http://www.eenews.net/energywire/2017/03/15/stories/1060051489
[35] Greg Miller, Senior Editor, "A massive floating LNG stockpile has just been unloaded", FreightWaves, American Shipper, 11/18/2019. Retrieved from https://www.freightwaves.com/news/a-massive-floating-lng-stockpile-has-just-been-unloaded?p=236598.
[36] Ibid.
[37] Ibid.
[38] Ibid.

Europe, Italy and Austria hit 62.3 billion cubic meters, or 94% of capacity, on Aug. 28."[39] "The only way for European prices to recover would be to scale back flows from Russia or Norway or halt more arrivals of cargoes liquefied natural gas, said Norbert Ruecker, head of economics at Julius Baer Group Ltd."[40] Again, what's the rush to push LNG for export without basic safety controls and rail car testing?

From the New England Journal of Medicine: Landrigan et al., "The False Promise of Natural Gas", *The New England Journal of Medicine*. Massachusetts Medical Society, 2019.
Another fact that undermines the need for LNG transport by rail is the uncertainty of the industry's economic future considering its rapidly growing costs, including immediate and long-term societal costs, and its liabilities due to the dangers and harms that fracking is delivering where it and its operations occur. In summarizing this paper, DRN points out that the authors state that production of natural gas has grown by nearly 400% in the United States since 1950, and gas is now the country's second-largest energy source, mainly driven by fracking.[41] This sets up reliance on a shaky energy source, rife with problems that are inherent in the fracking process.

The dangers of fracking have been well documented, including explosions and fires at natural gas pipelines. In addition, the paper states that many fracking chemicals are toxic: 25% are carcinogens; 75% are dermal, ocular, respiratory, and gastrointestinal toxins; 40 to 50% have toxic nervous, immune, cardiovascular, and renal effects; 30 to 40% are endocrine disrupters.[42]

The paper states that the health effects from fracking impacts include lung cancer, asthma, COPD, cardiovascular disease, sleep disturbance, stress, and anxiety.[43] Fracking also exacerbates climate change. As much as 4% of all gas produced by fracking is lost to leakage, and these releases appear to have contributed to recent sharp increases in atmospheric methane. Methane is a potent contributor to global warming, with a heat-trapping potential 30 times greater than that of carbon dioxide over a 100-year span and 85 times greater over a 20-year span.[44]

Despite these dangers, fracking is continuing and its liabilities are expanding. The authors state that it does not make sense economically to continue fracking, as the Energy Information Administration estimates that by 2023 it will cost $36.60 per megawatt-hour to produce electricity from wind and $37.60 to produce solar energy, versus $40.20 to produce energy from gas.[45]

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[39] Vanessa Dezem, Mathew Carr and Anna Shiryaevskaya, "A Natural Gas Glut Grows in Europe and Prices Hit 10-Year Low", Bloomberg, September 3, 2019. Retrieved from: https://www.bloomberg.com/news/articles/2019-09-03/gas-prices-poised-to-fall-in-europe-as-producers-keep-taps-open.
[40] Ibid.
[41] Landrigan et al. (2019). The False Promise of Natural Gas. *The New England Journal of Medicine*. Massachusetts Medical Society. Retrieved from https://www.nejm.org/doi/pdf/10.1056/NEJMp1913663?articleTools=true
[42] Ibid. page 2.
[43] Ibid, p. 2.
[44] Ibid, p. 3
[45] Ibid, p. 3

The authors also point out that a recent study recommends that state and federal subsidies for natural gas be reduced over the next 2 years and then eliminated.[46] This will remove current prop-ups that are helping to artificially keep the industry going. Additionally, they recommend new residential or commercial gas hookups should not be permitted, new gas appliances be should removed from the market, further gas exploration on federal lands should be banned, and all new or planned construction of gas infrastructure should be halted.[47] At the same time, they recommend the EPA proposal to roll back limits on methane pollution should be blocked.[48]

Deregulation of the gas development industry (such as the removal of methane pollution limits) is a subsidy in itself, making it more profitable due to the removal of environmental requirements that do not make companies money. Today's federal administrative agencies and the President are catering to the industry to help make a case that it will expand and need to move LNG to fill growing demand. Extraordinary efforts are being made to force gas development and induce new markets to attempt to save a failing business model – a model that requires enormous resource consumption and leaves a legacy of pollution, environmental degradation and ruinous health effects. Deregulation and other "favors" to the gas industry unlevel the playing field amongst industrial sectors and give advantages to natural gas that are not enjoyed by most other industries or by competing renewable energy sources. Removal of subsidies and halting the rolling back of regulatory controls would bring the industry closer to reality and the economic hardships this resource-intense and expensive endeavor requires.

The authors also call for the creation of new tax structures, subsidies, and incentives such as carbon pricing that favor wind, solar power, and other nonpolluting, renewable energy sources and policies that support energy conservation, clean vehicles, and expansion of public transit.[49] They state that other countries and even states such as New York and Idaho have existing models in place for effective climate action and it would be beneficial for the entire United States to do its part.[50]

There are costs attached to natural gas development that are crippling to the industry and subvert the claim of need for LNG to be transported by rail car. The very future of natural gas is in question.

Climate change costs

The approval of the movement of LNG on the nation's railways will induce natural gas development, at least in the short term, and may also buoy the industry from economic collapse for a period of years. Unfortunately, even a short-term gas boom can have significant negative climate effects, especially when added to the years of emissions that have preceded; there is a price being paid now that will be exacerbated by more natural gas development. The potential consequences of this must be considered in this proposed rulemaking. PHMSA does not

[46] Ibid.
[47] Ibid.
[48] Ibid.
[49] Ibid.
[50] Ibid.

recognize any of the costs that will burden the public or the cumulative environmental costs that the Proposed Alternative will impose. Climate costs that accompany the Proposed Alternative must be fully assessed.

Of great importance to the nation's economic health and energy security are the costs of climate change. To effectively limit the devastating impacts of climate change, there must be a national-scale campaign to immediately take action. This means shifting from greenhouse gas-emitting energy sources – i.e. fossil fuels - to greenhouse gas-free energy sources – i.e. clean and renewable sources, energy efficiency and conservation - starting today. This is necessary to avoid the critical environmental tipping points that will not be able to be undone and to avoid and reduce the devastating impacts of climate change, including hazardous air pollution and disasters that routinely disproportionately harm poor, minority, and vulnerable populations across the nation and the globe.

Scientists in the most recent Intergovernmental Panel on Climate Change (IPCC) Report estimate that at least 45% - 50% reduction of greenhouse gases must be achieved by 2030 in order to effectively limit atmospheric warming. "Emissions need to be halved by 2030 to limit warming to 1.5 degrees Celsius but temperatures are on track to reach double that by the end of the century even if countries' current plans are fully implemented, research by scientists shows."[51] The IPCC Report says limiting warming to 1.5 degrees C will require reducing greenhouse gases by 45% from 2010 levels by 2030 and that there can be no carbon emissions from energy production by about 2050.[52]

We know the composition of natural gas is about 95% methane. Methane leaks or is vented or flared at all stages of the natural gas process (extraction/production, gathering, processing, transmission, storage, local distribution and consumption). Methane is 86 times more efficient than CO2 at trapping heat over a 20-year period and 34 times more efficient over a 100-year period.[53]

Natural gas is not a bridge fuel because methane is the most powerful greenhouse gas over the time scale during which reductions must be made – over the next two decades and particularly over the next 10 years. The proof of the ineffective strategy of replacing coal and oil with natural gas in terms of thwarting atmospheric warming can be found in recent tracking greenhouse gas reports: "However, energy-related carbon dioxide emissions were at a record high last year and new renewable power capacity has stalled after years of strong growth. At the same time,

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[51] https://climateactiontracker.org/publications/warming-projections-global-update-dec-2018/

[52] *Intergovernmental Panel on Climate Change, Summary for Policymakers, Revised on January 2019 by the IPCC, Switzerland, ISBN 978-92-9169-151-7*, downloaded at: https://www.ipcc.ch/sr15/

[53] Myhre, G. et al. 2013. Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., D. Quin, G.K. Plattner, M.Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P.M. Midglet (eds). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. and https://en.wikipedia.org/wiki/Global_warming_potential

methane, a more potent greenhouse gas than carbon dioxide, has risen in recent years due to oil and gas production, including fracking."[54]

To achieve accuracy in calculating the effect of methane on heating the atmosphere and subsequently feeding climate change, it is essential to consider the greenhouse gas impacts from methane from a full life cycle perspective. That means calculating the emissions from gas extraction wells, storage units, compressor stations, pipelines, gas processing facilities, including LNG processors, modes of transport such as truck, rail, and shipping vessels, transloading of natural gas, natural gas liquids, and LNG, and, finally end use. The planet's atmosphere is receiving emissions from these sources and more (such as orphan and abandoned wells); to not count all sources would result in inaccurate conclusions of the contribution of natural gas development to climate change.

Atmospheric methane levels rose steadily during the last few decades of the 20th century before leveling off for the first decade of the 21st century.[55] Since 2008, however, methane concentrations have again been rising rapidly. This increase, if it continues in coming decades, will significantly increase global warming and undercut efforts to reach the COP21 target of < 2 degrees C above the pre-industrial baseline by 2021.[56] Limiting warming to 1.5 degrees C will be even more difficult, if not impossible.

30% to 60% of the global increase in atmospheric methane between 2010 and 2014 was due to emissions in the lower 48 U.S. states and 63% of the increase in gas production over the past decade has been from shale gas.[57] Natural gas systems emit more anthropogenic methane than any other source in the United States, and are the third highest source for carbon dioxide emissions nationally.[58] Natural gas, considered "clean" or a "bridge fuel" is, in fact, a bigger problem than other fossil fuels due to uncontrolled and uncontrollable leaks, intentional flaring and venting. "Methane is far more potent than carbon dioxide in contributing to climate change. That makes it particularly harmful to the environment when it is discharged into the atmosphere. In the U.S. alone, the methane that leaks or is released from oil and gas operations annually is equivalent to the greenhouse gas emissions from more than 69 million cars, according to a Wall Street Journal analysis using conversion formulas from the Environmental Protection Agency and emissions estimates for 2015 published last year in the journal Science."[59]

The damaging changes that are already occurring and can be expected to occur in the near term are extremely costly. As the nation looks to meeting our energy needs in a way that engenders

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[54] https://www.insurancejournal.com/news/international/2019/06/19/529839.htm

[55] Howarth, R. (2019). Ideas and perspectives: is shale gas a major driver of recent increase in global atmospheric methane? *Biogeosciences* (16), 3033-3046. Retrieved from https://www.biogeosciences.net/16/3033/2019/bg-16-3033-2019.pdf

[56] Ibid.

[57] Dr. Robert Howarth, Cornell University, https://www.youtube.com/watch?v=1NPuYr1LGMI

[58] EPA 2016.Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014. https://www.epa.gov/ghgemissions/us-greenhouse-gas-inventory-report-1990-2014

[59] Wall Street Journal, *The Leaks That Threaten the Clean Image of Natural Gas*, https://www.wsj.com/articles/the-leaks-that-threaten-the-clean-image-of-natural-gas-11565280375

wealth and prosperity for the public, it becomes clear that avoiding the harms of natural gas development is essential. Switching to natural gas is counter-productive in terms of energy security and sustainability due to the unavoidable negative impacts that accompany methane emissions. Attempting to mitigate the harmful impacts of methane cannot be successful because the harms will always outpace the mitigation, especially in the 10 and 20-year time frame that is so critical.

Because of the potent global warming potential of methane, natural gas substitution for other fossil fuels does not avoid substantial damages to the economy, environment, and human health over the coming decades.[60] Rising air and water temperatures and changes in precipitation are intensifying droughts, increasing heavy downpours and flooding, reducing snowpack, and causing declines in surface water quality, with varying impacts across different regions of the country.[4] Changes in temperature and precipitation are increasing air quality and health risks from wildfire and ground-level ozone pollution. These impacts include an increase in heat-related deaths, allergic illnesses like asthma and hay fever, and vector-borne diseases such as Lyme disease from ticks.[61]

Climate change has already had observable impacts on biodiversity, ecosystems, and the benefits they provide to society. These impacts include the migration of native species to new areas and the spread of invasive species, which will worsen and could affect the ecological balance in the long term.[62] Yields from major U.S. crops are expected to decline as a consequence of increases in temperatures and possibly changes in water availability (drought conditions), soil erosion, and disease and pest outbreaks.[63] Expected increases in the severity and frequency of heavy precipitation events will exacerbate flooding and affect inland infrastructure in every region, including access to roads, the viability of bridges, and the safety of pipelines and other facilities.

The Fourth National Climate Assessment looks at the Northeast region climate impacts. These are among expected changes in the near term:

- Less distinct seasons with milder winter and earlier spring conditions are already altering ecosystems and environments in ways that adversely impact tourism, farming, forestry, and other economies.[64]
- Warmer ocean temperatures, sea level rise, and ocean acidification threaten ocean habitats, ecosystem services, and livelihoods.[65]

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[60] USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II: Report-in-Brief* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 186 pp. Retrieved from https://nca2018.globalchange.gov/ at 14.

[61] Ibid, p. 15.

[62] Ibid, p. 16.

[63] Ibid, p. 16.

[64] Ibid, p. 116.

[65] Ibid, p. 117.

- Major negative impacts on critical infrastructure, urban economies, and nationally significant historic sites are already occurring and will become more common with a changing climate.[66]
- Changing climate threatens the health and well-being of people in the Northeast through more extreme weather, warmer temperatures, degradation of air and water quality, and sea level rise.[67]

From Nature: Burke, M., Davis, W.M., & Diffenbaugh, N.S. (2018). Large potential reduction in economic damages under UN mitigation targets. *Nature*, Vol. 557, 549 – 557. Retrieved from https://www.nature.com/articles/s41586-018-0071-9.

The United Nations Paris Agreement increased the need for quantitative analysis of uncertainties in the costs and benefits of holding global warming to "well below 2 °C above pre-industrial levels" and pursuing a 1.5 °C target.[68] A 2018 Research Letter addresses this by examining the global and country-specific economic impacts of limiting warming to 1.5 °C relative to 2 °C, as well as the global impacts of projected warming under current mitigation commitments. The researchers used annual measurements of average temperature and growth in gross domestic product (GDP) per capita from 165 countries over the years 1960–2010.[69] Most response functions generated more negative global impacts at 2 °C than at 1.5 °C.

The results indicated that limiting warming to 1.5 °C instead of 2 °C by mid-century would lead to an increase in global GDP of 1.5%–2.0% and US $7.7–11.1 trillion in discounted avoided damages under a 3% fixed annual discount rate.[70]

The report states that meeting these targets at the end of the century was estimated to lead to median gains in global GDP per capita of 3.4% and discounted avoided damages of US $36.4 trillion.[71] Achieving the 1.5 °C target at mid-century (2046–2065) would lead to a 68%–76% chance of overall cumulative net benefit relative to 2 °C under a fixed 3% discount rate.[72]

Under the same discount rate, there was a 43%–53% chance of discounted cumulative benefits exceeding US $10 trillion and a 4%–8% chance of exceeding $30 trillion, which is about 40% of current global GDP.[73] For the end of the century (2081–2100), there was a >75% chance of net gain in per capita global GDP, an approximately 38% chance that benefits would exceed US $50 trillion, and an approximately 5% chance that benefits would exceed US $100 trillion.[74]

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[66] Ibid, p. 117.
[67] Ibid, p. 117.
[68] Burke, M., Davis, W.M., & Diffenbaugh, N.S. (2018). Large potential reduction in economic damages under UN mitigation targets. *Nature*, Vol. 557, 549–557. Retrieved from https://www.nature.com/articles/s41586-018-0071-9.
[69] Ibid, p. 549.
[70] Ibid, p. 550.
[71] Ibid, p. 550.
[72] Ibid, p. 550.
[73] Ibid, p. 550.
[74] Ibid, p. 550.

On a country scale, the researchers found that 71% of countries (approximately 90% of the projected global population) exhibited a >75% chance of experiencing positive economic benefits at 1.5 °C relative to 2 °C , and 59% of countries exhibited a >99% chance.[75] These countries include the three largest economies (the USA has a 76% chance of positive benefits; China 85%; Japan 81%).[76]

They also include a large fraction of the world's poorest countries, with the likelihood of economic gains rising rapidly at lower levels of GDP per capita.[77] In contrast, under current national global warming commitments (2.5 to 3 °C), there was a 15%–25% reduction in per capita output by 2100, and reductions of more than 30% for 4 °C warming.[78] These results therefore suggest that achieving the 1.5 °C target is likely to reduce aggregate damages and lessen global inequality, and that failing to meet the 2 °C target is likely to increase economic damages substantially.[79] The most vulnerable and poorest communities would suffer even more.

Health, community, and environmental costs

From ECONorthwest: "The Economic Costs of Fracking in Pennsylvania", May 2019. Available at: https://bit.ly/2JCO7yz

A study of the economic impacts of Unconventional Oil and Gas Development (UOGD) in Pennsylvania authored by ECONorthwest was published by Delaware Riverkeeper Network in May 2019. The report found annual costs of current fracking activity over $1 billion, with cumulative costs given continued fracking activity over the next 20 years of over $50 billion in net present value. This estimated annual cost is roughly equivalent to 0.3 percent of the state's Gross Domestic Product.[80] The report evaluated the health, community, and environmental costs of fracking in the state.

> "UOGD in Pennsylvania has transformed the state in a relatively short amount of time. While this boom is creating economic activity in the state, it is doing so by imposing large and long-term costs on residents on the state. If fracking continues at current rates, the economic, social, and environmental costs for Pennsylvania are estimated to be at least $54 billion over the next twenty years. Increases in the rates of fracking in the state will increase these costs."[81]

In addition to mounting and devastating health impacts and costly impacts to communities and other industries such as tourism and agriculture, there are costs associated with the environmental resources used and impacted by UOGD. These include but are not limited to: land changes; wetland, vernal pool, stream and river degradation; air pollution; water consumed for

[75] Ibid, p. 552.
[76] Ibid, p. 552.
[77] Ibid, p. 552.
[78] Ibid, p. 549.
[79] Ibid, p. 549.
[80] ECONorthwest, "The Economic Costs of Fracking in Pennsylvania", May 2019. Available at: https://bit.ly/2JCO7yz, E.S. p. vii.
[81] Ibid, p. 61.

fracking; water and soil contamination; bioaccumulation of contamination; healthy habitat loss such as forests, natural vegetation, land forms, geologic features; and in-water habitats for species; noise, light, and traffic impacts; infrastructure construction and operation; wastewater discharged from fracked wells; and community and social costs.

The report explains that other costs result from violations by operators in the fracking industry. Violations of permits and management practices that are not protective of the environment nor public health and safety have come with the rise of UOGD. For instance, in 2017 in Pennsylvania there were 821 violations at unconventional wells and 3,273 violations at conventional wells. Almost all (92 percent) of the unconventional well violations were environmental health and safety-related.[82] The number of unconventional well violations for all wells (821) exceed the number of unconventional wells drilled in Pennsylvania in 2017 (810) (Figure 11). Well violations occur for wells at all stages of its lifespan.[83]

The researchers found that many of these costs can be monetized but some cannot be "bought and sold". Nonetheless, these costs are real and paid for by those who are impacted, primarily the public. In many cases, there is no effort made to measure or limit the "externalized costs" of an activity and the costs are not included in a typical cost-benefit analysis but are nonetheless carried on the shoulders of the public - taxpayers, residents, workers, and generations yet to come. The report examines and evaluates all costs that can be accounted for, to provide a more accurate and unbiased view of the economic costs of UOGD, primarily "fracking" ["UOGD represent the activities involved with hydraulic fracturing, which allows access to "unconventional" oil and gas reserves that are not possible to extract without the horizontal drilling associated with hydraulic fracturing][84].

> "In the United States, it is estimated that the annual ecological costs of fracking are over $1.52 billion per year.[85, 86] This value includes the economic value associated with "ecosystem services" that are damaged by UOGD. Ecosystem services are the benefits that natural capital provides to people, such as carbon sequestration, flood mitigation, food security, recreation, and genetic diversity. These benefits are not bought and sold in markets, but economists derive and measure their value using various methods, including estimating the cost to replace the service with built infrastructure, asking people about their willingness to pay to protect or enhance services, and revealed social preference based on regulatory costs and government spending to sustain and protect scarce resources. UOGD directly impacts water and air resources, producing many of the health and community effects described in previous sections. It also affects the integrity of ecological systems, which in turn reduces the quantity and quality of terrestrial and aquatic habitat. People derive value both from the species that depend on the habitat, and from its

[82] Ibid, p. 14.
[83] Ibid, p. 14.
[84] Ibid, p. 1.
[85] The original 2015 values have been inflated to 2019 dollars.
[86] Moran, M. D., Taylor, N. T., Mullins, T. F., Sardar, S. S., & McClung, M. R. (2017). Land-use and ecosystem services costs of unconventional US oil and gas development. *Frontiers in Ecology and the Environment*, 15(5), 237–242. doi: 10.1002/fee.1492

aesthetic character. Greenhouse gas emissions impose costs on human communities now and in the future. Geologic destabilization produces increased risks to physical infrastructure."[87]

"The costs of fracking primarily affect vulnerable populations such as children, elderly, and low income people, due to economic inequities and health risks. If fracking in Pennsylvania increases, then the total costs will also increase since they are rooted in per-well estimates. If fracking in Pennsylvania decreases these costs will decline, although some impacts like the loss of habitat will take years to restore. Even if fracking in Pennsylvania were to cease today, legacy wells will continue to pose risks to local communities and the broader region from health, community, and environmental impacts."[88]

"In addition to the monetized costs, other economic costs should also be considered as resulting from UOGD in Pennsylvania. These non-monetized costs include:

- Increases in fatal traffic accidents, primarily in high well-density counties;
- Detrimental effects to the water resources of the state from the high volumes of fresh water and groundwater being used for extraction of natural gas;
- Long-term economic effects from lower educational attainment, primarily among men;
- Lack of economic resiliency from reliance on natural resource commodity subject to boom and bust economic cycles;
- Long-term health effects, including increased cancer rates;
- Environmental effects from the accumulation of chemicals and pollutants over time;
- Impacts to recreational hunters and fishermen due to declining wildlife populations;
- Fiscal risk to the state from inadequate bonding requirements which could transfer the costs of clean-up to the state;
- Loss of land for agriculture and recreation due to creation of well-pads and inadequate restoration once drilling is completed; and
- Perpetuation of reliance on U.S. energy on fossil fuels that delays and impedes transitions to renewable energy."[89]

"Hydraulic fracturing primarily impacts human health through the pathways of air quality, groundwater contamination, surface water contamination, occupational hazards, and soil/agricultural contamination. The drivers of this risk are the chemicals and materials used in the fracking process, as well as the subterranean materials brought to the surface through extraction. The support infrastructure to the fracking process including compressors, pipelines, and trucks also produces health impacts through air quality impacts, noise, and safety issues. The health effects of UOGD are exacerbated by leaks, improper storage, and negligence associated with natural gas infrastructure, as well as by the intensity of nearby operations.[90] Health effects that have been linked to fracking include

[87] ECONorthwest, "The Economic Costs of Fracking in Pennsylvania", May 2019. Available at: https://bit.ly/2JCO7yz, p. 44.
[88] Ibid, E.S. p. ix.
[89] Ibid, E.S. p. x.
[90] ProPublica. (2009). *Officials in Three States Pin Water Woes on Gas Drilling*. ProPublica. Retrieved from www.propublica.org/article/officials-in-three-states-pin-water-woes-on-gas-drilling-426.

low birth weight, preterm births, infertility, asthma, respiratory diseases, cancer, liver damage, silicosis, cardiovascular diseases, migraines, anxiety, insomnia, depression, and other mental health problems.[91] The most commonly reported health symptoms of people living within one kilometer of a well include sleep disruption, headache, throat irritation, stress or anxiety, cough, shortness of breath, sinus problems, fatigue, nausea, and wheezing.[92]

Of the 685 papers published between 2008 and 2015 on fracking, 226 studies investigated the link between adverse health effects and fracking.[93] The exact causes of the illnesses are often unclear because of the unknown chemicals that are used in the fracking process.[94] In 2005, the U.S. Environmental Protection Agency (EPA) enacted regulations, commonly known as the Halliburton Loophole that exempts oil and gas companies from federal oversight under the Safe Water Drinking Act. This exemption means that oil and gas companies do not have to disclose the chemicals used in hydraulic fracturing production."[95]

The costs of climate change are examined in the report as well. These costs are directly relevant to the proposed rulemaking, even though some figures are calculated for Pennsylvania. Considering that Pennsylvania is the second largest producer of natural gas in the country and it is developing gas processing and end uses within its borders, its greenhouse gas emissions are substantial and contribute to the national problem of overproduction of greenhouse gases. The costs of climate change are directly relevant to the viability and security of the natural gas industry, undermining a false narrative of an energy source with a growing, beneficial future. The lack of benefits for the public and the environment thwart its expansion as problems multiply and compound and subvert the need for developing another mode of transport for LNG. The public and some regulators and policy makers are becoming more and more intolerant of the unmitigatable impacts. This is especially true for such a dangerous and untested Proposed Alternative, rushed through without LNG-specific controls and analyses.

"The EPA has estimates for the value of social costs of GHGs, which represent the long-term costs based on damages due to GHG-caused changes in agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs. The effects of climate change in Pennsylvania include changes in precipitation and

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[91] Concerned Health Professionals of New York & Physicians for Social Responsibility. (2018). *Compendium of scientific, medical, and media findings demonstrating risks and harms of fracking (unconventional gas and oil extraction).*

[92] Weinberger, B., Greiner, L. H., Walleigh, L., & Brown, D. (2017). Health symptoms in residents living near shale gas activity: A retrospective record review from the Environmental Health Project. *Preventive medicine reports*, 8, 112-115.

[93] FracTracker Alliance. (2019). *Categorical Review of Health Reports on Unconventional Oil and Gas Development; Impacts in Pennsylvania.* FracTracker Alliance Issue Paper.

[94] Hays, J., & Shonkoff, S. B. (2016). Toward an understanding of the environmental and public health impacts of unconventional natural gas development: a categorical assessment of the peer-reviewed scientific literature, 2009-2015. *PloS one*, *11*(4), e0154164.

[95] ECONorthwest, "The Economic Costs of Fracking in Pennsylvania", May 2019. Available at: https://bit.ly/2JCO7yz, p. 18.

runoff that will increase flooding and drought, as well as increases in temperature and frequency of temperature extremes.264 Additionally, water resources will be impacted by sea level rise which could cause salt water intrusion to Delaware River Estuary water supplies, the drinking water source for millions of people. Salt water intrusion, floods, and droughts will also lead to loss of habitat and degradation of water quality. Agricultural costs and health costs are also anticipated to be large due to climate change in Pennsylvania. Using a three-percent discount rate, the social cost of carbon is $39, and the social cost of methane is $1,088.265.

Pennsylvania accounted for 19 percent of total U.S. marketed natural gas production in 2017. Applying that percentage to the total U.S. natural gas emissions for methane and carbon dioxide emitted in 2016 (the most recent data available*)."*[96]

"The estimated annual cost due to natural gas production in Pennsylvania are estimated as $1.3 billion for methane and $11.2 billion for carbon dioxide."[97]

"The EPA estimates that the social cost of GHGs will increase over time due to the cumulative effects. ***If Pennsylvania continues to produce a similar level of natural gas as in 2016, in twenty years that production is estimated to result in a social cost of methane of $28.4 billion and a social cost of carbon dioxide of $21.5 billion."*** These estimates for the social costs of GHG emissions are lower bound estimates. Research suggests that by 2025 GHG emissions from Pennsylvania's natural gas sector will be at least three times higher than emissions in 2012. Social costs of GHG emissions also increase over time as the cumulative level of GHGs in the atmosphere increases."[98]

<u>Health Costs</u>

The health costs of natural gas development are also jeopardizing the future viability of the industry. These cost are externalized costs that the public must bear even though they have not chosen to do so, in opposition to their and future generations' environmental rights. There is a growing recognition among health professionals, scientists and government agencies of the health impacts that are harming people who are exposed to natural gas development operations. PHMSA must consider these costs in its determination regarding the proposed rulemaking. The growing evidence of significant health costs that are demanding accountability from the industry cannot be swept under the rug. They must be realized in terms of the industry's future and its stability as a viable energy source.

From Fractracker Alliance: "Categorical Review of Health Reports on Unconventional Oil and Gas Development; Impacts in Pennsylvania", authored by Kyle Ferrar, Erica Jackson, Samantha Malone, Fractracker Alliance, May 2019. Available at: https://bit.ly/30kqe4u

"This infrastructure is increasingly encroaching on communities and residential areas. The Oil and Gas Threat Map, a joint project of FracTracker Alliance, Clean Air Task Force, and

[96] Ibid, p. 54.
[97] Ibid, p. 54.
[98] Ibid, p. 54-55.

Earthworks, estimated that 12.6 million people live within the half-mile threat radius of active oil and gas wells, compressor stations, and/or processing stations.[99] The proximity of homes to development has raised significant public health concerns and community resistance since communities started raising concerns of exposure to groundwater and air contamination, beginning in 2007 and 2008."[100]

"Of the 142 studies in our sample population (including 5 published in 2019), a total of 127 reports 89.4%) indicated a positive relationship of UOGD with health impacts. There were a total of 106 articles that published new, original research, with 104 focused on health impacts. Of these 104 articles, 94 indicated a positive relationship with health impacts (90.3%)."[101]

"Important Health Impact Findings:

- Cancer outcomes, including Non-Hodgkins lymphoma [62], and urinary bladder cancer [61]
- Impacts on pregnancy and development, including association with early infant mortality, pre-term birth, and poor infant health [24, 35, 36, 58]
- Impacts on mental health and well-being, including depression, self-reported stress, worry about health, and sleep disturbances [20, 43, 44]
- Pneumonia hospitalizations rates in elderly populations [49]
- Increased risk of asthma exacerbations [31, 33]
- Skin-related hospitalizations [50]
- General health symptoms, such as headache, fatigue, nasal and sinus impacts, and throat irritation [51, 60]
- Impacts on sexual health, in particular gonorrhea and chlamydia rates, which may be driven by demographic and population changes where unconventional oil and gas development occurs [47, 59]
- A Delphi study to determine adequacy of current setback distances from unconventional oil and gas development found that current distances do not protect public health [10]
- Radon concentration at wellheads is strongly correlated with production rate, and poses hazard to the public and environment [67]
- Risk assessment of residential exposure to contaminated drinking water from a modeled spill of flowback water poses cancer risk from radionuclide exposure and non-cancer risk from barium and thallium exposure [63]
- Risk assessment of exposure of contaminated drinking water from a spill of flowback water poses excess lifetime cancer risk and exposure to barium and lithium in drinking water pose non-cancer risk [64]
- Exposure to contaminants in unconventional oil and gas wastewater spread on roads, poses a health risk from release of salt, radioactivity and organic contaminants into the environment, at concentrations above drinking water

[99] *Oil and Gas Threat Map*. FracTracker Alliance, Clean Air Task Force, Earthworks.
[100] Fractracker Alliance, "Categorical Review of Health Reports on Unconventional Oil and Gas Development; Impacts in Pennsylvania", May 2019. https://bit.ly/30kqe4u p. 3.
[101] Ibid, p. 7.

standards. Toxicological studies indicated that the organic micropollutants in wastewater caused toxicity to aquatic organisms like Daphnia magna [65]

- Chemical characterization and toxicologic research of fracking fluids and wastewater pose the possibility of "toxicity to human organs, sensitization, irritation, developmental effects, and tumor promotion" [66]
- A modeled scenario of exposure patterns of volatile organic compounds (VOCs), particulate matter (PM) and diesel found periods of extreme exposure which correlate with the documented peaks in reported health complaints [68]"[102]

"Well pads and infrastructure degrade air quality, surface water quality, have the potential and have already contaminated groundwater sources as well. From the primary research conducted in the Marcellus Shale and specifically in Pennsylvania, we find that impacts are not just anecdotal or segregated to a particular region. Wherever there is a dense concentration of UOGD in the shale play, public health assessments are documenting community and environmental health impacts."[103]

"The sources of pollution are not limited to just oil and gas well pads either. Expansive infrastructure is necessary to support the transmission, processing and even petrochemical manufacturing that constitute the fossil fuel extraction economy. In addition to natural gas liquids (NGL) pipelines, cryogenic plants, and fractionation facilities in shale plays, plans for ethylene cracker projects are also in the works.

The international shale boom has depressed both oil and gas prices, but the decrease in natural gas prices has been most substantial domestically. As the price of natural gas continues to fall operators are looking for ways to balance profits. What materials were once considered production by-products – the longer chain hydrocarbon condensates, have become valuable raw materials for ethane production. Major operators such as Shell, Exxon, and BP have the capacity to make use of these byproducts. The Ohio River Valley is becoming a hot bed for new ethane "cracker" facilities, starting in Pennsylvania, leading to the development of a new major industrial corridor on the Ohio River[104]."[105]

"The results of this study indicate that a variety of health impacts in every major organ system are being experienced by individuals living near UOGD. Furthermore, these impacted communities clearly attribute declines in health to the presence of the oil and gas industry. Additionally, the epidemiologic studies with a longitudinal aspect that tracked the inclement growth of the industry show a response to increased development and additional drilling."[106]

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[102] Ibid, p. 9.
[103] Ibid, p. 16.
[104] Jackson, E., *Ethane Cracker Project: Risks of Bringing Plastic Manufacturing to Ohio.* 2018: FracTracker Alliance. https://www.fractracker.org/2013/09/swpa-preta/.
[105] Ibid, p. 16.
[106] Ibid, p. 17.

From: Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Gas and Oil Extraction) Sixth Edition, June 19, 2019
The *Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (*the Compendium*)* is a fully referenced compilation of evidence outlining the risks and harms of fracking.

> "In our review of the data, seventeen compelling themes emerged; these serve as the organizational structure of the Compendium. Readers will notice the ongoing upsurge in reported problems and health impacts, making each section top-heavy with recent data. The Compendium focuses on topics most closely related to the public health and safety impacts of fracking. These include risks from fracking infrastructure, including compressor stations, pipelines, silica sand mining operations, natural gas storage facilities, the manufacture and transportation of liquefied natural gas (LNG), and, for the first time, gas-fired power plants."[107]

From: *Nature Sustainability*. Mayfield et al., (2019). "Cumulative environmental and employment impacts of the shale gas boom", 2019.

> "The cumulative impacts over the boom-and-bust nature of the natural gas supply chain are still largely unexplored and unaccounted for in public and private decision-making. A new study analyzed the shale gas boom (and decline) in the Appalachian basin with respect to both reserves and production.[108]
>
> Impacts across the regional supply chain from preproduction to end use from 2004 to 2016 were modeled. It was estimated that 1,200 to 4,600 premature mortalities were associated with air pollutant emissions from shale gas activity between 2004 and 2016.[109] Annual mortalities (439) and damages ($3.7 billion) peaked in 2014, and air pollution damages from natural gas electricity generation are around 5% that of coal.[110]
>
> Methane emissions from natural gas-related sources within Pennsylvania, Ohio, and West Virginia (1.25 million tonnes in 2015) accounted for 10% of U.S. emissions, while carbon dioxide in these states (134 million tonnes in 2016) accounted for 9% of all emissions in the country.[3]
>
> End use processes contributed most CO2 (85%) emissions across the supply chain, with remaining emissions attributable to well development (2%) and fuel consumption for production, processing, transmission and distribution (13%).[3] Cumulative climate damages from natural gas activity over the period 2004 to 2016 range from $12 billion to 94 billion, depending on assumptions regarding social costs."[111]

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[107] Compendium of Scientific, Medical, and Media Findings Demonstrating Risks and Harms of Fracking (Unconventional Gas and Oil Extraction) Sixth Edition, June 19, 2019. http://concernedhealthny.org/compendium/
[108] Mayfield et al. (2019). Cumulative environmental and employment impacts of the shale gas boom. *Nature Sustainability*.
[109] Ibid, p. 2.
[110] Ibid, p. 3.
[111] Ibid, p. 4.

From: Pittsburgh Post-Gazette. The Southwest Pennsylvania Environmental Health Project. The Editorial Board, "Fear and frustration: Fuel for solving the Ewing sarcoma mystery", Pittsburgh Post-Gazette, 11.10.2019. The Southwest Pennsylvania Environmental Health Project, "EHP Addresses Childhood Cancer Issue in SWPA", THE YEAR IN REVIEW Term: Winter, Issue 5, Dec. 2019.

There is emerging evidence of childhood cancers in southwestern Pennsylvania, one of the most active and concentrated Marcellus Shale development regions in Pennsylvania. A shocking expose by the Pittsburgh Post-Gazette (PG) revealed an aggregation of childhood cancers in the region, many concentrated in one school district. The area has a concentration of natural gas extraction wells that employed fracking.

From the paper's Editorial: "In March, the PG documented six Ewing sarcoma cases within Canon-McMillan (comprising Cecil and North Strabane townships and Canonsburg) as well as an additional nine Canon-McMillan preschoolers and students who during the 2018-2019 school year had cancer. Those cases include two cases each of osteosarcoma (bones) and leukemia (blood), and one case each of liposarcoma (connective tissue), rhabdomyosarcoma (soft tissue), neuroblastoma (nerve cells), liver cancer and Wilms (kidney) tumor. Additionally, a teenage student died in February from astrocytoma, a brain and spinal cord cancer."[112]

The Southwest Pennsylvania Environmental Health Project YEAR IN REVIEW newsletter reported on the childhood cancer cases and the ongoing investigations, including Pennsylvania government-funded study. "In 2019, EHP found itself on the front line of a disturbing controversy surrounding the rise in childhood cancers in SWPA. According to a series published in the Pittsburgh Post-Gazette, there have been a total of 67 rare childhood cancers from 2008-2018 in 4 SWPA counties, including a total of 27 cases of a rare bone cancer, Ewing sarcoma (ES). In the last decade, 6 children in the Canon-McMillan School District alone have been diagnosed with ES. At least 10 additional children attending this school district have been diagnosed with other rare cancers during the same time period."[113]

The fallout from the investigation that is now underway may impact the region that is one of two most productive natural gas producing areas in the Commonwealth. Obviously, the tragedy that is unfolding in this part of the shale play will have far-reaching effects should a connection be found between the cancers and fracking and natural gas operations. These findings directly affect the viability of natural gas as an energy source.

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[112] The Editorial Board, "Fear and frustration: Fuel for solving the Ewing sarcoma mystery", Pittsburgh Post-Gazette, 11.10.2019. Retrieved from: https://www.post-gazette.com/opinion/editorials/2019/11/10/Ewing-sarcoma-cancer-mystery-fear-frustration/stories/201910240049. Further information at: https://newsinteractive.post-gazette.com/ewing-sarcoma-cancer-cluster-pittsburgh-washington-westmoreland/

[113] The Southwest Pennsylvania Environmental Health Project, "EHP Addresses Childhood Cancer Issue in SWPA", THE YEAR IN REVIEW Term: Winter, Issue 5, December 2019. Retrieved from: https://www.environmentalhealthproject.org/sites/default/files/assets/resources/winter-2019-newsletter.pdf.

In conclusion, Delaware Riverkeeper Network disagrees with PHMSA's proposed finding that the proposed regulations allowing the transport of LNG via DOT-113C120W tank car will not result in a significant environmental impact. There are significant environmental, public health, and safety impacts that will occur if the proposed regulations and the Proposed Alternative are adopted.

For this reason, DRN opposes the proposed Hazardous Material Regulation changes and calls for the denial of the proposed rulemaking and the Proposed Alternative.

Thank you for the opportunity to comment.

Respectfully submitted,

Maya van Rossum
the Delaware Riverkeeper

Tracy Carluccio
Deputy Director

Imbedded Attachment: DRN Appendix A

APPENDIX A

History of LNG Incidents
December 2019

1. History of LNG Accidents[114]

- *The Cleveland Disaster, U.S.* 1944. The very first commercial LNG facility built in the United States in 1941, caused a major industrial accident known as the "The Cleveland Disaster." Where, in 1944, according to the U.S. Bureau of Mines report, LNG holding tanks failed and released their contents into the streets and sewers and their vaporous cloud ignited and fire engulfed the nearby residents and commercial establishments. LNG destroyed 79 Homes, 2 Factories, 217 Cars, 7 Trailers, Left 680 Homeless, Injured 225 and Killed 131. The fiery LNG inferno devastated one square mile of Cleveland, Ohio.
- *Methane Princess* Spill, 1965. The LNG discharging arms on a vessel which were disconnected before the liquid lines had been completely drained – caused another LNG accident
- *Jules Verne* Spill, May 1965. Failure of the liquid level instrumentation – caused another LNG accident
- La Spezia, Italy, 1971. Phenomenon called rollover, where two layers of LNG having different densities and heat content are allowed to form back flow of natural gas from the compressor to the nitrogen line – caused another LNG accident
- Montreal East, Quebec, Canada, 1972. Explosion occurred in the LNG liquefaction and peak shaving plant of Gaz Metropolitan in Montreal East, Quebec. The accident occurred in the control room due to a back flow of natural gas from the compressor to the nitrogen line.
- Staten Island Tank Fire, USA, 1973. A fire erupted at an out-of-service LNG tank that was being repaired. Forty workers then inside the tank were killed. LNG, which had leaked through the liner during previous fillings, had accumulated in the soil below and around the concrete tank wall berm. It has been assumed that an electrical spark in one of the irons or vacuum cleaners ignited the flammable gas reentering the tank.
- Massachusetts Barge Spill, July 1974. After a power failure and the automatic closure of the main liquid line valves, a small amount of LNG leaked from a 1-inch nitrogen-purge globe valve on the vessel's liquid header - pressure surge caused by the valve closure induced the leakage of LNG – caused another LNG accident
- *Aquarius* Spill, September 1977. Difficulties in the liquid level gauge system – caused another LNG accident
- Das Island, United Arab Emirates, March 1978. Failure of a bottom pipe connection of a LNG tank– caused another LNG accident
- Cove Point, Maryland, 1979. LNG leak from a high-pressure pump found its way into an electrical conduit – caused another LNG accident
- *Mostafa Ben Bouliad* Spill, April 1979. A check valve in the piping system of a 125,000 cubic meter vessel failed – caused another LNG accident
- *Pollenger* Spill, April 1979. Leaking from a valve gland – caused another LNG accident

[114] https://www.timrileylaw.com/LNG.htm

- Bontang, Indonesia, 1983. Rupture of a heat exchanger in an LNG plant and resultant explosion – caused another LNG accident
- Nevada Test Site, Mercury, NV, 1987. An accidental ignition of an LNG vapor cloud occurred at the US Department of Energy (DOE) Nevada Test Site in August 1987.
- *Bachir Chihani,* Hull Cracking, 1990. Inner hull fracture occurred in a 130,000 cubic meter vessel at a part of the ship's structure that is prone to the high stresses that accompany the complex deflections that the hull encounters on the high seas – caused another LNG accident
- *Mediterranean Off Gibraltar, Minor LNG Carrier "Collision," November 13, 2002.* LNG carrier Norman Lady was struck off Gibraltar by the USS Oklahoma City, a Navy nuclear submarine. Minor damage to both vessels was caused by submarine periscope. The company said the vessel, had already unloaded its LNG cargo in Barcelona, Spain.
- *Algeria, LNG Facility Explosion, January 19, 2004.* LNG port facility designed to load only small LNG Tankers for short distances exploded; death toll: 27; workers injured: 74; blast felt miles away; facility destroyed; fires raged for 8 hours; property damage: approx. $ 1 Billion; cause: (initially believed: "defective boiler" which had earlier received "superficial repairs;"); insurance investigation determined cause: liquefied natural gas leak in pipe
- *Trinidad Tobago,* June 13, 2004. LNG turbine explodes, workers evacuated. Scores of workers had to be evacuated after a gas turbine at Atlantic LNG's Train 3 facility exploded. *Details Still Unfolding...*
- *Belgium,* July 31, 2004. Fluxy's LNG gas pipeline explosion kills 15 in Belgium. It was the deadliest gas blast in Belgium since 1967, when a tanker truck carrying liquid gas blew up, killing 22 people. "Debris from the initial explosion was found up to four miles away" (BBC video)
- *Norway,* September 20, 2004. LNG tanker adrift north of Bergen. A fully loaded LNG tanker with a crew of 14 was adrift west of Fedje, on the west coast of Norway, north of Bergen. The ship's engines had stopped, and the anchors were useless in the stormy weather. Tugboats could not get the tanker undertow until the ship was only 30 yards from hitting rocks. There was strong wind and bad weather conditions in the area, and preparations were made to evacuate the 800 persons living on the island of Fedje, for fear that the tanker would explode if it grounded, NRK reports.
- *USA, March 2005.* LNG Causes Pipeline Leaks and house explosion. On July 7, 2005, a company-sponsored study, launched after a District Heights house exploded in late March, found that subtle molecular differences in the imported liquefied natural gas the utility began using in August 2003 were drying the rubber seals of aging metal couplings that link sections of pipe. The breakdown of seals in the couplings of gas pipelines led to about 1,400 gas leaks during the past two years, and has required the company to launch a $144 million project to replace lines and equipment. Two other house explosions in the area are now under investigation.
- *Nigeria, August* 2005. 28-inch Liquefied Natural Gas underground pipeline exploded - Wild inferno engulfed an estimated 27 square kilometers. Eleven persons are feared missing and aquatic life completely destroyed when a 28-inch Liquefied Natural Gas underground pipeline exploded at Kalakama, an Ogoloma fishing community in Okrika Local Government Area of Rivers State. The incident, which occurred at the weekend, resulted in a wild inferno that engulfed an estimated 27 square kilometers of the once rich Kalakama

mangrove, killing seafoods and cash crops. So huge, the impact of the explosion was felt on the Okrika Island and the Borikiri area of Port Harcourt where, residents were forced into a stampede for safety. Nigeria LNG pipeline explosion

- *India, September 17, 2005*. Winds just over a mere 40 knots led to an accident at Petronet LNG Ltd.'s terminal at Dahej when the tugboats of LNG carrier "Disha" hit Dolphin Piles of the jetty. The LNG ship was casting off after unloading the cargo. Petronet LNG Ltd.'s is evaluating the extent of damage. Mishap at Dahej LNG unit, supply hit
- *Savannah, GA March 14, 2006.* A potentially disastrous spill was averted early Tuesday morning when the liquefied natural gas tanker Golar Freeze discharging its load at the Southern LNG terminal on Elba Island broke from its moorings and pulled away from the pier. The dock was shut down for about 36 hours while representatives from the Coast Guard and an LNG engineer from the Federal Energy Regulatory Commission investigated the incident. Near-miss shuts down LNG imports on Elba
- *Trinidad & Tobago May 18 & May 21 & June 6, 2006.* Fire at LNG Plant - "YET another blowout has occurred at Atlantic LNG in Point Fortin. On Tuesday, fire broke out at the base of a Flame Pole when a seal broke loose. The incident that occurred around 8.30 pm did not result in any injuries to employees or damage to the plant. According to a report from the Point Fortin sub-fire station, the seal popped and fire shot out. An employee nearby alerted a safety officer who quickly extinguished the fire. On May 21, Atlantic LNG employees had to evacuate the plant after a plug blew out and struck an employee in the chest. Three days before that incident, Train 11 plant had to be shut down for six hours when a natural gas leak was discovered in a two-inch pipeline." FIRE AT LNG PLANT Trinidad News, Trinidad and Tobago
- *Ship carrying liquid gas burns off Jordan July 13, 2006.* "AMMAN, Jordan -- A tanker carrying liquefied natural gas caught fire as it unloaded Thursday in Aqaba, injuring 12 people, the manager of the Jordanian Port Said. Four of the injured were firefighters, who needed an hour to bring the blaze under control, said Awwad al-Maaytah, the director general of Aqaba Port Authority. The other injured were crewmembers. The ship was promptly evacuated and towed away from the pier in the Red Sea port having unloaded only half of its cargo. Al-Maaytah said the cause of the fire was under investigation." Seattle Post Intelligencer. Jordan Liquid-Gas Ship Mishap Injures 19
- *LNG Tanker Adrift Off Cape Cod Needs Rescue February 11, 2008.* Coast Guard and tugboat crews rescued a liquefied natural gas tanker crippled off Cape Cod after many hours of drifting at sea at the mercy of powerful winds and high waves. Just 5-years-old, the fully laden LNG carrier was corralled by four tugboats about 25 miles east of Provincetown. Apparently, about 3 a.m. Monday its propulsion system shut down because of a computer malfunction according to the Coast Guard. The 933-foot Spanish-flagged LNG tanker Catalunya Spirit was heading from Trinidad to the LNG facility in Everett. 2/15/08. After several days of troubleshooting, repair specialists determined a malfunctioning boiler feed pump, which supplies water to the main propulsion boilers, caused the Catalunya Spirit's loss of power and propulsion. Captain of the Port of Boston reviewed and approved the final repair certification presented by Lloyd's Register and Teekay Corporation. The LNG delivery through Boston Harbor was cancelled.
- *Washington, March 31, 2014* U.S. LNG Explosion "Early Monday, a "processing vessel" at the Williams facility near the small town of Plymouth, Washington, exploded, spraying

chunks of shrapnel as heavy as 250 pounds as far as 300 yards, according to local emergency responders.

- The flying debris pierced the double walls of a 134-foot LNG tank on site, causing leaks. Five workers were injured, and local responders warned that vapors from the leaks could trigger a more devastating, second explosion. A county fire department spokesperson said authorities were concerned a second blast could level a 0.75-mile 'lethal zone' around the plant.
- Everyone within a two-mile radius of the site was evacuated..."

2. On June 21, 1970 in Crescent City, IL, 16 railcars derailed and 10 of them contained 34,000 gallons of liquid propane. As a result of the derailment, one of the propane tank cars was punctured by a coupler of another car, causing a leak that ignited almost immediately, engulfing the other nine derailed propane cars. Flame impingement on the uninsulated tank cars caused an increase in pressure inside the tank cars from impingement on the liquid space. Impingement on the vapor space caused weakening of the steel that resulted in the BLEVEs (boiling liquid expanding vapor explosions) that occurred. Flames reached several hundred feet into the air and a nearby house and business were set on fire by radiant heat. The heat from the incident could be felt from three blocks away. A total of 66 people (fire, police and press personnel) were injured by the explosions and 11 required hospitalization.[115]

3. On June 22, 2002, an LNG tanker truck near Tivissa, Spain lost control on downhill section of the road, probably due to speeding. The truck flipped over on its left side and immediately ignited in flames. The flames grew and burned for 20 minutes before the tank violently exploded. The explosion broke the tank and the truck into several pieces, distorting some of them considerably, ejecting them over considerable distances and causing a pressure wave. The driver died and two people 200 meters away were burned.[116]

4. On January 19, 2004, the Skikda LNG plant in Algeria exploded and set off a chain reaction that damaged surrounding structures and facilities — including a nearby power plant, one of the berths at the Skikda harbor, and numerous homes and other buildings in the community. At least six people died instantly in the explosion. The shockwave leveled the maintenance, security and administrative buildings nearby, trapping workers under the debris. The force of the blast overturned security vehicles and ambulances that were parked near the facilities, and the heat was so intense that it melted the vehicles' metal structures. Several people died in the ensuing fire, with some reportedly trapped by a chain-link fence that surrounded a fire-engulfed area.[117]

5. On June 29, 2009, a 14-car train carrying liquefied petroleum gas (butane, propane) derailed and crashed into nearby neighborhood in Viareggio, Italy. The train exploded, collapsing five

[115] https://www.firehouse.com/home/article/10467137/crescent-city-train-derailment-40-years-later
[116] https://www.academia.edu/7741565/Explosion_of_a_road_tanker_containing_liquified_natural_gas
[117] https://us.evershedssutherland.com/mobile/portalresource/lookup/poid/Z1tOl9NPluKPtDNIqLMRV56Pab6TfzcRXncKbDtRr9tObDdEuW3Cu0!/fileUpload.name=/PGJLNG.pdf

buildings and setting fire to the surrounding area. At least 12 people were killed on 50 injured in the blast.[118]

6. On October 20, 2011, an LNG tanker truck in Murica, Spain, collided with another vehicle that was stationary on the side of the road. A fire started immediately, igniting plastic and rubber materials and the fuel tank that which finally engulfed the cargo tank. The cargo tank was of a single wall construction with polyurethane insulation and aluminum cladding. The inlet and outlet pipes for both liquid and gas were fitted with valves flush with the tank wall but there were other connections from the tank leading to the exterior. One of these connections was broken as a result of the accident and this allowed the tank contents to leak and feed the fire. The fire was burning for 71 minutes at which time the tank exploded and collapsed. The fireball that resulted was ~100 meters high with a radius of ~75 meters. Further damage was caused by thermal radiation, a pressure wave (broken windows at a nearby gas station) and debris being thrown over a distance of 200 meters. The driver of the tanker was killed in the explosion.[119]

7. On March 31, 2014, gas processing equipment at Plymouth LNG in Washington exploded into a towering, mushroom-shaped cloud. Nearby residents saw flames shoot into the air, and people living three to six miles from the plant could feel the explosion. The blast sent 250 pounds of debris and shrapnel flying as far as 300 yards, damaging buildings and equipment and puncturing one of the large LNG storage tanks. Shrapnel injured four of the fourteen employees on duty, and a fifth worker was hospitalized for burns.[120]

8. In 2018, about 0.6 Bcf of U.S. LNG exports were by truck to Canada and Mexico, with 97% going to Mexico.[121]

9. The rail incident rate per mile is approximately five times higher than the rate for road tankers.[122]

10. There have been two accidental releases of cryogenic liquids approved for U.S. rail transport in DOT-113 tank cars in the past 16 years.[123]

11. However, there is a low quantity DOT-113 tank cars carrying LNG, which lowers the accident rate. In 2015, there were under 13,000 carloads of product moved using DOT-113 tank cars. To put that in perspective, according to a 2014 AAR document, U.S. railroads were transporting 9,500 carloads of crude oil in 2008 but by 2013, that number skyrocketed to 407,761 carloads.[124]

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[118] https://www.theguardian.com/world/2009/jun/30/train-crash-viareggio-lucca
[119] https://www.gti.energy/wp-content/uploads/2018/12/Safety-4-Juan_M_Bonilla-LNG17-Poster.pdf
[120] https://www.sightline.org/2016/02/08/how-industry-and-regulators-kept-public-in-the-dark-after-2014-lng-explosion-in-washington/
[121] https://www.eia.gov/energyexplained/natural-gas/liquefied-natural-gas.php
[122] https://www.exponent.com/knowledge/alerts/2015/08/bulktransportation/~/media/03b73782ec76446798c70f6ac403ef84.ashx
[123] https://fortune.com/2019/04/11/trump-natural-gas-ship-rail/
[124] https://www.desmogblog.com/2019/04/17/trump-executive-order-lng-rail-bomb-train-risks

12. Derailments involving DOT-113 tank cars can result in large quantities of hazardous materials released, which can result from venting or breach of the inner tank shell.[125]

13. A “roll-over” in an LNG tank can occur if the liquid at the bottom becomes lighter than that at the top, and rapidly rises to the surface. The liquid that moves to the top of the container experiences a drop in pressure equal, to a first approximation, to the head of liquid. It may therefore be above its boiling point at that pressure. In such an event, the vapor pressure within the tank may be as high as the liquid pressure at the bottom of the tank, whence the liquid came, and so the resulting pressure spike might overwhelm the pressure relief systems in place and if pipe work is not designed, constructed and maintained to cope with these, then they might fail.[126]

14. There were 73 incidents involving cryogenic ethylene DOT-113 tank cars between 1977 and 2015 reported by PHMSA. Of these 73 incidents, only 5 were listed as “HMS Serious Incident.” Of the 5, 3 included one incident in Moran, KS in which three DOT-113 tank cars containing liquid ethylene derailed and burned. The incident in Brunswick, MD was due to a broken line in the piping cabinet. Another incident resulted from loss of vacuum in the annular space, due to a failure in the outer tank. After reviewing the description of each incident, several are related to venting from residue cars. In these cases, a 15 psi (20 percent) increase in the start-to-discharge pressure of the main safety relief valve could have a significant benefit by reducing the number of times cars vent and the amount they vent. There are no reports of inner vessel punctures. In some cases, railcars may be delayed in transit or on a siding or at a plant location. In these situations, there is a chance of venting or the need to flare gas to maintain vapor pressures within acceptable limits.[127]

15. On May 23, 2011, three DOT-113 tank cars containing liquid ethylene derailed and caught fire near Moran, KS. No injuries were reported.[128]

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[125] https://www.federalregister.gov/documents/2019/10/24/2019-22949/hazardous-materials-liquefied-natural-gas-by-rail
[126] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106029/jrc106029_online.pdf
[127] https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/research-and-development/hazmat/reports/71651/fr2-phmsa-hmtrns16-oncall-20mar2019-v3.pdf
[128] https://kansaspublicradio.org/kpr-news/train-derailment-sparks-grass-fire-allen-county

Attachment B

EARTHJUSTICE

August 7, 2019

VIA Email and www.regulations.gov

William Schoonover
Associate Administrator for Hazardous Materials Safety
Pipeline and Hazardous Material Safety Administration
U.S. Department of Transportation, East Building PHH-30
1200 New Jersey Avenue, SE
Washington, D.C. 20590
william.schoonover@dot.gov

RE: Comments Objecting to the Approval of the Environmental Assessment for Proposed Special Permit SP 20534, Docket PHMSA-2019-0100.

Dear Associate Administrator Schoonover:

Earthjustice, on behalf of the League of United Latin American Citizens Florida ("LULAC"), Delaware Riverkeeper Network, Center for Biological Diversity, Mountain Watershed Association, Clean Air Council, and Sierra Club submits these comments opposing Energy Transport Solutions' Special Permit SP 20534, Docket PHMSA-2019-0100 and the associated Environmental Assessment ("EA"). LULAC is a nonprofit organization dedicated to advancing civil rights for Latinx residents in the United States. The Delaware Riverkeeper Network, Center for Biological Diversity, Mountain Watershed Association, Clean Air Council, and Sierra Club are nonprofit organizations that are dedicated to protecting the environment and devoted to the general purposes of conservation of natural resources. We submit the following comments to raise concerns about the inadequacies of the EA when it pertains to safety, risks, and significant environmental impacts.

The Department of Transportation's Pipeline and Hazardous Materials Safety Administration ("PHMSA") EA is completely inadequate and PHMSA cannot rely on this assessment to determine the safety of the proposed Special Permit. The Special Permit seeks to authorize the transportation in commerce of methane, refrigerated liquid

(liquefied natural gas or "LNG") in DOT specification 113C120W tank cars. The EA cannot stand for the following reasons:

I. The Environmental Assessment is inadequate and a full Environmental Impact Statement is needed to address public safety and risks challenges of rail transport of methane, refrigerated liquid in populated areas.

II. The Environmental Assessment fails to analyze greenhouse gas emissions and climate impacts of the proposed Special Permit and thus violates PHMSA's duty under the National Environmental Policy Act.

We strongly urge PHMSA to deny the Special Permit application given the fact that a rulemaking process is needed to allow the transportation of LNG via rail, or at the very least, conduct a full Environmental Impact Assessment ("EIS") to correct the inadequacies and legal errors of this EA and reconsider its conclusions on the basis of the corrected information.

BACKGROUND

The Hazardous Materials Transportation Act was created to "protect against the risks to life, property, and the environment that are inherent in the transportation of hazardous material in intrastate, interstate, and foreign commerce."[1] Because transporting designated hazardous material in commerce in a particular amount and form may pose an unreasonable risk to health and safety or property, proceedings to prescribe regulations for safe transportation must be conducted under the Administrative Procedure Act ("APA") rule making process.[2]

PHMSA is the agency in the United States Department of Transportation that regulates safety standards in transporting hazardous materials.[3] It is responsible for "[a]dministering a national program of safety, including security, in multi-modal hazardous materials transportation including identifying hazardous materials safety concerns, developing uniform safety standards, and promulgating and enforcing safety and security regulations."[4] For adding, amending, or deleting regulations, PHMSA uses informal rulemaking procedures under the APA.[5] Generally, they need to publish the

[1] 49 U.S.C. § 5101.
[2] 49 U.S.C. § 5103.
[3] *See* 49 C.F.R. Pts. 100-185.
[4] 49 C.F.R. § 1.96.
[5] 49 C.F.R. § 106.10.

following rulemaking documents in the Federal Register: (1) an advance notice of proposed rulemaking; (2) a notice of proposed rulemaking; (3) a final rule; (4) an interim final rule; (5) a direct final rule.[6]

On February 2, 2017, the Association of American Railroads ("AAR") submitted to PHMSA a "Petition for Rulemaking to Allow Methane, Refrigerated Liquid to be Transported in Rail Tank Cars" pursuant to 49 C.F.R. § 106.100, which establish the rulemaking petition process.[7] In this petition for rulemaking, the AAR described that there is a commercial interest in transporting LNG by rail from Pennsylvania to New England, and between U.S. and Mexico.[8] They argued correctly that the "[a]uthorization of transportation of LNG by rail requires amendment of the Hazardous Materials Table in 49 C.F.R. section 102" and the amendment of "section 173.319 to include specific requirements for DOT-113 cars used for the transportation of LNG."[9]

A week later, on February 9, 2017, PHMSA acknowledged the receipt of AAR's petition and assigned the Petition Number P-1697, but did not initiate a rulemaking process.[10] On May 15, 2017, the Center for Biological Diversity ("CBD") submitted a letter to PHMSA to request AAR's petition to be denied, or at the very least, that PHMSA fully comply with the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4342, the Hazardous Materials Transportation Act ("HMTA"), 29 U.S.C. § 5101, and the Administrative Procedure Act ("APA"), 5 U.S.C. § 553.[11] It was not until May 7, 2018 that PHMSA answered both letters. While PHMSA responded to CBD that their comments "will be considered in the ongoing analysis, as well as any future potential rulemaking

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[6] *Id.*

[7] *See* Robert E. Fronczak, AAR, Petition for Rulemaking to Allow Methane, Refrigerated Liquid to be Transported in Rail Tank Cars, https://www.regulations.gov/document?D=PHMSA-2017-0020-0002 (last visited Aug. 7, 2019).

[8] *Id.*

[9] *Id.*

[10] *See* Letter from Steven Andrews, Transportation Regulations Specialist, PHMSA, to Robert E. Fronczak, Asst. Vice President, AAR (Feb. 9, 2017), https://www.regulations.gov/document?D=PHMSA-2017-0020-0001.

[11] *See* Letter from Emily Jeffers, Center for Biological Diversity, Comments to Dkt. No. PHMSA-2017-0020 (May 15, 2017), https://www.regulations.gov/document?D=PHMSA-2017-0020-0003.

action,"[12] PHMSA made a determination under 49 C.F.R. § 106.105, that AAR's petition "merits consideration in a future rulemaking."[13]

Meanwhile, on August 17, 2017, Energy Transport Solutions, LLC ("ETS") submitted a Special Permit application (SP20534) to PHMSA for the transportation of methane, refrigerated liquid (UN1972), commonly known as Liquefied Natural Gas ("LNG") in DOT-113C120W and DOT 113C140W rail tank cars, even though the applicant acknowledged that LNG is not authorized by law for transport by rail in tank cars.[14] ETS seeks to transport LNG in approximately 50-100 cars in two unit trains per day through different regions in the United States that the public does not know since that information was redacted from the application.[15]

On June 6, 2019, PHMSA announced the availability for public review and comments of the draft EA for the Special Permit 20534.[16] The agency only provided a 30-day public comment period, which was insufficient to provide informed comments on such a profoundly dangerous activity. After multiple requests for extensions of time, including Earthjustice's letter on July 3, 2019, and a letter from Representative Peter DeFazio, Chairman, House Committee on Transp. & Infrastructure, & Representative

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[12] *See* Letter from Steven Andrews, Transportation Regulations Specialist, PHMSA to Emily Jeffers, Center for Biological Diversity (May 7, 2018), https://www.regulations.gov/document?D=PHMSA-2017-0020-0004.

[13] *See* Letter from Shane C. Kelley, Director, Standards and Rulemaking Division to Robert E. Fronczak, Asst. Vice President Environment and Hazmats, AAR, to, PHMSA (May 7, 2018), https://www.regulations.gov/document?D=PHMSA-2017-0020-0005.

[14] *See* Energy Transport Solutions (ETS) Application for SP 20534 to Transport Methane, Refrigerated Liquid in DOT 113 Tank Cars (Aug. 21, 2017), https://www.regulations.gov/document?D=PHMSA-2019-0100-0941.

[15] *Id.*

[16] *See* Hazardous Materials Safety: Notice of Availability of the Draft Environmental Assessment for a Special Permit Request for Liquefied Natural Gas by Rail 84 Fed. Reg. 26,507 (June 6, 2019), https://www.regulations.gov/document?D=PHMSA-2019-0100-0002.

Tom Malinowski, Member of Congress, to Howard Elliot, Administrator, PHMSA,[17] the agency extended the comment period for 30 more days, until August 7, 2019.[18]

ETS intends to ignore the rulemaking process by invoking the Special Permit provisions under 49 U.S.C. § 5117 and 9 C.F.R. § 107.105 (d). An application under these provisions must demonstrate that a special permit achieves a level of safety at least equal to that required by regulation, or if a required safety level does not exist, is consistent with the public interest.[19] Special permit is defined as "a document issued by the Associate Administrator, the Associate Administrator's designee, or as otherwise prescribed in the HMR, under the authority of 49 U.S.C. § 5117 permitting a person to perform a function that is not otherwise permitted under subchapters A or C of this chapter, or other regulations issued under 49 U.S.C. § 5101 (e.g., Federal Motor Carrier Safety routing requirements)."[20]

Pursuant to the Executive Order on Promoting Energy Infrastructure and Economic Growth issued April 10, 2019, the Department of Transportation ("DOT") is required to begin the rulemaking process for LNG transport by rail. The Executive Order requires the Secretary of Transportation to propose for notice and comment a rule that would treat LNG the same as other cryogenic liquids and permit LNG to be transported in approved rail tank cars. The Executive Order mandated that the rulemaking process be initiated with 100 days of the April 10, 2019 order. Therefore, this Special Permit application is premature given that the DOT could propose, any day now, a rule to govern the very issue that the Special Permit is meant to address. Such a conflict would greatly impede the ability of the public to adequately comment on these issues of significant public importance.

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[17] *See* letter from Peter DeFazio, Chairman, House Committee on Transp. & Infrastructure, & Tom Malinowski, Member of Congress, to Howard Elliot, Administrator, PHMSA (June 28, 2019) https://transportation.house.gov/news/press-releases/as-trump-administration-attempts-to-fast-track-authorization-to-move-lng-by-rail-tank-car-chair-defazio-rep-malinowski-call-on-phmsa-to-disclose-risks-to-public-and-extend-public-comment-period-.

[18] *See* Hazardous Materials Safety: Notice of Availability of the Draft Environmental Assessment for a Special Permit Request for Liquefied Natural Gas by Rail 84 Fed. Reg. 32, 831 (July 9, 2019) https://www.regulations.gov/document?D=PHMSA-2019-0100-0938 (extending comment period until Aug. 7, 2019).

[19] *See* 49 U.S.C. § 5117; 9 C.F.R. § 107.105 (d).

[20] 49 C.F.R. § 107.1.

ARGUMENT

PHMSA's Environmental Assessment cannot support the Special Permit application and does not comply with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4332. For the following reasons, we respectfully request that PHMSA deny the Special Permit, or at the least, conduct a full EIS and fix the flaws identified below.

I. The Environmental Assessment is inadequate and a full Environmental Impact Statement is needed to address public safety concerns and the risks and challenges posed by rail transport of liquefied natural gas ("LNG") in populated areas.

PHMSA in exercising its authority must comply with NEPA, and its implementing regulations, which require that all federal agencies include an environmental impact statement ("EIS") "in every recommendation or report on . . . major Federal actions significantly affecting the quality of the human environment." 42 U.S.C. § 4332(2)(C); *see also* 40 C.F.R. § 1508.11. To determine whether an EIS is necessary, an agency first prepares an environmental assessment ("EA"), 40 C.F.R. § 1508.9, which must include, among other information, a discussion of "the environmental impacts of the proposed action," *id*. § 1508.9(b). After preparing an EA, an agency may conclude that the proposed action would have no significant impact ("FONSI" for a "finding of no significant impact") in lieu of issuing an EIS. *Id*. §§ 1508.9(a)(1), 1508.13. Here, PHMSA generated an EA, which included a finding of no significant impact.

Through this EA, ETS and PHMSA would allow an unprecedented, abrupt opening of the United States mainline rail system to long, heavy, hard-to-handle unit trains of LNG, using a 50-year-old rail tank car design (DOT-113C120W), which has never before been authorized for LNG service. A full EIS is needed to address what the United States Federal Railroad Administration ("FRA") has termed the "uniquely challenging" public safety aspects of LNG rail transport in populated areas. Millar Aff. ¶ 7. The EIS must also address the likely upstream and downstream impacts of rail LNG, including the fracking of natural gas, the new terrorism vulnerabilities posed by urban routing of LNG trains, the risks of methane leakage, and the impact on climate change. Millar Aff. ¶ 9.

The current EA lacks a compelling supply-demand analysis showing strong demand for near-term rail shipment of LNG. There seems to be no compelling need for PHMSA to be moving so quickly on the issuance of a nationwide Special Permit for LNG transport by 70 plus units (EA at 3) of rail tank cars, in the absence of reasonably

supporting agency research and development actions in the public safety arena. Millar Aff. ¶ 12.

In order for there to be an adequate EIS, the agency research and development actions needed include:

- a new federally-approved LNG-specific tank car design that meets modern safety standards;
- rigorous agency testing of either the existing 50-year-old DOT-113 tank car and/or a proposed new design tank car for survivability in derailment conditions, fire impingement, and collision forces;
- evaluation of the railroads' average 100-car-plus unit train business model which has proved highly risky in triggering the recent 2012-2015 North American trauma of numerous crude oil unit train derailments and is now proposed for LNG by rail; and
- adequate consideration of mandating LNG train major safety conditions, including protective urban rerouting, odorization of the cargo, and restrictions on train length and speed.

Overall, cryogenic LNG loss-of-containment transportation releases involve serious risks of cold embrittlement of nearby structures and surfaces, fire radiation from high and unquenchable gas cloud fires, and offsite travel downwind of flammable and explosive LNG vapor clouds. *See* EA at 7. Even without serious loss of containment, LNG containment vessels are subject to overheating and consequent Boiling Liquid Expanding Vapor Explosions (BLEVE), as seen in two recent Spanish LNG truck BLEVE accidents, which surprised many LNG experts who had thought such events physically impossible. Millar Aff. ¶ 22.

A. There is Great Public Concern for Potential LNG Disasters Based on the Regional Pilot Programs.

As is evident from just the comments in this docket alone, there is grave public concern regarding the potential for LNG disasters. In recent decades worried at-risk residents in many U.S. coastal locations have decisively defeated various LNG import facility siting proposals largely because of testimony by gas scientists on protective distance issues. These scientists, including Dr. James Fay and Dr. Jerry Havens, have

underscored the significant fire radiation risks posed by transporting LNG for communities within 2-3 miles of LNG transport, often LNG marine shipping routes.[21]

Additionally, there has been a lack of public information provided regarding the two LNG by rail pilot programs in Alaska and Florida. These pilot programs have been in operation since 2016 when permitted by FRA. Important Florida East Coast Railway technical documents demanded by FRA have been withheld from residents who filed Freedom of Information Act ("FOIA") requests in 2018 and 2019. Of upmost importance to the FOIA requesters is the 2016 Florida East Coast Rail Quantitative Risk Assessment ("QRA") on LNG rail operations in Florida, authored by Exponent consultants. This document was provided to FOIA requesters, but nearly completely redacted. Millar Aff. ¶¶ 28, 86-94, Exhibit E.

These pilot programs were hastily approved. In fact, in a FRA letter dated March 3, 2016, to Florida East Coast Railway,[22] the FRA expressed concern about transporting LNG over routes that traverse Florida's congested, highly populated coastal areas, with scores of often traversed highway-rail grade crossings that involve many pedestrian deaths each year. FRA here also noted that any LNG transported along the proposed routes would share the routes with high-speed performance passenger trains, such as the Brightline (now VirginRail), which travel at top speeds of 79 mph and are projected to soon travel at speeds up to 110 mph. The top speed for the LNG transport on this line is 40 mph. Millar Aff. ¶ 30. Natural gas is presently liquefied at the American LNG Hialeah Facility, located on the Northern portion of Hialeah Railyard in Medley, FL, and transported via Florida East Coast Railway lines to Port Everglades and Port Miami for export.[23]

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[21] *See generally* Congressional Research Service, *Liquefied Natural Gas (LNG) Import Terminals: Siting, Safety, and Regulation*, Dec. 14, 2019, https://www.everycrsreport.com/reports/RL32205.html; 60 Jerry Havens, *LNG: Safety in Science*, Bulletin of the Atomic Scientists, 30-31 (Jan./Feb. 2004), https://journals.sagepub.com/doi/full/10.2968/060001010; Jerry Havens, Comment to Coast Guard Dkt. No. USCG-2004-19615 (Aug. 22, 2005), available at https://www.regulations.gov/document?D=USCG-2004-19615-0091; James A. Fay, *Model of Spills and Fires from LNG and Oil Tankers*, B96 J. of Hazardous Materials 171-188 (2003); James A. Fay, *Spills and Fires from LNG and Oil Tankers in Boston Harbor*, (2003). *see also* Millar Aff. ¶ 25.

[22] The Florida East Coast Railway is a Class II regional railroad that owns 351 miles of mainline track between Jacksonville and Miami. Florida East Coast Railway, *About the Company* (last visited July 15, 2019), https://fecrwy.com.

[23] Ann Henson Feltgen, *Despite 'disaster risk' Trains Haul Highly Flammable Gas Cargo Across South Florida*, Miami Herald (Aug. 23, 2018), https://www.miamiherald.com/latest-

Contrary, to long-expressed Congressional, scientific, and public concerns, PHMSA's draft EA abruptly proposes to bring LNG transportation disaster risks directly by mainline and short line U.S. rail carriers through virtually all major U.S. cities. This effectively *obliterates* the notion of protective distance, which the EA backhandedly concedes in its unfounded assertion that rail transportation is safer than truck transportation because the latter is allegedly in closer "proximity" to populations. Millar Aff. ¶ 32.

B. There is a Serious and Dangerous Lack of Scientific Research Related to LNG Transportation via Rail.

There is no specific data on LNG bulk rail shipments because LNG has long been "forbidden" except by special permit from the FRA. The EA does not mention the history of any exceptions granted to the ban. Certainly, LNG has been "forbidden" because of the unique and challenging risks that exist in transporting LNG by the U.S. railroads.[24] Millar Aff. ¶ 26.

The EA analyzes whether transportation of LNG in DOT-113C12W tank cars is appropriate and safe, by reviewing past performance of DOT-113s in general, which are used to transport cryogenic materials. EA at 7. Currently, the transportation of ethylene, a cryogenic flammable gas is authorized for DOT-113C120W rail cars. EA at 7. PHMSA has collected data on the safety history of DOT-113 from its incident database and from AAR, which compiles data provided by FRA. PHMSA has therefore analyzed data regarding DOT-113 damage history. Millar Aff. ¶ 33.

From 1980 to 2017, there were 14 instances of damage to DOT-113 tank cars during transportation. EA at 7. According to the EA, of these 14 instances, there were two times where a DOT-113 lost lading from breach of both the outer and inner tanks, which is considered the most serious type of damage. EA at 7. "Additionally, there were four instances in which a DOT-113 lost lading from damage or other failure to the

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news/article217176680.html; *see* U.S. Dep't of Energy Office of Fossil Energy, *American LNG Hialeah Facility Terminal* (last accessed July 15, 2019), https://www.energy.gov/fe/american-lng-hialeah-facility-terminal; *see also* John S. Decker, *Letter to U.S. Dep't of Energy Re: American LNG Marketing, LLC DOE/FE Order No. 3690*, 6 (Mar. 8, 2016), https://www.energy.gov/sites/prod/files/2016/03/f30/sales%20contract%20Hialeah%20Facility03_08_16.pdf.

[24] However, the LNG industry maintains it was simply because of no strong demand for bulk LNG by rail. Millar Aff. ¶ 34.

valves/fittings." EA at 7. The two instances cited by the EA occurred in May 2011, in Moran, Kansas and in October of 2014, in Mer Rouge, Louisiana. These incidents resulted in the total quantity of refrigerated ethylene spilled was 44,306 gallons and refrigerated argon spilled was 47,233 gallons respectively. EA at 7. These two instances cited by PHMSA in the EA, are hardly enough to make up an adequate database to make an informed decision when determining whether to transport LNG by these rail cars. Millar Aff. ¶ 41.

Moreover, PHMSA has conducted more robust research regarding LNG stationary facilities. It is clear that historically, PHMSA believed that more robust research was needed to assess the potentially high-risk releases from fixed LNG facilities, which have traditionally been located at significant distances from populations. There is no justification for how PHMSA has declined to conduct a similar robust risk research effort when it comes to approving LNG by rail. Arguably a similarly, if not more dangerous, activity than LNG stationary facilities. These trains will carry LNG on 100-car units directly through major U.S. cities which are densely populated. Millar Aff. ¶ 44. For example, LNG tank cars are currently passing through areas with 9,500 people per square mile from Hialeah to Port Miami, similarly as the Hialeah to Port Everglades trip.[25]

Additionally, it is not a secret that more information is required for understanding the risks of transporting LNG. PHMSA's own consultant, David Willauer of Cambridge Systematics, presented "Risk Assessment of Surface Transport of Liquefied Natural Gas" in May 2018, and suggested key federal research and regulatory needs on assessing the safety risks of LNG rail transport.[26]

Furthermore, the EA ultimately concludes that protective distance is needed for LNG disasters, but yet does not adequately address the protective distance required. The EA ultimately underscores the flaws of its public safety arguments by compromising, on the LNG potential release impact distance question. EA at 12. The EA very briefly endorses (with no analysis) the Protective Action Distance guidance for flammable cargoes in the DOT Emergency Response Guidebook (ERG), which is highly revered by the North American fire and emergency services. In its generic, simplified "Orange

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[25] *See* Jerry Iannelli, *Brightline Tracks Transport Possibly Dangerous Natural Gas Through Miami*, Miami New Times, Aug. 22, 2018, https://www.miaminewtimes.com/news/florida-east-coast-railroad-ships-liquid-natural-gas-in-miami-10654689.

[26] Cambridge Systematics, Inc., *Risk Assessment of Surface Transport of Liquid Natural Gas*, Mar. 20, 2019, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/research-and-development/hazmat/reports/71651/fr2-phmsa-hmtrns16-oncall-20mar2019-v3.pdf; *see also* Millar Aff. ¶ 91.

Pages" guides for highly flammable gases (including its Guide 115 for refrigerated liquids such as LNG), the current ERG2016 –and previous editions produced by PHMSA every 4 years—provides a widely-used "bible" intended to be used by first responders explicitly only for their initial decisions in the first 20 minutes of a "large spill" of various high-risk chemical cargoes in a transportation emergency.

The ERG's Guide 115 has long advised first responders to "consider initial downwind evacuation" of half a mile if there is even a single breached refrigerated liquids transportation container with no fire. But if the container is involved in a fire, emergency responders should isolate the scene (prevent entry) for one mile in all directions and also "consider initial evacuation for one mile in all directions." Millar Aff. ¶¶ 96-97.

Notably, this EA does not consider the public safety implications of this advice regarding some potential need for appropriate safety precautions in the proposed LNG nationwide rail transportation. Moreover, the EA leaves unexamined the question of whether and how this generic ERG guidance is adequate for LNG transportation.

C. The EA Could Have Used Existing Gas Models to Estimate LNG Risks and Distance Potentials for LNG Releases.

Even if PHMSA, in its EA, has been unwilling to estimate distance potentials for an LNG tank car rail release, a multitude of others in government and industry have been using well-known available and approved gas science modeling for estimating the distance consequences of various hypothetical LNG facility and rail car releases. A prominent example of agency and researcher use of gas modeling to assess LNG rail transportation risk exists in the FRA-permitted LNG rail transportation experiment along Florida's East Coast. The meager EA does not impose any new significant LNG-specific safety conditions in this proposed draft Permit for ETS shipment of LNG by rail, but explicitly relies only on existing federal hazmat regulations regarding generic highly flammable tank car rail carriage. Millar Aff. ¶ 88. The EA has added in–without substantial analysis or even discussion—the voluntary consensus railroad industry minimum standard guidance in AAR Circular OT-55Q. Millar Aff. ¶ 89.This is the latest version of industry's OT-55, which was introduced many years ago for AAR-member railroad guidance on handling the most dangerous toxic and radioactive rail cargoes, with no consideration of flammable cargo risks. Millar Aff. ¶ 89; EA at 4-5.

In order to set federal actions such as permits and rulemaking, PHMSA could easily adapt and use—with relatively respectable assumptions, but without performing

a full probabilistic QRA – one of the long-approved LNG gas dispersion models (or other models if arguably more adequate) for a set of representative potential LNG rail car releases and publish in an EIS the impact distance results for a selected set of potential LNG rail car releases: pool fires, vapor cloud travel and explosions, and BLEVEs. Millar Aff. ¶ 90.

It is worth noting that the October 2017 ETS QRA was not even available through this Docket for the Special Permit comment period until July 9, 2019. The initial comment period for this Special Permit ended on July 8, 2019. Therefore, it was not until the original comment period closed, that the QRA was available electronically through the PHMSA docket.

D. The EA Asserts That Rail is Safer than Truck Transportation, While Ignoring the Comparative Risks, as Well as the Potential Terrorism Vulnerabilities.

Without merit, and in part due to the lack of research, the EA asserts that LNG by rail tank car will be safer than the existing LNG by tank truck. EA at 13. While the EA acknowledges that incidents involving rail tank cars can lead to a larger area of consequences as compared to hazard areas arising from incidents involving MC-338s cargo tank motor vehicles. EA at 13. As the EA also points out, this is because of the larger volume of LNG in each tank car compared to that in a MC-338 cargo tank. EA at 13.

In reality, LNG trucks often travel to liquefaction facilities located in remote areas from remote natural gas mining locations that are not well serviced by pipelines. Millar Aff. ¶ 74. The EA discusses that if it were to deny the Special Permit, ETS would likely continue to ship the LNG via MC-388 cargo tanks on highways. EA at 14. The EA explains that because of the increased amount of trips and higher accident rates for highway traffic as compared to rail traffic, that truck transport poses larger risks than railway travel. EA at 14. However, this conclusion is not meritorious, as the EA in the next sentence, explains that because of the larger quantity of LNG loaded into each rail car, along with the risks that result from multiple LNG railcars moving together, a cascading failure could lead to higher consequences. EA at 14. Therefore, the EA concludes that either option, rail car or truck transportation, can cause injury, death, property destruction, and environmental harm, but that the likelihood of failure is higher for truck transportation, and yet acknowledges that the scope of potential injury and death is greater for rail travel because of higher volumes of LNG carried in each tank car. EA at 14. This conclusion unacceptably declares that rail transport is the safer option.

Additionally, the EA does not discuss the potential for terrorism associated with the transportation of LNG via rail car given the increased amount of LNG per train and the huge potential impacts for death, destruction, and damage to the environment. It has been nearly 18 years since 9/11, and the potential terrorism vulnerabilities still exist for the transport of toxic chemicals.[27] Millar Aff. ¶¶ 76, 80.

II. The Environmental Assessment fails to analyze greenhouse gas emission and climate impacts of the proposed Special Permit and thus violates PHMSA's duty under the National Environmental Policy Act.

The EIS must also address the likely upstream and downstream impacts of LNG by rail, including on fracking of natural gas and climate change. The most catastrophic environmental impact of all would be the prolonging of the fossil fuel era with huge LNG investments in North America and worldwide instead of directing those investments to renewable energy resources.

For either an EA or an EIS, the purposes of NEPA require the agency to "consider and disclose" the environmental effects of the actions it certifies. *Baltimore Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 96 (1983). So long as the agency takes a "hard look" at the environmental consequences, NEPA "does not mandate particular results." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989). NEPA's "hard look" requires "discussion of the 'significance' of [an] indirect effect, *see* 40 C.F.R. § 1502.16(b) (2018), as well as 'the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.'" *Sierra Club,* 867 F.3d at 1374 (internal citation omitted).

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[27] *See* Richard A. Falkenrath, *Op-Ed: We Could Breathe Easier: The government must increase the security of toxic chemicals in transit*, Wash. Post. (Mar. 29, 2005) ("Of the all the various remaining civilian vulnerabilities, one stands alone as uniquely deadly, pervasive and susceptible to terrorist attack: industrial chemicals that are toxic when inhaled, such as chlorine, ammonia, phosgene, methyl bromide, and hydrochloric and various other acids. These chemicals, several of which are identical to those used as weapons on the Western Front during World War I, are routinely shipped through and stored near population centers in vast quantities, in many cases with no security….A cleverly designed terrorist attack against such a chemical target would be no more difficult to perpetrate than were the Sept. 11 attacks. The loss of life … might even exceed it… [N]o other category of potential terrorist targets presents as great a danger as toxic industrial chemicals.")

Indirect effects "are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."[28] An environmental impact is reasonably foreseeable "if it is 'sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision.'" *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549 (8th Cir. 2003) (internal citation omitted). Implicit in this requirement to analyze foreseeable effects is a duty to engage in "reasonable forecasting." *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm'n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973). However, here, PHMSA failed to account for the context and intensity of the upstream and downstream emissions impacts resulting from the activity proposed in the Special Permit.[29]

The indirect effects inquiry is wide-ranging. Specifically, under this standard, courts have required federal agencies to consider the indirect effects of energy-related transportation projects. In *Mid States*, for example, because a new rail line provided a more direct route from coal mines to power plants, the court held that NEPA required the Surface Transportation Board to consider the downstream impacts of burning the coal. *Mid States*, 345 F.3d at 549 ("[I]t is reasonably foreseeable – indeed, it is almost certainly true – that the proposed project will increase the long-term demand for coal and any adverse effects that result from burning coal."); *see also Border Power Plant Working Grp. v. Dep't of Energy*, 260 F. Supp. 2d 997, 1030 (S.D. Cal. 2003) (air quality impacts of Mexican power plant that would export electricity to the United States over new transmission line were reasonably foreseeable result of constructing transmission line).

Accordingly, "[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct." *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008), citing 40 C.F.R. § 1508.7 (cumulative impact is "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency ... or person undertakes such other actions"); *see also id.* at 1216 (cumulative impacts analysis inadequate where agency failed to "discuss the actual environmental effects resulting from [greenhouse gas] emissions" (emphasis in original)).

The D.C. Circuit recently ruled in *Sierra Club v. FERC*, 867 F.3d 1357, 1371-1372 (D.C. Cir. 2017), that NEPA required the Federal Energy Regulatory Commission to

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[28] 40 C.F.R. § 1508.8(b); *see New York v. Nuclear Regulatory Comm'n*, 681 F.3d 471, 476 (D.C. Cir. 2012).

[29] 40 C.F.R. § 1508.27.

consider the indirect but reasonably foreseeable impacts of natural gas pipelines which included the downstream greenhouse gas emissions resulting from burning of gas transported by the pipeline in its NEPA review. Although the Commission had claimed that it lacked information regarding the amount of gas that would be burned downstream, the Court found that the agency could "make educated assumptions" about use of gas based on its knowledge of the general capacity of the pipeline. *Sierra Club* at 1374.

Applying *Sierra Club*, federal district courts in other jurisdictions reached similar results. For example, in *San Juan Citizens All. v. U.S. Bureau of Land Mgmt.*, 326 F. Supp. 3d 1227 (D.N.M. 2018), the court rejected BLM's claim that "consumption is not 'an indirect effect of oil and gas production because production is not a proximate cause of GHG emissions resulting from consumption'." *Id.* at 1242. Instead, the court ruled that BLM's "statement is circular and worded as though it is a legal conclusion…[and] it is contrary to the reasoning in several persuasive cases that have determined that combustion emissions are an indirect effect of an agency's decision to extract those natural resources*." Id.; see also W. Org. of Res. Councils v. U.S. Bureau of Land Mgmt.*, No. CV 16-21-GF-BMM, 2018 WL 1475470, *13 (D. Mont. Mar. 26, 2018), *appeal dismissed*, No. 18-35836, 2019 WL 141346 (9th Cir. Jan. 2, 2019) (finding that NEPA requires consideration of environmental consequences of the downstream combustion of the coal, oil and gas resources potentially open to development under agency plan within the NEPA document).

In *San Juan*, the court continued that "it is erroneous to fail to consider, at the earliest feasible stage, 'the environmental consequences of the downstream combustion of the coal, oil and gas resources potentially open to development' under the proposed agency action." *San Juan*, 326 F. Supp. 3d at 1244. Accordingly, the court found that BLM's action was "arbitrary" due to its failure to estimate the amount of greenhouse gas emissions which will result from consumption of the oil and gas produced as a result of the development of wells in the leased areas*. Id.; see also Montana Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1097-99 (D. Mont. 2017), *amended in part, adhered to in part sub nom. Montana Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, No. CV 15-106-M-DWM, 2017 WL 5047901 (D. Mont. Nov. 3, 2017); *Dine Citizens Against Ruining Our Env't v. U.S. Office of Surface Mine Reclamation and Enforcement*, 82 F. Supp. 3d 1201, 1213 (D. Colo. 2015), *Dine Citzens Against Ruining our Env't v. U.S. Office of Surface Mining Reclamation & Env't*, 643 F. App'x 799 (10th Cir. 2016).

PHMSA's analysis of greenhouse gas emissions in the EA violates NEPA in at least three ways. First, PHMSA violated NEPA by failing to analyze the impact of downstream

and upstream greenhouse gas emissions and climate change despite the clear connection between the activities authorized in the proposed Special Permit and the release of greenhouse gases. Second, PHMSA violated NEPA by failing to request any information from the applicant regarding downstream and upstream greenhouse gas emissions. Third, PHMSA violated NEPA by failing to account for, or otherwise examine, the induced development of additional production, transportation, and combustion of natural gas liquids ("NGLs") as a result of the Special Permit.

There is no doubt that the activities authorized in the Special Permit will result in the combustion of LNGs that will emit significant quantities of greenhouse gases into the atmosphere. Indeed, that is the entire purpose of ETS's request for the Special Permit. PHMSA states as much in the EA, where they admit that "[i]n most cases . . . the ultimate end-users of this LNG will be foreign generators of power for residential, commercial and industrial purposes," and that "there will be some domestic end-users of the LNG." EA at 1. However, in the draft EA, PHMSA failed to analyze the greenhouse gas emission and climate impacts of the activities authorized in the Special Permit. PHMSA does not even attempt to quantify the emissions, let alone examine their context and intensity as required by NEPA. Instead, greenhouse gas emissions are only fleetingly mentioned once with regard to a comparison of train versus truck engine emissions, and even in that context the emissions are not quantified.

In addition to PHMSA's failure to analyze greenhouse gas emissions and their impacts, PHMSA also failed to perform an even more fundamental task required under NEPA – requesting the relevant data from the applicant. This is a separate but equally dispositive violation of NEPA. Specifically, PHMSA must request information regarding the extent of potential increased domestic production and consumption of methane gas and its environmental impact to comply with NEPA. NEPA "requires the [agency] to at least *attempt* to obtain the information necessary to fulfill its statutory responsibilities." *Birckhead v. FERC*, 925 F.3d 510, 520 (D.C. Cir. 2019) (emphasis added*); see also Delaware Riverkeeper Network v. FERC*, 753 F.3d 1304, 1310 (D.C. Cir. 2014) ("an agency must fulfill its duties to the fullest extent possible") (citations omitted). Even if the relevant information is unavailable, the reviewing agency has an affirmative duty to seek it out. *See Barnes v. U.S. Dep't of Transp.*, 655 F.3d 1124, 1136 (9th Cir. 2011) ("an agency must use its best efforts to find out all that it reasonably can") (citations omitted).[30]

[30] *See also* 40 C.F.R. § 1502.16(b).

An example of relevant data is that Marcellus and Utica methane gas production has been limited by pipeline takeaway capacity in the region.[31] However, the U.S. Energy Information Administration ("EIA") "estimate[d] that if all pipeline projects meet the scheduled service dates, more than 24 billion cubic feet per day (Bcf/d) of takeaway capacity will be online in 2018, up from the estimated 16.7 Bcf/d in 2017".[32]

> Since 2013, when the region's supply began exceeding demand, producers have been squeezing gas out through any available outbound pipeline capacity in order to access interregional demand. As a result, the Northeast's gas flow and pricing dynamics have been defined by takeaway constraints, with flows perpetually hitting capacity limits and supply hub prices getting knocked down.[33]

The production of methane gas in the United States "grew by 10.0 billion cubic feet per day (Bcf/d) in 2018, an 11% increase from 2017. The growth was the largest annual increase in production on record, reaching a record high for the second consecutive year."[34] The U.S. continued to export more methane gas than it imported in 2018, after being a net exporter in 2017 for the first time in nearly 60 years: total methane gas exports grew 14% in 2018, and LNG experts grew by 53%.[35] It has been said that the Appalachian region remained the largest methane gas-producing region in the United States.[36] In fact, Appalachian methane gas "from the Marcellus and Utica/Point Pleasant shales of Ohio, West Virginia, and Pennsylvania continued to grow, with gross withdrawals increasing from 24.2 Bcf/d in 2017 to 28.5 Bcf/d in 2018. Ohio saw the largest percentage increase in gross withdrawals of natural gas, up 34%, in 2018 to 6.5 Bcf/d."[37]

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[31] *Northeast Natural Gas Pipeline Takeaway Capacity Expected to Increase in 2018*, Pennsylvania State University, May 23, 2018, https://extension.psu.edu/northeast-natural-gas-pipeline-takeaway-capacity-expected-to-increase-in-2018.

[32] *Id.*

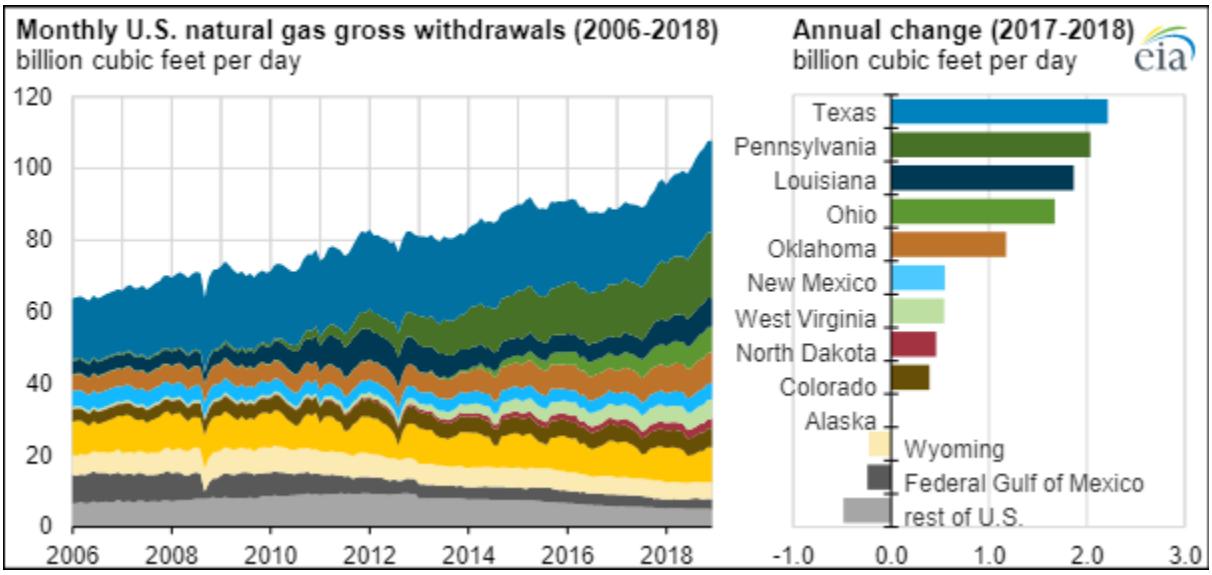
[33] Sheetal Nasta, *Room At The Top, Part 4 – Northeast Gas Takeaway Capacity vs. Production in 2019*, RBN Energy, July 4, 2019, https://rbnenergy.com/room-at-the-top-part-4-northeast-gas-takeaway-capacity-vs-production-in-2019.

[34] U.S. Energy Information Administration, U.S. natural gas production hit a new record high in 2018 (Mar. 14, 2019), https://www.eia.gov/todayinenergy/detail.php?id=38692.

[35] *Id.*

[36] *Id.*

[37] *Id.*



Source: U.S. Energy Information Administration, Monthly Crude Oil, Lease Condensate, and Natural Gas Production Report.

EIA has reported that over the past several years, methane gas production in the Appalachian basin from the Marcellus and Utica shales has grown significantly.[38] "Because pipeline projects often have longer lead times than production projects, transport infrastructure for accessing natural gas demand centers and export locations in the Appalachian Basin has not kept pace with production capability."[39] Even though there have been takeaway capacity challenges in the Northeast and particularly in Pennsylvania, because of a lack of available pipelines, as production continues to escalate to record levels.[40]

There is credible information that shows the increase in domestic production and consumption of methane gas. PHMSA has a duty to study the environmental impacts of this increase in production and consumption to comply with NEPA, and failing to do so, undermines its ability to adequately analyze the Special Permit application and EA.

Where a federal agency contended that it was too speculative to reach any conclusions regarding the upstream and downstream emission of greenhouse gases because the applicant was unlikely to have the information, the D.C. Circuit stated it was:

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[38] U.S. Energy Information Administration, New Infrastructure Aims to Increase Takeaway Capacity of Natural Gas from Utica Region, Nov. 22, 2016, https://www.eia.gov/todayinenergy/detail.php?id=28872.

[39] *Id.*

[40] Brian Walzel, *No Signs of Slowing the Marcellus-Utica*, Hart Energy, Sept. 4, 2018, https://www.hartenergy.com/exclusives/no-signs-slowing-marcellus-utica-31343.

> . . .skeptical of any suggestion that a project applicant would be unwilling or unable to obtain it if the [agency] were to ask for such data as part of the certificate application process. In fact, when we asked counsel for Tennessee Gas during oral argument 'what would have happened if the [agency] . . . , as part of your application,' had requested that 'you . . . ask the shipper/marketer where the gas is coming from,' he replied that the company 'would have gone to [the shipper] and posed the question.' [] 'When the regulator asks us questions,' counsel explained, 'we generally answer them as promptly as possible and as completely as possible.'
> *Birckhead*, 925 F.3d at 520 (D.C. Cir. 2019).

Here, there is neither evidence that PHMSA requested information related to the downstream or upstream emission of greenhouse gases, nor is there evidence that this information was volunteered by the applicant. PHMSA's failure to carry out this basic requirement violates NEPA.

Not only is the primary purpose of the proposed Special Permit directly causing or otherwise facilitating the release of greenhouse gases, PHMSA has conceded that granting the Special Permit will also result in induced development, and increased consumption of natural gas. Specifically, PHMSA states that granting the Special Permit may "result in additional business opportunities to be realized as a result of the efficiencies of transporting LNG by rail and thereby further incentivize domestic production." EA at 21. PHMSA notes that "[s]uch business opportunities could include end-use applications (such as power plants), export facilities, and the associated loading/unloading facilities that would accommodate such developments." *Id*. PHMSA's failure to examine reasonably foreseeable induced development facilitated by the use of the previously prohibited rail tanks is yet a third violation of NEPA.

ETS also directly concedes in its application that approving the Special Permit will incentivize an increase in natural gas production and consumption. ETS stated that the low price of natural gas has made it "not economically viable" to build other types of infrastructure to transport natural gas, which has "resulted in stranded gas." ETS Application at 9. ETS states that approving the Special Permit will therefore result in "[b]ringing additional amounts of LNG to market." *Id*. ETS further contends that "transporting LNG by rail as authorized by this Special Permit would result in an *increase* in U.S. exports." *Id.* (emphasis added). The only way to "increase exports" and bring "additional" LNG to market is to induce increased production, which of course also results in increased consumption.

This induced development is further supported by PHMSA's underlying economic conclusions related to the authorization of the Special Permit. For example, PHMSA notes that using DOT-113 rail tank cars is "less costly" than moving freight by truck, which "further incentivizes production." EA at 15, 21, 22. Specifically, the EA notes that using the rail would be "3.5 times more [fuel] efficient" than hauling via trucks, and that moving "one ton of freight by train would result in 70% less fuel than moving the same freight by truck." EA at 15. These potential savings – assuming they are accurate – combined with the fact that one of the constraints on production is the "limited" nature of other transportation methods, leads to the inevitable conclusion that allowing the use the DOT-113 rail tank cars will increase production upstream, and result in the burning of more LNGs downstream. However, none of this is accounted for in the EA.

The fact that an "increase in the domestic production and export/use of LNG [is] already underway" is not an excuse for PHMSA to ignore its statutory mandate under NEPA to examine the upstream and downstream greenhouse gas emissions resulting from the proposed Special Permit. For example, in *Sierra Club*, where the agency raised a "practical objection, arguing that it is impossible to know exactly what quantity of greenhouse gases will be emitted as a result of [the approval]." *Sierra Club*, 867 F.3d at 1373-1374. However, the court rejected that argument stating that because the agency already knew the capacity of the pipeline project, it could "estimate greenhouse-gas emissions" resulting from the approval. *Id*. at 1374. Here, PHMSA has provided that the "baseline case of LNG movement" is "700 trucks or 2–4 unit trains per day." EA at 20; *see also* EA at 5, "approximately 1200 MC-338 cargo tanks trucks per day." Based on the availability of this information alone, PHMSA violated NEPA by failing to quantify the total emissions resulting from granting the Special Permit.

CONCLUSION

For these reasons, PHMSA's Environmental Assessment cannot support the Special Permit application and does not comply with NEPA and the rulemaking process under APA.

We therefore respectfully request PHMSA to deny the Special Permit application submitted by Energy Transport Solutions or, at the least, conduct a full Environmental Impact Assessment to correct these inadequacies and legal errors and reconsider its conclusions on the basis of the corrected information. Please contact us with any questions.

Sincerely,

Laura Arroyo
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On Behalf of:
League of United Latin American Citizens Florida
Delaware Riverkeeper Network
Center for Biological Diversity
Mountain Watershed Association
Clean Air Council
Sierra Club

AFFIDAVIT

Before me, the undersigned Notary Public, personally appeared Fred Millar, who, after being by me duly sworn, upon his oath stated and deposed as follows:

1. My name is Fred Millar. I am a public interest and environmental safety advocate, national policy analyst and lobbyist, and consultant, based in the Washington, D.C. area, and have worked for over 40 years on local, national, and international arenas regarding hazmat transportation issues and strategies. Specifically, I have worked on nuclear waste transportation, industrial chemical transportation, crude oil trains, LNG transportation, accident prevention, emergency planning and homeland security. A copy of my curriculum vitae is attached to this Affidavit as Exhibit A.

2. Additionally, I served as consultant to major U.S. chemical and oil worker unions, environmental groups, insurance companies, and university and governmental bodies.

3. I make this Affidavit based on my own personal knowledge, professional skill, specialized training and education.

FURTHER, AFFIANT SAYETH NOT.

Fred Millar
Expert's Name

STATE OF VIRGINIA

COUNTY OF ARLINGTON

I, the undersigned Notary Public, in and for said State and County, hereby certify that Fred Millar, whose name is signed to the foregoing Affidavit, and who is known to me, acknowledged before me on this day that, being informed of the contents of said Affidavit, he executed same voluntarily on the day the same bears date.

Given under my hand and seal this 17th day of August, 2019.

Michael R. LaRose
Notary Public

My Commission Expires: 12/31/2022

MICHAEL R LAROSE
NOTARY PUBLIC 7780528
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES:
DECEMBER 31, 2022

1. I have worked on nuclear waste transportation, industrial chemical transportation, crude oil trains, LNG transportation, accident prevention, emergency planning and homeland security.

2. Additionally, I served as consultant to major U.S. chemical and oil worker unions, environmental groups, insurance companies, and university and governmental bodies.

3. I have analyzed safety problems and advocated for national and grassroots action strategies for chemical hazard assessment, emergency planning, accident prevention, and public access to information.

4. I have worked with citizens, workers, and public officials in scores of petrochemical communities on generic industrial safety issues and on existing risk documents such as worst case accident scenarios. I have pressed for many specific safety improvement activities by companies and governments, commented on many federal rulemakings, and testified in Congress and local city councils.

5. In the post-Bhopal disaster period,[1] while working with allies, I worked to develop new legislation enacting a major new federal regulatory program on prevention of chemical facility accidents.

6. I have written this Expert Statement in the context of the 23-page Draft Environmental Assessment (EA) dated June 5, 2019 from the Pipelines and Hazardous Materials Safety Administration (PHMSA) for the Special Permit 20534 to be granted to Energy Transport Solutions, LLC (ETS) for use nationwide.[2]

7. A full Environmental Impact Statement (EIS) is needed to address what the United States Federal Railroad Association (FRA) has termed the uniquely challenging public safety aspects of LNG rail transport in populated areas.

8. The EA proposes to allow an unprecedented and abrupt opening of the U.S. mainline rail system to long, heavy, hard-to-handle (up to 100 cars) unit trains of Liquefied Natural Gas (LNG), using a 50-year-old rail tank car design, which has never before been authorized for LNG service.

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[1] *See generally* Alan Taylor, *Bhopal: The World's Worst Industrial Disaster, 30 Years Later*, The Atlantic, Dec. 2, 2014, https://www.theatlantic.com/photo/2014/12/bhopal-the-worlds-worst-industrial-disaster-30-years-later/100864/.

[2] *See* PHMSA, Draft SP 20534 Environmental Assessment, June 5, 2019, Docket PHMSA-2019-0100, https://www.regulations.gov/searchResults?rpp=25&po=0&s=PHMSA-2019-0100&fp=true&ns=true. This EA and its slightly modified version dated July 8, 2019, features mainly minor amendments and is wholly inadequate.

9. The EIS must also address the likely upstream and downstream impacts of LNG by rail, including the fracking of natural gas, the new terrorism vulnerabilities posed by urban routing of LNG trains, and the risks of methane leakage and climate change.

10. The most catastrophic environmental impact of all, of course, would be the prolonging of the fossil fuel era with huge LNG investments in North America and worldwide instead of directing those investments to renewable energy resources.

11. The public safety impacts of the current worldwide boom in the LNG industry worldwide have yet to become evident. *See* Nace, Plante & Browning, *The New Energy Boom: Tracking Global LNG Infrastructure*, Global Energy Monitor (June 2019), https://globalenergymonitor.org/new-gas-boom/.

12. These public safety impacts may become evident relatively soon. As happened very quickly in the abrupt growth of crude oil unit trains across North America during 2012-2015, when there were several highly flammable derailment disasters soon after the introduction of that rail transportation practice. This bears strong similarities to the LNG unit train operations which PHMSA proposes to approve with Special Permit 20534.

13. The current EA lacks a compelling supply-demand analysis showing strong demand for near-term rail shipment of LNG. There seems to be no compelling need for PHMSA to be moving so quickly on issuance of a nationwide Special Permit for LNG transport by 70-cars-plus unit trains (EA at 3) of rail tank cars, in the absence of reasonably supporting agency research and development actions in the public safety arena. PHMSA's dangerous haste to permit LNG by rail does not take into account what the EA itself admits is the considerable time the shippers and rail industry will need to build out an LNG market and provide a new fleet of DOT-113s for LNG service. EA at 3.

14. The agency research and development actions needed include:

    - a new federally-approved LNG-specific tank car design that meets modern safety standards;
    - rigorous agency testing of either the existing 50-year-old DOT-113 tank car and/or a proposed new design tank car for survivability in derailment conditions, fire impingement, and collision forces;
    - evaluation of the railroads' average 100-car-plus unit train business model which has proved highly risky in triggering the recent 2012-2015 North American trauma of numerous crude oil unit train derailments and is now proposed for LNG by rail; and
    - adequate consideration of mandating LNG train major safety conditions, including protective urban rerouting, odorization of the cargo, and restrictions on train length and speed.

I. MAJOR PUBLIC SAFETY ISSUES WITH THE EA.

15. The most crucial deficiency is that the EA throughout, while briefly outlining some potential LNG rail release potentials, severely downplays the significant risks of unit trains as well as the unique safety challenges of LNG by rail.

16. This flies in the face of longstanding concerns from Congress, public officials and the public, about LNG facilities and LNG transportation disaster risk potentials. Congress has long mandated that several federal safety agencies share responsibilities in regulating LNG operations, and specifically has advised that LNG facility proponents should seek remote siting. *See* Congressional Research Service, Liquefied Natural Gas (LNG) Import Terminals: Siting, Safety, and Regulation, Dec. 14, 2019, https://www.everycrsreport.com/reports/RL32205.html ("We believe remote siting is the primary factor in safety. Because of the inevitable uncertainties inherent in large-scale use of new technologies and the vulnerability of the facilities to natural phenomena and sabotage, the public can be best protected by placing these facilities away from densely populated areas.")(citing Peach, J.D. General Accounting Office (GAO), Director, Energy and Minerals Division. Testimony to the Senate Committee on Commerce, Science and Transportation. Washington, DC. April 25, 1979. p. 10.)

17. Most important to underscore, the key is *protective distance* between the LNG facility and potentially impacted residents or resources.

18. The current Special Permit 20534 has no mandate for protective re-routing using the multitude of standing railroad interchange agreements, which can avoid in many cases urban areas and sensitive establishments.

19. This Permit *would effectively obliterate any principle of protective distance* in LNG rail operations.

20. The significant public safety risks of LNG facilities and transportation have been of concern to the at-risk public, public officials, and scientists for several decades. The highest concern for decades was for the potential miles-long fire radiation impact disasters from imported LNG ship carriers. Now, in this current era, LNG export-related risks are of paramount concern.

21. Overall, cryogenic LNG loss-of-containment transportation releases involve serious risks of cold embrittlement of nearby structures and surfaces, fire radiation from high and unquenchable gas cloud fires, and offsite travel downwind of flammable and explosive LNG vapor clouds. *See* EA at 7.

22. Even without serious loss of containment, LNG containment vessels are subject to overheating and consequent Boiling Liquid Expanding Vapor Explosions (BLEVEs), as

seen in two recent Spanish LNG truck BLEVE accidents which surprised many LNG experts who had thought such events physically impossible.[3]

23. Because of the large costs and risks of conducting large scale LNG field research, however, LNG experts have periodically indicated that there has been only limited progress in understanding even some of the most basic factors in the behavior of serious potential LNG releases.[4]

24. Therefore, scientists, companies and agencies have to rely on various competing gas release and dispersion models, each with its own assumptions, limitations and uncertainties, to design and regulate and provide industry best practice voluntary guidance for the siting and operation of LNG facilities worldwide. Many experts suggest that these models need more field testing for their validation. They also recognize the important data gaps in the historical record of relevant LNG-specific operations and accidental releases real-world data needed to build valid models. Four dense gas models have been approved for LNG facility siting use by the federal agencies, none specifically for assessing LNG transportation release risks.

II. RECENT HISTORY OF PUBLIC CONCERN FOR LNG DISASTER POTENTIALS.

25. In recent decades worried at-risk residents in many U.S. coastal locations decisively defeated various LNG import facility siting proposals largely because of testimony by gas scientists on distance issues. These scientists, including Dr. James Fay and Dr. Jerry Havens, have underscored the significant LNG release fire radiation risks posed to communities within 2-3 miles of LNG transportation (often LNG marine shipping) routes.[5]

26. Most relevant to the current EA, are the safety agencies, including the Federal Railroad Administration (FRA) that shares regulatory jurisdiction over LNG transportation with PHMSA, have long kept bulk transportation of LNG by rail tank car in the "forbidden" category of the federal Hazardous Materials Table, allowed only under special permit from FRA, and rarely granted. 49 CFR § 172.101.

27. Since 2016, in the context of the current and new growth of the North American LNG industry, FRA has approved two recent regional LNG transport programs via Alaska and

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[3] 17 Planas-Cuchi & Gasulla, et al., *Explosion of a Road Tanker Containing Liquified Natural Gas*, J. of Loss Prevention in the Process Industries, 315-321 (2004). Attached as Exhibit B.
[4] *See e.g.,* the classic comprehensive work of Woodward & Pitblado, *LNG Risk Based Safety: Modeling and Consequence Analysis* (2010), available at https://onlinelibrary.wiley.com/doi/book/10.1002/9780470590232.
[5] *See* James A. Fay, *Spills and Fires from LNG and Oil Tankers in Boston Harbor*, (2003). Attached as Exhibit C.

Florida railroads,[6] but only with many FRA demands for technical risk evaluations and data reports from the carriers.

28. This report will discuss later the parallel 2017 Exponent QRA for ETS[7], which was withheld from public view by not being placed on the PHMSA Docket until the very last day of the initial 30-day comment period, which was subsequently extended by 30 days.

29. The recklessness of the recent federal rail LNG regional pilot experiments is suggested by many of FRA's own statements.

30. In an FRA letter dated March 3, 2016, to Florida East Coast Rail, the FRA expressed concern about transporting LNG over routes that traverse Florida's congested, highly populated coastal areas, with scores of often traversed highway-rail grade crossings that involve many pedestrian deaths each year. FRA here also noted that "Any LNG transported along the proposed routes would eventually share the routes with high-speed performance passenger trains [formerly Brightline, now VirginRail] traveling at speeds up to 110 mph." The top speed for the LNG transport on this line, with scores of grade crossings, is 40 mph. *See* letter from Karl Alexy, Staff Director, Hazardous Materials Division, PHMSA to James R. Hertwig, President/CEO of Florida East Coast Railway, Mar. 3, 2016.[8]

31. FRA itself has apparently not produced for public consumption a worst case scenario for either of the high-risk Alaska and Florida regional pilot experiments with bulk LNG, nor any substantial safety evaluation of the pilots, or any risk assessments for LNG by rail operations in general.

32. Contrary to long-expressed Congressional, scientific, and public concerns, PHMSA's draft EA abruptly proposes to bring LNG transportation disaster risks directly by mainline and shortline U.S. rail carriers through virtually all major U.S. cities. This effectively *obliterates* the notion of protective distance, which the EA backhandedly concedes in its dubious assertion that rail transportation is safer than truck transportation because the latter is allegedly in closer "proximity" to populations. EA at 14.

III. THE EA LACKS A ROBUST RESEARCH BASIS FOR FEDERAL ACTION ON LNG RAIL TRANSPORT.

33. Perhaps the most illuminating safety-related statements in the EA (*see* EA at 7) feature sobering risk analysis results from PHMSA's efforts to cobble together for this EA some

[6] The pilot programs us ISO cargo containers, one-third the volume of the DOT-113 cryogenic rail tank cars proposed under Special Permit 20534.

[7] ETS Movement of LNG in DOT-113 Tank Cars by Rail, Quantitative Risk Analysis (QRA) Considering DOT-113 Tank Car Position in Train and Train Speed, Exponent Project No. 1705991.000 (Oct. 27, 2017) PHMSA-2019-0100-0940, https://www.regulations.gov/document?D=PHMSA-2019-0100-0940.

[8] Attached as Exhibit D.

kind of respectable transportation history that could be used to make reasonable estimates of future LNG rail accident scenarios and impacts. PHMSA had to reach far back and try to make conclusions based incorrectly on data from US DOT-113 tank car refrigerated gas shipments of all refrigerated chemicals by rail.

34. No specific data on LNG bulk rail shipments were available because LNG had long been "forbidden" except by special permit from FRA. The EA does not mention the history of any exceptions granted to the ban. The federal safety agencies would no doubt explain this agency ban as a reasonable reaction to LNG's uniquely challenging risks in the U.S. rail environment. The LNG industry maintains it was simply because of no strong demand for bulk LNG by rail.

35. The EA displays a seriously deficient effort to gather relevant data needed for rational agency action on LNG rail transportation. A big problem evident in the EA's analysis is that there is a very limited history of incidents with the DOT-113 rail car with any kind of refrigerated liquids.

36. This reflects the very limited number annually of all such cryogenic rail tank car shipments nationally. The EA leaves this important overall data unmentioned. In 2015, only some 12,770 rail cryogenic shipments occurred, according to U.S. Energy Information Administration (EIA) data, a tiny proportion of the 2.3 million railcars annually the AAR estimates for all hazmat rail cargoes. And of those 12,770 annual cryogenic shipments, some 11,000 were of ethylene; the rest were for carbon dioxide, argon, etc. – and none were with the "forbidden" LNG.

37. Reportedly only a relative handful, fewer than 100, of the DOT-113 railcars used for all refrigerated liquid shipments are in service today.

38. Therefore, making statistically respectable estimates, from the skimpy historical record, of the DOT-113 rail cars' likely performance in future derailments is virtually impossible. One can only note bluntly, as the EA does, that releases can occur and that there is no reason to doubt that in a serious puncture the whole refrigerated LNG cargo is likely to be released and promptly vaporize.

39. PHMSA and the DOT model safety agencies have historically crafted their safety regulations by relying centrally on PHMSA's own directly relevant data on historical operations and accidents that indicate what kinds of hazmat releases can be expected. PHMSA based its dubious safety assertions in the EA on LNG by rail on a very slim historical data basis of non-LNG rail releases from a rather small U.S. cryogenics industry overall.

40. According to the EA, the first derailment that resulted in the breach of an inner tank of a DOT-113 occurred in May 2011 in Moran, Kansas. Three DOT-113C120 specification tank cars containing liquid ethylene sustained damage. One of the cars was breached in the derailment and initially caught fire, and the other two cars were mechanically breached with explosives and burned due to the damages they sustained from the

derailment. The total quantity of refrigerated ethylene spilled was 44,306 gallons and the total damage estimate was calculated at approximately $231,000 in 2017. The other derailment that caused tank failure occurred in October 2014 in Mer Rouge, Louisiana. The rail tank cars were filled with refrigerated liquid argon. One car was a DOT-113A90W specification tank car authorized by Special Permit and the other was an AAR204W tank car. The total quantity of refrigerated argon spilled was 47,233 gallons and the total damage estimate is calculated at approximately $228,000 (in 2017 dollars). No injuries or fatalities were reported as a result of the release of hazardous materials from either incident. The average quantity spilled per derailment involving the analyzed cryogenic liquids, 45,769 gallons, is approximately ten times greater than the average quantity spilled for all rail incidents involving hazardous materials from 2005 to 2017, at 4,807 gallons. EA at 7.

41. Two accidents hardly provide a respectable database for federal action.

42. By contrast, PHMSA has conducted robust research on LNG facility risks.

43. PHMSA has undertaken to improve its data collection and analysis methodologies for regulating LNG facilities, when compared to its lack of research for LNG rail transportation.

44. It is also clear that historically, PHMSA believed that more robust research was needed to assess the potentially high-risk releases from fixed LNG facilities, which have historically been located at significant distances from populations. There is no justification for how PHMSA has declined to conduct a similarly robust risk research effort when it comes to approving LNG by rail, which is arguably a similar, if not more dangerous, activity than LNG fixed facilities. These unit trains will carry LNG up to 100-cars each directly through major U.S. cities which are densely populated.

IV. THE EA IGNORES THE SERIOUS ISSUES WITH COMMUNITY EMERGENCY RESPONSE FOR LNG TRANSPORTATION RELEASES.

45. A major LNG-related risk issue which PHMSA's EA does highlight is that "offensive" (fire quenching or event containment from close to the release source) emergency response (ER) is essentially impossible for a transportation-related LNG release that can result in an unquenchably hot LNG fire or a huge flammable LNG gas cloud formation 620 times as large as the tank car volume released.

46. Response and mitigation techniques (defensive ER) beyond evacuation for breaches in cryogenic tank cars do not exist or are impractical during a derailment scenario. Breach of a cryogenic tank car will result in the loss of the entire volume of material in the tank car. Incidents are rare, though rail impacts can have tremendous consequences, given the quantity of hazardous materials in transportation. *See* EA at 7.

47. In order to assess the overall risks to public safety from the proposed issuance of Special Permit 20534, one significant question is whether local fire and emergency services are both prepared and equipped to prepare for and to deal effectively with potential LNG rail release emergencies.

48. The U.S. fire service and local officials nearby LNG stationary facilities reportedly are uneducated about the risks of LNG transportation. The bluntest example of this came from Chief Lonnie Click, who responded to, and was Incident Commander, at the March 31, 2014, Plymouth, Washington LNG release accident. Chief Click shared his experience in a Washington D.C. DOT PHMSA and National Association of Pipeline Safety Regulators (NAPSR) LNG Workshop held on May 19, 2016. "Not knowing what we were getting into until we were closer…crash course of learning all about LNG that morning because I really didn't know much about it."[9]

V. THE IMMEDIATELY PRECEDING HISTORY OF HAZMAT UNIT TRAINS IS SOBERING.

49. In historical context, the EA is falling in line with the posture of the AAR, which in 2017 petitioned PHMSA for new regulations to open the whole U.S. rail system to LNG using the DOT-113 tank cars.[10]

50. Both AAR and PHMSA have deliberately downplayed the 2012-2015 national trauma caused by the railroad industry's new crude oil unit train business model that railroads imposed, on a manifestly unprepared North American rail physical and regulatory infrastructure. That analogous recent high-risk industry hazmat experiment situation produced fifteen fiery crude oil unit train derailments with the old puncture-prone DOT-111 railcars, including the 47 fatalities at Lac-Mégantic.[11]

51. The basic LNG by rail safety research has not been done. However, the LNG shippers and carriers want to roll the dice anyway, and the EA demonstrates that PHMSA as a federal regulator is going along with the rush to transport LNG by rail without adequate safety research.

52. The EA never assesses the potential worst case scenarios of LNG release impact distances for either LNG tank car or ISO container trains. The EA completely ignores this potential,

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[9] Presentation available at, https://www.youtube.com/watch?v=yCTIJaElAlw&list=PL4wHDsuQ-uKleTf4Z3ca6vJgpiRVTkSZ2&index=3.

[10] Robert E. Fronczak, AAR, Petition for Rulemaking to Allow Methane, Refrigerated Liquid to be Transported in Rail Tank Cars, https://www.regulations.gov/document?D=PHMSA-2017-0020-0002.

[11] *See* Justin Mikulka, *Trump Order to Allow LNG by Rail Would Expand Bomb Train Risks*, Desmog Blog, Apr. 17, 2019, https://www.desmogblog.com/2019/04/17/trump-executive-order-lng-rail-bomb-train-risks.

even while proposing to grant the Special Permit which would move enormous 100-car LNG unit trains as potential terrorist weapons into and through major U.S. cities.

53. The EA simply declines to produce any such consequence estimates of distances, asserting that, for LNG-specific U.S. rail transportation, the U.S. historical data, field research and gas dispersion modeling are absent. While this is true, it is not a decisive obstacle to some reasonable agency effort on modeling and estimation of impact distances.

54. The EA repeatedly downplays the potential disaster consequences by asserting that there is an arguably low LNG release probability and that the likelihood of accidents and releases and resulting fires/explosions/BLEVEs is low.

55. The EA does indicate some potential LNG rail car release scenarios, but omits key consequence factors which need explicit consideration, such as:

    - The EA omits mentioning the huge volume of even a single LNG rail car flammable gas cloud release. The released gas cloud that could move into a nearby community is 620 times larger than the rail car liquid volume released.

    - The EA omits discussing in detail the most severe offsite LNG release Worst Case Scenario: an LNG flammable cloud if not immediately ignited can travel far downwind, and if it gets "confined" in any number of ways, can explode. Such a release occurred in the 1944 Cleveland, Ohio, LNG storage tank disaster that released LNG vapor clouds which entered the sewer system caused explosions over a 1 square mile area, killing 128 people.

56. In the few sections in which the EA even mentions the worst case scenario question of "how far will the harmful impacts of various LNG releases extend," the EA declines to answer:

> The distance over which an LNG vapor cloud remains flammable is difficult to predict. Local weather conditions (wind speed, atmospheric stability or turbulence), terrain, surface cover (i.e., vegetation, trees, and buildings) will influence how a vapor cloud disperses, and how rapidly it dilutes. If an LNG vapor cloud is ignited before the cloud has been dispersed or diluted to below its lower flammability limit, a flash fire may occur. Unlike other flammable liquids and gases, a LNG vapor cloud will not entirely ignite at once. If ignited, the methane in LNG has a flame temperature of about 1,330°C (2,426°F). The resulting ignition leads to a relatively slow (subsonic) burning vapor fire which travels back to the release point producing either a pool fire or a jet fire.
> EA at 8.

57. And the EA mentions, but dismisses in three short sentences, the real LNG release worst case scenario, is that of possible "confined" LNG cloud explosions. *See* EA at 9.

> …Such a slow burning (released LNG) vapor fire will not generate damaging overpressures (i.e. explosions), if unconfined. To produce an overpressure event, the LNG vapors need to be within the flammability range and ignited, and either be confined within a structure or the travelling flame in the open encounter structural obstructions (houses, trees, bushes, pipe racks, etc.) that can increase the flame turbulence significantly. Other hydrocarbons that are transported by rail and highway, such as propane and butane, are more susceptible to vapor cloud explosions when they become vaporized. EA at 9.

58. Many gas scientists and agency experts now would agree that LNG cloud "confinement," leading to a possible spontaneous explosion, does not depend on the cloud being in a "structure," but could occur by the cloud's being "confined" under a rail car, between two homes, in a ditch or ravine, or being held up by a wall or even dense vegetation. The EA does suggest awareness of this potential danger with LNG. EA at 9. However, the EA does not try to estimate:

    - the distances that a large, dense, ground-hugging LNG vapor cloud can travel into a community if unconfined; nor

    - what extraordinary confinement risks are posed in a rail and especially an urban rail environment where trackside obstacles such as the EA-cited examples of "houses, trees, bushes…" exist, along with many other potential obstacles such as tunnels, overpasses, and buildings that often overlook train tracks.

59. The EA tries to deflect from the unique risks for LNG only by saying that other common flammables in transportation such as propane and butane can ignite and explode "in much less confined conditions." EA at 9.

VI. THE EA IGNORES THE LIMITED RESEARCH THAT IS AVAILABLE ON LNG OVER-LAND RELEASE RISKS.

60. As the EA underscores, there is a paucity of federal research on LNG releases over-land, whereas there are decades of research pertaining to potential LNG releases over-water from ships. However, the EA selectively ignores some arguably relevant and useful LNG flammable vapor cloud research and misuses irrelevant toxic gas cloud research.

61. Puzzlingly, the EA does not discuss the one classic 1987 federally-sponsored Falcon series of 4 LNG over-land gas release tests. Five tests had been planned, but the fourth unexpectedly blew up the whole federal test apparatus and ended the test series.

62. The 1987 Falcon tests had been designed to show industry and government agencies how effective facility-provided LNG vapor barrier enclosures could be. The primary purpose of the test was not to measure downwind, and therefore only a few gas concentration sensor

arrays were erected downwind, and only out to 100 meters and 250 meters distance. The Falcon researchers did not in the later tests add more sensors downwind, although the gas clouds from the two largest of the 4 releases (Falcon-1 and Falcon-3) were recorded going beyond the 250 m sensors at levels above the dangerous Lower Flammable Limit (LFL) for LNG of 2.5% (LNG to air ratio). The farther distances went unrecorded.

63. The completed Falcon field research trials showed the released dense LNG cloud temporarily "held up" by and then rapidly filling up the four-sided, 9-meters tall fiberglass cloth vapor barrier enclosure, then overtopping the barriers and moving downwind. Some industry observers reportedly expressed keen disappointment at the minimal success of the barriers in preventing downwind travel of the gas cloud.

64. The released clouds traveled at a dangerous level beyond 250 meters. This is the most important solid federal field test research result that can be cited for assessing how far an LNG release can travel over-land, which is 250 meters-plus.

65. The EA does not even attempt to grapple with the implications of the Falcon research for the formidable issues of how many kinds of real world obstacles exist in the U.S. rail transportation environment, especially in urban rail corridors, which obstacles could provide numerous kinds of "vapor barriers" for an accidental or terrorism-released LNG vapor cloud.

66. Beyond its assertions of insurmountable difficulties in LNG consequence calculations, the EA asserts further it cannot even make robust calculations of the probabilities of LNG rail releases because of the same cited gaps in LNG rail transportation data and research. Respectable professional probability analysis, it is true, demands robust and relevant historical data and prior calculations of consequence as the basis for arriving at the final calculations of probabilities of given releases.

67. Notably, while discounting the value of learning from historical LNG stationary facility releases such as the Cleveland[12] and Skikda[13] disasters, the EA dubiously cites the 2010-2015 era industry/federal Jack Rabbit I and II research project, specifically its narrow findings on toxic chlorine gas release impacts on soil or vegetation. EA at 19. The EA suggests, without a rationale, that LNG would have similar minimal impacts upon vapor cloud deposition on the ground over which it travels.

68. The Jack Rabbit tests have no direct relevance to LNG, and the EA does not mention that the purpose of the industry/federal Jack Rabbit field and lab tests was to support their joint

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[12] *See e.g., The Day Cleveland Exploded: 70 Years Later, the Unthinkable Disaster of the East Ohio Gas Co. Explosion*, Cleveland Scene, Oct. 15, 2014, https://www.clevescene.com/cleveland/the-day-cleveland-exploded-70-years-later-the-unthinkable-disaster-of-the-east-ohio-gas-co-explosion/Content?oid=4391878.

[13] *See e.g.*, Simon Romero, *Algerian Explosion Stirs Foes of U.S. Gas Projects*, N.Y. Times, Feb. 12, 2004, https://www.nytimes.com/2004/02/12/business/algerian-explosion-stirs-foes-of-us-gas-projects.html.

efforts to minimize the perceptions of risks of toxic gas releases. The outcome was instructive. The Fire Administration did not buy into this effort and insisted on more conservative risk estimates as in the 2012-2016 ERG.[14]

69. A reasonable overall conclusion, therefore, from the PHMSA-identified research gaps on LNG risk issues does not let the agency off the hook. PHMSA cannot rationally grant nationwide LNG rail transportation permits, much less national regulations, for LNG rail transportation until robust and necessary agency research is completed and analyzed, to inform an adequate EIS.

70. Field research is especially needed on the both the fire survivability and impact crashworthiness of the 50-year-old design DOT-113 cryogenic tank cars which the Permit proposes to authorize for nationwide use. [15]

71. The EA cites no crash testing or fire testing at all, much less with LNG cargo specifically, of the 50-year-old DOT-113 design tank car proposed for this permit.

72. The updated EA changed its estimation–with no explanation–of the probability, which the EA elsewhere asserted was unknowable, of an LNG rail release high consequence scenario involving "inner tank damage resulting in large release/spill." Instead of its earlier estimation of "very low" probability, the updated EA version estimate now asserts, citing no evidence, "low." EA at 12.

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[14] The then-current scientific consensus had been producing alarming toxic gas science predictions, in industry and government gas dispersion modeling–e.g., of serious potential chlorine gas releases [often rail car releases were modeled] travelling 20-25 miles downwind. The reactive risk-minimization research effort was to explore in federally funded lab and field research every conceivable new environmental factor that could be asserted to diminish the predicted downwind impact of chlorine gas releases from accidents or terrorism, then to inject such results into gas dispersion science models for toxic gases, and finally especially into the Emergency Response Guidebook (ERG) guidance for emergency responders.

This multi-year Jack Rabbit project propaganda effort ultimately proved controversial with the U.S. fire service observers/participants. Even though the Jack Rabbit research results have been published in two articles in Fire Engineering magazine in efforts to influence the fire service community to take chlorine gas release risks less seriously, the fire service participants apparently managed to influence the authors ultimately to reaffirm instead the more safety-conservative and longstanding ERG advice on long Protective Action Distances for chlorine gas releases.

[15] "When you begin to look at cars that are derailing at speeds of 30, 40 miles an hour, it's very difficult, it's a big ask, to expect that a tank car get hit [and] not be breached." Karl Alexy, staff director of the Federal Railroad Administration's Office of Safety, said in the National Transportation Safety Board's April 22-23 National Forum on Crude Oil and Ethanol Transportation Safety.
https://www.ntsb.gov/news/events/Pages/2014_Crude_Oil_Ethanol_FRM_Agenda-Presentations.aspx.

73. EA repeatedly makes unsupported assertions minimizing LNG rail transportation risks. Again with no evidence cited from any relevant testing, EA asserts the LNG release behaviors would be similar in both rail and truck release emergencies:

> Incident data with (non-LNG) hazard materials may suggest that incidents involving rail tank cars can lead to a larger area of consequence as compared to hazard areas arising from incidents involving MC-338s cargo tank motor vehicles (or ISO portable tanks moved by rail). This is because of the larger volume of LNG in each tank car compared to that in a MC-338 cargo tank. …
> It is important to note that the risks of transporting LNG via rail also apply to the shipment of LNG via highway. As discussed above, the transportation of LNG by cargo tank is already permitted by the HMR. … The risks that would increase with the selection of the No Action Alternative are increased trips (because of lower volume transported per cargo tank), thereby increasing opportunity for an incident, higher accident rate for highway traffic as compared with rail traffic, and closer proximity to people and inhabited structures on roadways as compared to rail rights of way. On the other hand, a larger quantity LNG loaded into each rail tank car, along with the risks that result from multiple tank cars moving together, could lead to higher consequences. A failure of either an MC-338 or a DOT-113 could cause injury, death, property destruction and environmental harm. The likelihood of failure of MC-338 is higher, but the scope of potential of injury and death, could be greater in a populated area for a DOT-113 failure because of higher volumes of LNG carried in each tank car (by about a factor of 3) compared to that in a MC-338 transport. EA at 14-15.

VII. THE EA ASSERTS THAT RAIL IS SAFER THAN TRUCK, WHILE IGNORING POTENTIAL TERRORISM VULNERABILITIES.

74. Rather astonishingly, the EA asserts that LNG by rail tank car will be safer than the existing LNG by tank truck. The LNG trucks often travel from remotely located liquefaction facilities to remote natural gas mining that is not well served by pipelines.

75. However, the EA alleges with no evidence, that highways used by truck cargoes are in closer "proximity to densely populated areas compared to the location of rail tracks." EA at 14. The EA does concede that a unit train possibly with 100 tank cars of LNG will carry a huge quantity, much more than a single MC-338 truck LNG vehicle or an ISO container on a single flat car.

76. The EA refrains from mentioning that it was the U.S. chemical shippers and rail industry that post-9/11 had to expend political capital fighting major cities worried about potential

hazmat train terrorism. Upon his death, it was discovered that Osama bin Laden had advised his cadres to attack US energy infrastructure.[16]

77. The EA needs to show the data regarding which mode is preferable from a disaster-prevention perspective.

78. The EA's minimizing of rail LNG accidental release risks and its complete neglect of rail LNG terrorist potentials are both facilitated by this EA characterization, without any data provided other than volumes of cargoes of rail transport of ultra-hazardous cargoes as safer than truck transportation. The terrorist threat to the U.S. freight rail systems has not evaporated.

79. One can hardly tout LNG as a major new essential element in U.S. energy security and simultaneously decline to address the potential for long and visible LNG trains moving relatively slowly through major cities to be very attractive targets for terrorism.[17]

80. Historically, and of key relevance, in the post-9/11 period, keen public and official recognition of rail urban hazmat safety and security vulnerabilities prompted strong efforts to get national protective hazmat urban rail routing regulations. Major media attention found urban rail hazmat terrorism risks very credible.[18]

81. Unfortunately, the Congressional urban rail hazmat re-routing proposals were soundly defeated in 2007 by the railroads and chemical shippers, in favor of Public Law 110-53, which has led to virtually no protective urban rail re-routing.

82. In 2015, CEO of Canadian Pacific, Hunter Harrison, lamented in the media that he was uncomfortable that his rail line was still routing very dangerous cargoes through Chicago – and other major North American cities.[19]

83. The international hazmat risk literature also seems sparse on the risks posed by rail versus truck transportation, as if it is generally assumed that truck transportation is ubiquitous. As commented by one Lithuanian QRA study focused on the probability of roadside damage posed by the two most serious types of fire and explosion transportation releases from liquefied gases: "Any comprehensive study which compares in detail the risks posed by

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[16] Jeanne Meserve & Carol Cratty, *U.S.: Al Qaeda Has Interest in Strikes on Energy Infrastructure*, CNN, May 20, 2011, http://www.cnn.com/2011/US/05/20/terror.alert/index.html.
[17] Bridget Johnson, *How the Terror Threat to Rail Has Evolved 15 Years After Madrid*, Homeland Security Today, Mar. 12, 2019, https://www.hstoday.us/subject-matter-areas/terrorism-study/how-the-terror-threat-to-rail-has-evolved-15-years-after-madrid/.
[18] See Richard A Falkenrath, Op-Ed: *We Could Breathe Easier: The government must increase the security of toxic chemicals in transit*, Wash. Post, Mar. 29, 2005.
[19] Eric Atkins, *CP Rail CEO Says Terrorists a Greater Threat than Derailments*, The Globe and Mail, Mar. 2, 2015 (updated May 12, 2018), https://beta.theglobeandmail.com/report-on-business/cp-rail-ceo-says-terrorists-a-greater-threat-than-derailment-to-oil-tank-cars/article23254667/?ref=http://www.theglobeandmail.com&.

VCEs (Vapor Cloud Explosions) and BLEVEs (Boiling Liquid Expanding Vapor Explosions) on road or rail is not known to us."[20]

84. This Lithuanian study cites U.S. data on reported accidents from 2003 to 2013, including "a very large number of which little or no damage" that indicate that "hazmat transportation by rail causes a substantially smaller number of accidents and incidents than moving such materials by truck." In the 2003-2013 period the totals reported were 478 fires and 375 explosions by road, versus 36 fires and 9 explosions by rail. Vaidogas, Egidijus & Kisežauskienė at 443. But the study cites no reports of comparative damage to structures or people from road or rail incidents, or of accidents relative to total mileage of road versus rail, or relative to mileages through populated areas.

VIII. THE EA COULD HAVE USED EXISTING GAS MODELS TO ESTIMATE LNG RISKS, AS MANY OTHER RESEARCHERS HAVE DONE.

85. Notably, even if PHMSA in its EA has been unwilling to estimate distance potentials for an LNG tank car rail release, a multitude of others in government and industry have been using well-known available and approved gas science modeling for estimating the distance consequences of various hypothetical LNG facility and rail car releases.[21]

86. A prominent example of agency and researcher use of gas modeling to assess LNG rail transportation risk exists in the FRA-permitted LNG rail transportation experiment along Florida's East Coast Rail. Although DOT agency FRA has apparently had in its possession

[20] Vaidogas, Egidijus & Kisežauskienė, et al., *Assessing Risk To Built Roadside Property Posed By Transportation Of Liquefied Gasses*, 254-259, 445 (2013), https://www.researchgate.net/publication/269062884_Assessing_Risk_To_Built_Roadside_Property_Posed_By_Transportation_Of_Liquefied_Gasses/link/57556d6808ae0405a5752636/download.

[21] For fixed LNG facilities, the U.S. Federal Energy Regulatory Commission (FERC) has for at least three decades required facility staff to model (using four officially FERC-approved standard gas models, at least one of which is proprietary) the regulatory proposed facility Exclusion Zone for potential LNG release impact distance calculations, which is an essential factor in winning FERC approvals of LNG siting. These calculations are not of worst case scenarios, but of less severe, credible facility releases based on "Design Basis Accidents" and modeling of their consequences. After working through the required distance calculations, FERC and the facility experts then delve into the non-well-defined and non-regulated areas when they consider various additional probabilistic release factors such as onsite facility-promised mitigations (e.g., the effectiveness of proposed facility-promised vapor barriers to "hold up" a released LNG cloud). FERC staff makes its own (un-transparent and significantly subjective) final overall assessments of the likelihood of the facility's potential LNG release impacts on the public, and eventually (almost always) assesses the approved proposed sites as "adequately safe." The LNG industry is constantly working to inject even more probabilistic elements into FERC regulation.

the seemingly relevant 2016 FECR QRA document, it is unmentioned by this EA, and has been kept essentially secret so far by FRA.[22]

87. This 2016 FECR QRA is perhaps the most illustrative indication of the industry and government determined consensus that the public needs to be kept in the dark, by various means, on potential LNG release impact distances:

    - The QRA methodology itself has been utilized by disaster risk-imposing industries, such as nuclear power and toxic chemicals, as it is designed to obscure the consequence distance estimates, which are nonetheless a necessary step for the overall risk calculations; and

    - FRA has not released the 2016 FECR QRA document to FOIA requests, except with every single data point redacted.

88. The skimpy EA does not impose any new significant LNG-specific safety conditions in this proposed Special Permit for ETS, but explicitly relies only on existing federal hazmat regulations regarding generic highly flammable tank car rail carriage.

89. The EA has added in–without substantial analysis or even discussion—the voluntary consensus railroad industry minimum standard guidance in AAR Circular OT-55Q. This is the latest version of industry's OT-55, which was introduced many years ago for AAR-member railroad guidance on handling the most dangerous toxic and radioactive rail cargoes, with no consideration of flammable cargo risks.

90. In order to undergird a set of federal actions (permits, rulemaking, etc.) PHMSA could easily adapt and use—with relatively respectable assumptions, but without performing a full probabilistic QRA—one of the long-approved LNG gas dispersion models (or other models if arguably more adequate) for a set of representative potential LNG rail car releases and publish in an EIS the impact distance results for a selected set of potential LNG rail car releases: pool fires, vapor cloud travel and explosions, and BLEVEs.

91. PHMSA consultant Cambridge Systematics, Inc., recently provided a simplified risk analysis without any details of potential release scenarios or distances. The report recommended strongly that PHMSA commission a full-scale QRA to underpin future agency safety actions on LNG rail safety. This is estimated to be very costly and take at least a full year. It is unknown whether PHMSA has begun such an effort. The abrupt proposal for Special Permit 20534 and previous PHMSAS R&D summary presentations seem to imply that it has not.[23]

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[22] Exponent, Florida East Coast Railway Quantitative Risk Analysis (FECR QRA) Considering LNG Position in Train and Train Speed, Exponent Project No. 1308194.001, attached as Exhibit E.

[23] Cambridge Systematics, Inc., *Risk Assessment of Surface Transport of Liquid Natural Gas*, Mar. 20, 2019, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/research-and-development/hazmat/reports/71651/fr2-phmsa-hmtrns16-oncall-20mar2019-v3.pdf.

92. PHMSA's potential future LNG release consequence modeling would, of course, be open to expert challenge, given the lack of LNG-specific data and transportation models that EA underscores and the large uncertainties in any modeling.

93. I do not call uncritically for PHMSA to conduct a full-blown QRA of the proposed nationwide LNG by rail, since QRAs are by design efforts to obscure the potential chemical release consequence impact distances under layers of complex probabilistic calculations. The FECR QRA on LNG rail in Florida is a notable example of this, as can be glimpsed -—as through a glass darkly—even in its redacted version. It would be useful, however, if PHMSA and FRA as part of this permit proceeding would release the 2016 FECR QRA in its currently withheld unredacted version.

94. An unexpected new indication of industry and agency efforts to keep the public in the dark, from the PHMSA-2019-0100 docket at issue here is that the draft EA never mentions that ETS itself, the requestor of the permit, back in 2016 or 2017, had commissioned from Exponent consultants a QRA for national LNG rail risks. That document, dated October 27 2017, was withheld from the PHMSA docket until the very last day of the original 30-day comment period which ended July 8 2019. It was then placed on the docket, and it is now listed as one of the official proceeding documents[24] on the docket at https://www.regulations.gov/document?D=PHMSA-2019-0100-0918.

IX. THE EA ULTIMATELY CONCEDES THAT PROTECTIVE DISTANCE IS NEEDED FOR LNG EMERGENCIES.

95. The EA ultimately underscores the flaws of its public safety argument by compromising weakly, but perhaps usefully on the LNG potential release impact distance question. EA at 12.

96. The EA very briefly endorses (with no analysis) the Protective Action Distance guidance for flammable cargoes in the DOT Emergency Response Guidebook (ERG),[25] which is highly revered by the North American fire and emergency services. In its generic, simplified "Orange Pages" guides for highly flammable gases (including its Guide 115 for refrigerated liquids such as LNG), the current ERG2016 –and previous editions produced by PHMSA every 4 years—provides a widely-used "bible" intended to be used by first responders explicitly only for their initial decisions in the first 20 minutes of a "large spill" of various high-risk chemical cargoes in a transportation emergency.

97. The ERG's Guide 115 has long advised first responders to "consider initial downwind evacuation" of half a mile if there is even a single breached refrigerated liquids transportation container with no fire. But if the container is involved in a fire, emergency

[24] *Supra* n.7.
[25] PHMSA, 2016 Emergency Response Guidebook, https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/ERG2016.pdf.

responders should isolate the scene (prevent entry) for one mile in all directions and also "consider initial evacuation for one mile in all directions."

98. Notably, this EA does not consider the public safety implications of this advice regarding some potential need for appropriate safety precautions in the proposed LNG nationwide rail transportation.

99. The EA leaves unexamined, moreover, the question of whether and how this generic ERG guidance is adequate for LNG cargoes specifically. For large nighttime spills from rail tank cars and low wind conditions, the 2016 ERG's Initial Isolation and Protective Action recommendations for toxic chemicals in Table 3 vary from 2.7 miles (ammonia) to 7+ miles (chlorine) to 7+ miles (sulfur dioxide).

100. The ERG has not, up until to now, singled out LNG rail transportation risks specifically for similarly targeted advice, perhaps because LNG has long previously been "forbidden" for U.S. rail transportation and with only a relatively small history of LNG truck shipments.

101. Perhaps with the boom in North American LNG infrastructure, the soon-to-be published ERG 2020 may consider adding such a specific focus on ER needs for LNG transportation releases.