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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

AGENCY: Pipeline and Hazardous Materials Safety Administration (PHMSA), Department of Transportation (DOT).

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: PHMSA, in coordination with the Federal Railroad Administration (FRA), is proposing changes to 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. This rulemaking proposes to authorize the transportation of Methane, refrigerated liquid by rail in the DOT-113C120W specification rail tank car.

DATES: Comments must be received by [INSERT DATE 60 DAYS FROM DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. To the extent possible, PHMSA will consider late-filed comments.

ADDRESSES: You may submit comments identified by the Docket Number PHMSA-2018-0025 (HM-264) via any of the following methods:

- *Federal eRulemaking Portal:* http://www.regulations.gov. Follow the instructions for submitting comments.
- *Fax:* 1-202-493-2251.
- *Mail:* Docket Management System; U.S. Department of Transportation, West Building, Ground Floor, Room W12–140, Routing Symbol M–30, 1200 New Jersey Avenue, SE, Washington, DC 20590.
- *Hand Delivery:* To the Docket Management System; Room W12–140 on the ground floor of the West Building, 1200 New Jersey Avenue, SE, Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Instructions: All submissions must include the agency name and Docket Number (PHMSA-2018-0025) or RIN (2137-AF40) for this rulemaking at the beginning of the comment. To avoid duplication, please use only one of these four methods. All comments received will be posted without change to the Federal Docket Management System (FDMS) and will include any personal information you provide. If sent by mail, comments must be submitted in duplicate. Persons wishing to receive confirmation of receipt of their comments must include a self-addressed stamped postcard.

Docket: For access to the dockets to read background documents or comments received, go to http://www.regulations.gov or DOT's Docket Operations Office (see **ADDRESSES**).

Confidential Business Information: Confidential Business Information (CBI) is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this notice contain

commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this notice, it is important that you clearly designate the submitted comments as CBI. Pursuant to 49 C.F.R. § 105.30, you may ask PHMSA to give confidential treatment to information you give to the agency by taking the following steps: (1) mark each page of the original document submission containing CBI as "Confidential"; (2) send PHMSA, along with the original document, a second copy of the original document with the CBI deleted; and (3) explain why the information you are submitting is CBI. Unless you are notified otherwise, PHMSA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this notice. Submissions containing CBI should be sent to Michael Ciccarone, Office of Hazardous Materials Safety, Standards and Rulemaking Division, Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, 1200 New Jersey Ave., S.E., Washington, DC 20590-0001. Any commentary that PHMSA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

Privacy Act: In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without change, including any personal information the commenter provides, to http://www.regulations.gov, as described in the system of records notice (DOT/ALL–14 FDMS), which can be reviewed at http://www.dot.gov/privacy.

FOR FURTHER INFORMATION CONTACT: Michael Ciccarone, Standards and Rulemaking Division, (202) 366-8553, Pipeline and Hazardous Materials Safety

Administration, or Mark Maday, Federal Railroad Administration, (202) 366-2535, U.S. Department of Transportation, 1200 New Jersey Avenue, SE, Washington, DC 20590-0001.

SUPPLEMENTARY INFORMATION:

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I. Overview

PHMSA, in coordination with FRA, is issuing this NPRM to solicit public comment on potential changes to the Hazardous Materials Regulations (HMR; 49 CFR parts 171-180) that permit the bulk transport of Methane, refrigerated liquid, commonly known as liquefied natural gas (LNG), in rail tank cars. Specifically, this NPRM proposes to authorize the transportation of Methane, refrigerated liquid by rail in certain DOT specification 113 (DOT-113) rail tank cars.[1]

LNG has been transported safely by highway and vessel for over 50 years within the United States and is now a critical energy resource for the 21st century; however, the HMR do not authorize the bulk transport of LNG in rail tank cars. Historically, this limitation has not created a major impediment in the transportation of natural gas (either in gas or liquid form), but the expansion in United States energy production has led to significant challenges in the transportation system.

Between 2010 and 2018, the number of LNG facilities in the U.S. increased by 28.7 percent, and total storage and vaporization capacities increased by 21 and 23 percent, respectively.[2] Over the same period, total liquefaction capacity increased by 939 percent due to new LNG export terminals.[3] This data suggests that there may be a demand for greater flexibility in the modes of transportation available to transport LNG, which is supported by PHMSA's receipt of a petition for rulemaking (P-1697) from the

[1] This NPRM is consistent with Section 4(b) of the President's April 10, 2019, "Executive Order on Promoting Energy Infrastructure and Economic Growth," which directs the Secretary of Transportation to publish an NPRM that would propose to treat LNG the same as other cryogenic liquids and permit LNG to be transported in approved rail tank cars. The Executive Order also directs that the NPRM be published within 100 days of date of the order, and that a final rule must be published within thirteen months of the date of the order. See https://www.whitehouse.gov/presidential-actions/executive-order-promoting-energy-infrastructure-economic-growth/.

[2] Based on PHMSA annual report data from 2010-2018.

[3] Id.

Association of American Railroads (AAR) proposing amendments to the HMR to allow for the transportation of Methane, refrigerated liquid by rail in DOT-113 rail tank cars. As noted in the petition, some shippers have expressed that there is an interest in the transportation of LNG by rail (domestically and for international export), which would help address these challenges. Additionally, there is an existing request for a special permit that seeks to authorize shipments of LNG in DOT specification 113C120W tank cars subject to certain operational conditions that would be used to transport LNG to ports or the applicant's domestic customers.[4]

Federal hazardous materials law authorizes the Secretary of Transportation to "prescribe regulations for the safe transportation, including security, of hazardous materials in intrastate, interstate, and foreign commerce." 49 U.S.C. 5103(b)(1). The Secretary has delegated this authority to PHMSA in 49 CFR 1.97(b). The HMR are designed to achieve three primary goals: (1) help ensure that hazardous materials are packaged and handled safely and securely during transportation; (2) provide effective communication to transportation workers and emergency responders of the hazards of the materials being transported; and (3) minimize the consequences of an accident or incident should one occur. The hazardous material regulatory system is a risk management system that is prevention-oriented and focused on identifying safety or security hazards and reducing the probability and consequences of a hazardous material release.

The Administrative Procedure Act (APA), 5 U.S.C. 551, *et seq.* requires Federal agencies to give interested persons the right to petition an agency to issue, amend, or repeal a rule. 5 U.S.C. 553(e). In accordance with PHMSA's rulemaking procedure

[4] Docket No. PHMSA 2019-0100 at https://www.regulations.gov/docket?D=PHMSA-2019-0100

regulations in 49 CFR part 106, interested persons may ask PHMSA to add, amend, or repeal a regulation by filing a petition for rulemaking along with information and arguments supporting the requested action (49 CFR 106.95). PHMSA has assessed P-1697[5] in accordance with 49 CFR 106.105 and determined that the request merits consideration in a rulemaking. In addition, a comment received to a notification[6] of regulatory review issued by DOT's Office of the Secretary of Transportation (OST) in October 2017 further expressed industry support of deregulatory efforts to address the safe transportation of LNG by rail.

PHMSA and FRA share responsibility for regulating the transportation of hazardous materials by rail and take a system-wide, comprehensive approach that focuses on prevention, mitigation, and response to manage and reduce the risk posed to people and the environment. In this rulemaking, PHMSA is seeking public comment on proposed changes to address the safe transportation of LNG by rail.

II. Background

A. Properties and Use of LNG

The proper classification of any hazardous material is required prior to it being offered into transportation. In accordance with § 173.115(g), a "cryogenic liquid" means a refrigerated liquefied gas having a boiling point colder than −90 °C (−130 °F) at an absolute pressure of 101.3 kPa (14.7 psia). Natural gas (methane) has a boiling point of -162 ºC (−260 °F), which means it must be refrigerated to be liquid—hence, liquefied

[5] Docket No. PHMSA-2017-0020

[6] See Interested Parties for Hazardous Materials Transportation comment in response to DOT's Notification of Regulatory Review, 82 FR 45750 (Oct. 2, 2017), which can be found at Docket No. DOT-OST-2017-0069, https://www.regulations.gov/docket?D=DOT-OST-2017-0069.

natural gas. Therefore, LNG meets the definition of Division 2.1, cryogenic liquid and is described by the entry "UN1972, Methane, refrigerated liquid (*cryogenic liquid*), 2.1" in the Hazardous Materials Table (HMT; § 172.101).

LNG is natural gas that has been liquefied through condensation at ambient pressure—a process referred to as liquefaction. The resulting LNG takes up about 1/600th of the volume of natural gas in its vapor state. Thus, LNG can be readily and economically stored and transported in specially designed storage tanks, highway cargo tanks, or International Organization for Standardization (ISO) containers. LNG is odorless, colorless, non-corrosive, and non-toxic. It will float on water, causing the water to look like its boiling as the liquid transitions back to vapor. To be consumed, LNG must be vaporized by warming to return it to its gaseous form; this warming and vaporization process is called regasification. The vaporized natural gas is then injected back into a pipeline system, or used to fuel natural gas operated equipment.

There is an international market for LNG, whereas natural gas tends to be a domestic commodity. International trends in the LNG industry directly impact domestic LNG and natural gas trends. LNG supplies regions, both domestic and international, that lack a natural gas source or the infrastructure to receive natural gas via pipeline. LNG production and consumption trends are related to international fuel prices, mainly crude oil, diesel, and coal. The LNG market in the United States grew considerably between 2010 and 2018.[7] In that timeframe, the number of LNG facilities in the United States increased by 28.7 percent, and the total storage and vaporization capacities increased by

[7] U.S. DOE, EIA: https://www.eia.gov/todayinenergy/detail.php?id=34032

21 and 23 percent, respectively. Over the same period, total liquefaction capacity increased by 939 percent due to new LNG export terminals.

B. Current Requirements for LNG

The current HMR do not authorize the bulk transport of LNG in rail tank cars.[8] LNG may only be transported via rail in accordance with the conditions of a PHMSA special permit or in a portable tank pursuant to the conditions of an FRA approval.

The HMR include design, manufacturing, and maintenance standards for packaging (see parts 178–180). Additionally, the regulations specify which packaging types may be used for specific materials and provide requirements for filling and loading of packages (see part 173). Column (8C) of the HMT provides bulk packaging authorizations for LNG in accordance with § 173.318, Cryogenic liquids in cargo tanks, only, and does not include authorization of LNG for rail tank cars. Additionally, Column (7) contains portable tank instruction T75 (see § 172.102(c)(7)), which allows for the transportation of refrigerated liquefied gases in certain United Nations (UN) portable tanks, which can then be moved by rail in accordance with § 174.63. Currently, to transport LNG by rail in a method not authorized, a person must apply for a special permit from the Associate Administrator for Hazardous Materials Safety, PHMSA (see 49 CFR 107.105).

[8] The HMR defines "bulk packaging" as having a capacity of greater than 119 gallons per 49 CFR § 171.8. By way of comparison, a single DOT-113C120W tank car has a capacity of approximately 30,000 gallons.

C. Petition for Rulemaking (P-1697)

The Association of American Railroads' Petition for Rulemaking

On January 17, 2017, AAR submitted a petition for rulemaking to PHMSA titled, "Petition for Rulemaking to Allow Methane, Refrigerated Liquid to be Transported in Rail Tank Cars" [PHMSA-2017-0020 (P-1697)] requesting revisions to § 173.319 of the HMR that would permit the transportation of LNG by rail in DOT-113 tank cars.

In its petition, AAR proposed that PHMSA amend the entry for "UN1972, Methane, refrigerated liquid" in the HMT (see § 172.101) to add a reference to § 173.319 in Column (8C), thereby authorizing transport of UN 1972 in rail tank cars. Additionally, AAR proposed that PHMSA amend § 173.319 to include specific requirements for DOT-113 cars used for the transportation of LNG. AAR suggested that the authorized tank car specifications be DOT-113C120W and DOT-113C140W[9], noting that 120W cars should provide 40 days in transportation and 140W cars should provide 45 days before the tank car might begin to vent the commodity from the pressure relief device.[10] AAR further proposed amending § 173.319(d)(2) to include maximum filling densities comparable to those specified for cargo tanks containing LNG in § 173.318(f)(3).

AAR noted that the current HMR allow for transport of LNG by highway and expressed the opinion that rail transport of LNG is a safer mode of transportation by comparison. AAR stated that LNG is similar in all relevant properties to other flammable cryogenic liquids, such as ethylene, that are currently authorized for transportation by rail tank car. AAR further stated that they believe the DOT-113 tank car was not previously

[9] The HMR do not authorize the DOT-113C140W specification tank car for hazardous materials transportation. See section "III. A. Tank Car Specification" of this rulemaking for further discussion.
[10] PHMSA understands this to mean one-way transit time.

authorized because of a lack of demand in the market. However, AAR noted that there is commercial interest in transporting LNG by rail tank car domestically, and internationally from the United States to Mexico, and that some railroads are actively exploring LNG as a locomotive fuel, thereby requiring supply of LNG along their networks.

AAR's petition—P-1697—requests a regulatory change that has the potential to reduce regulatory burdens and enhance domestic energy production without having a negative impact on safety; therefore, PHMSA accepted it as having merit for consideration in a rulemaking. PHMSA requests public comment on all relevant aspects of this NPRM, including its potential to reduce regulatory burdens, enhance domestic energy production, and impact safety.

The Center for Biological Diversity's Response to P-1697

On May 15, 2017, the Center for Biological Diversity (the Center) submitted a response to P-1697, recommending that PHMSA deny AAR's petition for rulemaking because of potential environmental impacts of LNG. The Center commented that PHMSA should not proceed in evaluating the petition request until the Agency has conducted a National Environmental Policy Act (NEPA) evaluation, prepared an Environmental Impact Statement (EIS) or Environmental Assessment (EA), and provided opportunity for public review and comment in accordance with the Hazardous Materials Transportation Act (HMTA), as applicable.

PHMSA is issuing this NPRM in accordance with the APA and all related Executive Orders and laws, including NEPA. This NPRM provides opportunity for

public notice and comment. See section "V. J. Environmental Assessment" of this rulemaking for further discussion of the EA.

D. Regulatory Review

On October 2, 2017, DOT published a notice[11] in the *Federal Register* expressing Department-wide plans to review existing regulations and other agency actions to evaluate their continued necessity, determine whether they are crafted effectively to solve current problems, and evaluate whether they potentially burden the development or use of domestically produced energy resources. As part of this review process, the Department invited the public to provide input on existing rules and other agency actions that have potential for repeal, replacement, suspension, or modification.

The Interested Parties for Hazardous Materials Transportation (Interested Parties) submitted a comment[12] requesting the authorization of LNG for rail tank car transport. Specifically, the Interested Parties noted in its comment that LNG shares similar properties to other flammable cryogenic materials currently authorized by rail tank car and has already been moved in the United States under a special permit. Additionally, they noted that Transport Canada (TC) authorizes LNG for transportation by rail in DOT-113 equivalent rail cars and that there is an increased commercial demand for rail transport within the United States and between the United States and Mexico.

PHMSA has reviewed the Interested Parties' comment and is proposing to authorize the transport of LNG by rail because it may support Department-wide safety

[11] *Notification of Regulatory Review*, Docket No. DOT-OST-2017-0069, 82 FR 45750 (October 2, 2017).
[12] Comment from Interested Parties for Hazardous Materials Transportation, Document No. DOT-OST-2017-00692591, https://www.regulations.gov/searchResults?rpp=25&po=0&s=dot-ost-2017-0069-2591&fp=true&ns=true.

investments and promote cost saving actions. The PHMSA proposal would amend the HMR to authorize transportation of LNG by rail in a DOT-113 specification tank car. PHMSA requests public comment on the potential regulatory impact of this proposal.

E. International Regulation

The Transport of Dangerous Goods Directorate within TC develops safety standards and regulations, provides oversight, and gives expert advice on dangerous goods incidents to promote public safety in the transportation of dangerous goods by all modes of transport in Canada. TC recently published a new standard on the bulk transport of LNG. TC authorizes LNG for transportation by rail in DOT-113 equivalent rail tank cars (TC-113C120W). PHMSA is not currently aware of LNG being transported via TC-113C120W; however, should that change, PHMSA expects incident and commodity flow data within Canada to be shared with PHMSA and FRA.

In Mexico, the Railway Transport Regulatory Agency's (Agencia Reguladora del Transporte Ferroviario), under the Ministry of Communications and Transportation (Secretaría de Comunicaciones y Transportes or SCT), mission is to promote, regulate, and monitor the railroad industry, and is responsible for regulating all types of cargo movement on trains. Currently, SCT does not provide explicit authorization for the bulk transportation of LNG in rail tank cars.

III. Proposed Changes

LNG's role as an energy resource continues to expand with ongoing innovation and economic development. Historically, the United States transported LNG by highway

and exported LNG via ports only. As a result, there was no need for a regulation that authorized transportation via rail tank car. With a growing supply and demand,[13] rail transportation is being considered as a viable alternative to the transportation of LNG by highway. PHMSA has identified this as an area where there are opportunities to allow industry innovation and to support infrastructure development while maintaining a high level of safety. The hazards of transporting LNG are no different than that of flammable cryogenic liquids already authorized for bulk rail transport in accordance with the HMR.[14] The HMR provides the framework for the safe transportation of hazardous materials in commerce, and regardless of the future capacity for LNG rail transport, the material itself will be transported in the safe specification tank cars outlined below. Nonetheless, in this NPRM, PHMSA and FRA must consider requirements for both the packaging (i.e., the rail tank car) and operational controls for a train consisting of tank cars loaded with LNG.

A. Tank Car Specification

The DOT-113 specification cryogenic liquid tank car is built to comply with specifications contained in 49 CFR part 179, subpart F and TC regulation TC14877E, Section 8.6, as well as certain requirements of the rail industry as identified in the AAR Manual of Standards and Recommended Practices, Specifications for Tank Cars (M-1002). These rail tank cars are vacuum-insulated and consist of an inner alloy

[13] U.S. Energy Information Administration, "Growth in domestic natural gas production leads to development of LNG export terminals," March 4, 2016, accessed at https://www.eia.gov/todayinenergy/detail.php?id=25232.
[14] For description of potential safety hazards of LNG, see LNG Safety Assessment Evaluation Methods, https://prod.sandia.gov/techlib-noauth/access-control.cgi/2015/153859r.pdf.

(stainless) steel tank enclosed with an outer carbon steel jacket shell specifically designed for the transportation of refrigerated liquefied gases, such as liquid hydrogen, oxygen, ethylene, nitrogen, and argon. Additionally, the design and use of the DOT-113 specification tank car includes added safety features—such as protection systems for piping between the inner and outer tanks, multiple pressure relief devices (pressure relief valves and vents), thermal integrity tests, and in-transit reporting requirements—that contribute to an excellent safety record throughout its 50 years of service.

In this NPRM, PHMSA is proposing to authorize DOT-113C120W tank cars for use in the transportation of LNG by rail. The HMR currently authorize the DOT-113C120W specification tank car for another flammable cryogenic liquid which shares similar chemical and operating characteristics with LNG (i.e., ethylene). The DOT-113C120W design specification is similarly suitable for the transport of Methane, refrigerated liquid (LNG). We anticipate that DOT-113 specification tank cars will need to be manufactured to satisfy the demand for transporting LNG as the current fleet of these tank cars is used for the transportation of ethylene and other cryogenic liquids.

DOT-113 specification rail tank cars are constructed in accordance with the requirements of 49 CFR, part 179, subpart F, "Specification for Cryogenic Liquid Tank Car Tanks and Seamless Steel Tanks." These cars are built to a double pressure vessel design with the commodity tank (inner vessel) constructed of ASTM A 240/A 240M, Type 304 or 304L stainless steel, and the outer jacket shell (outer vessel) typically is constructed of carbon steel. This design provides an increased crashworthiness when compared to a single vessel design rail tank car. The rail tank car is manufactured with an insulated annular space holding a vacuum between the two pressure vessels. This

vacuum area and the insulation significantly reduce the rate of heat leak from the atmosphere to the liquid inside the tank car thus minimizing the heating of the cryogenic (i.e., refrigerated) material in the tank car while being transported. For these reasons, PHMSA has determined the DOT-113C120W specification tank car is an acceptable packaging to transport Methane, refrigerated liquid (LNG) by rail. This determination is based upon the design of the DOT cryogenic tank car specification, which includes added safety features designed to address the hazards presented by cryogenic liquids, and has a demonstrated safety record.

In addition to requesting a rule change to allow DOT-113C120W tank cars to transport LNG, AAR requested that PHMSA add a new tank car specification, the DOT-113C140W, for transportation of bulk quantities of LNG. AAR stated that the advantage to the DOT-113C140W tank car is that it is similar in design and construction to the DOT-113C120W specification, but would allow for an additional transportation timeframe of 5 days for cryogenic materials. This claim assumes that the new specification would use a thicker inner tank material that would allow for a higher inner tank test pressure (140 psig) and higher pressure relief device settings. These design changes could have the potential to increase the time in transportation by 5 days.

Currently, the HMR does not authorize the DOT-113C140W specification for cryogenic hazardous materials transportation and thus, this type of regulatory change would require considerably more time and resources to incorporate a new specification proposal into this rulemaking. PHMSA believes the addition of this tank car specification warrants an extensive engineering review and evaluation, including consideration of the risk of release in a derailment and ignition when transported at these

higher pressures. PHMSA does not want to delay deregulatory action authorizing the DOT-113C120W tank car for the transport of LNG pending evaluation of the DOT-113C140W tank car. Accordingly, PHMSA is not proposing to authorize the DOT-113C140W specification at this time.

Moreover, the petitioner did not include design specifications for the DOT-113C140W tank car. PHMSA may consider it for future rulemaking after design specifications, engineering details, and data demonstrating an equivalent level of safety are submitted to PHMSA in support of this regulatory change.

PHMSA is proposing to amend the Pressure Control Valve Setting or Relief Valve Setting Table in § 173.319(d)(2) by adding a column for methane as follows:

PRESSURE CONTROL VALVE SETTING OR RELIEF VALVE SETTING

Maximum start-to-discharge pressure (psig)	**Maximum permitted filling density (percent by weight)**				
	Ethylene	**Ethylene**	**Ethylene**	**Hydrogen**	**Methane**
17				6.60	
45	52.8				
75		51.1	51.1		32.5
Maximum pressure when offered for transportation	10 psig	20 psig	20 psig		15 psig
Design service temperature	Minus 260 °F	Minus 260 °F	Minus 155 °F	Minus 423 °F	Minus 260 °F
Specification (see §180.507(b)(3) of this subchapter)	113D60W, 113C60W	113C120W	113D120W	113A175W, 113A60W	113C120W

The proposed changes to the table would authorize methane in DOT-113C120W specification tank cars with a start-to-discharge pressure valve setting of 75 psig; a design

service temperature of −260 °F; a maximum pressure when offered for transportation of 15 psig; and a filling density of 32.5 percent by weight. The maximum offering pressure of 15 psig is consistent with the 20-day transportation requirement for cryogenic materials and the estimated 3 psig per day pressure increase during transportation. The filling density is similar to the filling density requirements for cryogenic materials transported in a cargo tank motor vehicle. These requirements will provide a 15 percent vapor volume outage (at the start-to-discharge-pressure of the pressure relief valve) for the rail tank car during transportation.

B. Operational Controls

AAR's Circular OT-55 is a detailed protocol establishing recommended railroad operating practices for the transportation of hazardous materials that was developed by the rail industry through the AAR.[15] The recommended practices were originally implemented by all Class I rail carriers operating in the United States, with short-line railroads following on as signatories. As a result, Circular OT-55 is comprehensive in its reach, applying to all train movements that fit within the terms of the circular. The circular outlines operational controls for trains meeting the industry definition of a "Key Train," including speed restrictions, track requirements, storage requirements, and the designation of "Key Routes."[16] Circular OT-55 defines a "Key Train" as any train with:

[15] Circular OT-55, "Recommended Railroad Operating Practices for Transportation of Hazardous Materials," https://www.railinc.com/rportal/documents/18/260773/OT-55.pdf.

[16] Circular OT-55 defines a "Key Route" as "any track with a combination of 10,000 car loads or intermodal portable tank loads of hazardous materials, or a combination of 4,000 car loadings of PIH or TIH (Hazard zone A, B, C, or D), anhydrous ammonia, flammable gas, Class 1.1 or 1.2 explosives, environmentally sensitive chemicals, Spent Nuclear Fuel (SNF), and High Level Radioactive Waste (HLRW) over a period of one year."

- One tank car load of Poison or Toxic Inhalation Hazard (PIH or TIH) (Hazard Zone A, B, C, or D), anhydrous ammonia (UN1005), or ammonia solutions (UN3318), or;
- 20 car loads or intermodal portable tank loads of any combination of hazardous material, or;
- One or more car loads of Spent Nuclear Fuel (SNF), High Level Radioactive Waste (HLRW).

While PHMSA is not proposing to incorporate by reference Circular OT-55 or to adopt the requirements for "Key Trains" in the HMR in this rulemaking, the railroad industry's voluntary adoption of the circular is an important consideration for PHMSA in assessing what operational controls are necessary. In accordance with the "Key Train" definition and the changes being considered in this NPRM, Circular OT-55's operational controls would apply to the bulk transport of LNG by rail in a train consist that is composed of 20 car loads or intermodal portable tank loads in which LNG is present along with any combination of other hazardous materials. Therefore, bulk transport of LNG would be subject to the industry standard even if only one rail tank car of the 20-car consist contained LNG, regardless of the classes of hazardous materials contained in the remaining 19 rail cars. Due to the operational controls introduced for "Key Trains," Circular OT-55 provides an additional level of safety regardless of what combination of hazardous materials the train consist is transporting. As such, PHMSA and FRA believe this industry standard helps ensure the safe transportation of all hazardous materials, including LNG.

PHMSA and FRA considered other options for operational controls such as mirroring the operational controls adopted for high-hazard flammable trains (HHFT)[17] or adopting the "Key Train" requirements into the HMR. Additional operational controls, while not limited to the following, might include limitations on train length, controls for train composition, speed restrictions, braking requirements, and routing requirements.

Train Length and Train Composition. PHMSA and FRA have not restricted train length in the past; however, PHMSA solicits comment on whether there is a reasoned basis for limiting the length of a train transporting LNG tank cars, and what that limitation would look like. Moreover, PHMSA solicits comment on whether there is a reasoned basis for limiting the amount of LNG tank cars that can be in one consist, or where the LNG tank cars may be placed within the train. For example, the National Transportation Safety Board issued a Safety Recommendation (R-17-001)[18] to PHMSA to: 1) evaluate the risks posed to train crews by hazardous materials transported by rail; 2) determine the adequate separation distance between hazardous materials cars and locomotives and occupied equipment that ensures the protection of train crews during normal operations and accident conditions; 3) and collaborate with FRA to revise 49 CFR § 174.85 to reflect those findings. To date, PHMSA has initiated a literature review to help identify gaps and changes in factors from previous and current studies and ultimately determine the adequate separation distance of train crews from hazardous materials in a train.

[17] As defined in § 171.8, a high-hazard flammable train means a single train transporting 20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block or a single train carrying 35 or more loaded tank cars of a Class 3 flammable liquid throughout the train consist.
[18] https://ntsb.gov/safety/safety-recs/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=R-17-001

Speed Restrictions and Braking Requirements. The HHFT regulations include a speed restriction of 50 miles per hour (mph) for all HHFTs with an additional speed restriction of 40 mph for those HHFTs traveling within a high-threat urban area (§ 174.310(a)(2)). The HHFT regulations also include advanced braking requirements for HHFTs, requiring all HHFTs operating in excess of 30 mph to be equipped and operated with distributed power system or a two-way end-of-train device (§ 174.310(a)(3)), which helps to propagate a quicker application of the air brake system throughout the entire train, particularly in emergency braking situations.

Routing Requirements. Section 172.820 prescribes additional planning requirements for transportation by rail, including route analysis, requiring railroads to address safety and security risks for the transportation along routes where commodity data is collected. This requirement applies to a rail carrier transporting one or more of: (1) More than 2,268 kg (5,000 lbs.) in a single carload of a Division 1.1, 1.2 or 1.3 explosive; (2) A quantity of a material poisonous by inhalation in a single bulk packaging; (3) A highway route-controlled quantity of a Class 7 (radioactive) material, as defined in § 173.403; or (4) A high-hazard flammable train (HHFT) as defined in § 171.8.

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. 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.

Finally, PHMSA notes that there is an existing special permit application to transport LNG by tank car. PHMSA is seeking comment on the draft special permit and environmental assessment, *see* 84 FR 26507 and Docket No. PHMSA-2019-0100, and will consider information provided to the special permit docket that is pertinent to the issue of operational controls in this rulemaking or potential future rulemakings.

In conclusion, we invite comment on PHMSA's and FRA's reliance on existing regulations and the operational controls in Circular OT-55 (not incorporated into the HMR) and whether additional operational controls may be warranted based on an assessment of risk. We also encourage commenters to provide data on the safety or economic impacts associated with any proposed operational controls, including analysis of the safety justification or cost impact of implementing operational controls.

IV. Section-by-Section Review

The following is a section-by-section review of the amendments considered in this NPRM.

Section 172.101

Section 172.101 provides the HMT and instructions for its use. PHMSA proposes amending the entry for "UN1972, Methane, refrigerated liquid" in the HMT to add reference to the cryogenic liquids in (rail) tank cars packaging section—§ 173.319 in Column (8C).

Section 173.319

Section 173.319 prescribes requirements for cryogenic liquids transported in rail tank cars. Paragraph (d) provides which cryogenic liquids may be transported in a DOT-113 tank car when directed to this section by Column (8C) of the § 172.101 HMT. PHMSA proposes to amend paragraph (d)(2) to authorize the transport of Methane, refrigerated liquid (LNG). Additionally, PHMSA is proposing to amend the Pressure Control Valve Setting or Relief Valve Setting Table in § 173.319(d)(2) to specify settings for methane in DOT-113C120W tank cars, specifically, a start-to-discharge pressure valve setting of 75 psig; a design service temperature of −260 °F; a maximum pressure when offered for transportation of 15 psig; and a filling density of 32.5 percent by weight.

V. Regulatory Analyses and Notices

A. Statutory/Legal Authority for This Rulemaking

This rulemaking is published under the authority of Federal Hazardous Materials Transportation Law (Federal hazmat law; 49 U.S.C. 5101 *et seq.*), and the Federal Railroad Safety Laws (49 U.S.C. ch. 201-213). Section 5103(b) of the Federal Hazmat Law authorizes the Secretary of Transportation to "prescribe regulations for the safe transportation, including security, of hazardous materials in intrastate, interstate, and foreign commerce." Section 20103 of the Federal Railroad Safety Laws, authorizes the Secretary to prescribe regulations and issue orders for every area of railroad safety. The

Secretary's authority is delegated to PHMSA at 49 CFR 1.97. This rulemaking proposes to authorize the transportation of LNG by rail in DOT-113C120W tank cars.

B. Executive Order 12866 and DOT Regulatory Policies and Procedures

This rulemaking is considered a significant regulatory action under section 3(f) of Executive Order 12866 ("Regulatory Planning and Review") and was reviewed by the Office of Management and Budget (OMB). This rulemaking is also considered a significant rulemaking under the DOT Regulatory Policies and Procedures of February 26, 1979 [44 FR 11034].

Executive Order 12866 ("Regulatory Planning and Review")[19] requires agencies to regulate in the "most cost-effective manner," to make a "reasoned determination that the benefits of the intended regulation justify its costs," and to develop regulations that "impose the least burden on society."

Additionally, Executive Order 12866 requires agencies to provide a meaningful opportunity for public participation, which also reinforces requirements for notice and comment under the APA.[20] Therefore, in this NPRM, PHMSA seeks public comment on revisions to the HMR authorizing the transportation of LNG by rail tank car. PHMSA also seeks comment on the preliminary cost and cost savings analyses, as well as any information that could assist in quantifying the benefits of this rule. Overall, this rulemaking maintains the continued safe transportation of hazardous materials while

[19] See 58 FR 51735, October 4, 1993 for Executive Order 12866
[20] See 5 U.S.C. 553

producing a net cost savings. For additional discussion about the economic impacts, see the preliminary Regulatory Impact Analysis posted in the docket.[21]

C. *Executive Order 13771*

This proposed rule is expected to be an Executive Order 13771 deregulatory action. Details on the estimated cost savings of this proposed rule can be found in the rule's economic analysis.[22]

D. *Executive Order 13132*

This rulemaking was analyzed in accordance with the principles and criteria contained in Executive Order 13132 ("Federalism"). This rulemaking may preempt State, local, and Tribal requirements but does not propose any regulation that has substantial direct effects on the States, the relationship between the national government and the States, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of Executive Order 13132 do not apply.

The Federal hazmat law, 49 U.S.C. 5101–5128, contains an express preemption provision [49 U.S.C. 5125(b)] that preempts State, local, and Indian tribal requirements on the following subjects:

(1) The designation, description, and classification of hazardous materials;

(2) The packing, repacking, handling, labeling, marking, and placarding of hazardous materials;

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[21] See Docket No. PHMSA-2018-0025 at www.regulations.gov.
[22] Ibid.

(3) The preparation, execution, and use of shipping documents related to hazardous materials and requirements related to the number, contents, and placement of those documents;

(4) The written notification, recording, and reporting of the unintentional release in transportation of hazardous material; and

(5) The design, manufacture, fabrication, marking, maintenance, recondition, repair, or testing of a packaging or container represented, marked, certified, or sold as qualified for use in transporting hazardous material.

This proposed rule addresses covered subject item (2) above and preempts State, local, and Indian tribe requirements not meeting the "substantively the same" standard.

Federal preemption also may exist pursuant to section 20106 of the former Federal Railroad Safety Act of 1970 (FRSA), repealed, revised, reenacted, and recodified at 49 U.S.C. 20106. Section 20106 of the former FRSA provides that States may not adopt or continue in effect any law, regulation, or order related to railroad safety or security that covers the subject matter of a regulation prescribed or order issued by the Secretary of Transportation (with respect to railroad safety matters) or the Secretary of Homeland Security (with respect to railroad security matters), except when the State law, regulation, or order qualifies under the section's "essentially local safety or security hazard."

PHMSA invites State and local governments with an interest in this rulemaking to comment on any effect that revisions to the HMR relative to LNG transportation may cause.

E. Executive Order 13175

This rulemaking was analyzed in accordance with the principles and criteria contained in Executive Order 13175 ("Consultation and Coordination with Indian Tribal Governments"). PHMSA does not anticipate that this rulemaking will have substantial direct tribal implications. Therefore, the funding and consultation requirements of Executive Order 13175 are not expected to apply. However, PHMSA invites Indian tribal governments to comment on any effect that revisions to the HMR relative to LNG transportation may cause.

F. Regulatory Flexibility Act, Executive Order 13272, and DOT Policies and Procedures

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires agencies to consider whether a rulemaking would have a "significant economic impact on a substantial number of small entities" to include small businesses, not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations under 50,000. This proposed rulemaking has been developed in accordance with Executive Order 13272 ("Proper Consideration of Small Entities in Agency Rulemaking") and DOT's procedures and policies to promote compliance with the Regulatory Flexibility Act to ensure that potential impacts of draft rules on small entities are properly considered. The proposed changes are generally intended to provide relief by easing requirements with no anticipated reduction in safety.

Consideration of alternative proposals for small businesses. The Regulatory Flexibility Act directs agencies to establish exceptions and differing compliance standards for small businesses, where it is possible to do so and still meet the objectives of applicable regulatory statutes.

The impact of this proposed rulemaking on small businesses is not expected to be significant. The proposed changes are generally intended to provide regulatory flexibility and cost savings to industry members. However, PHMSA seeks comment on the potential impacts on small entities.

G. Paperwork Reduction Act

Section 1320.8(d), Title 5, Code of Federal Regulations requires that PHMSA provide interested members of the public and affected agencies an opportunity to comment on information collection and recordkeeping requests. This NPRM does not impose new information collection and recordkeeping burdens.

H. Regulation Identifier Number (RIN)

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

I. Unfunded Mandates Reform Act

This rulemaking does not impose unfunded mandates under the Unfunded Mandates Reform Act of 1995. It does not result in costs of $100 million or more, adjusted for inflation, to either State, local, or Tribal governments, in the aggregate, or to the private sector and is the least burdensome alternative that achieves the objective of the rulemaking. PHMSA will evaluate any regulatory action that might be proposed in subsequent stages of the proceeding to assess the effects on State, local, and Tribal governments and the private sector.

J. Environmental Assessment

The National Environmental Policy Act of 1969 (NEPA) requires Federal agencies to consider the consequences of major Federal actions and prepare a detailed statement on actions significantly affecting the quality of the human environment. The Council on Environmental Quality (CEQ) implementing regulations (40 CFR part 1500) require Federal agencies to conduct an environmental review considering (1) the need for the action, (2) alternatives to the action, (3) probable environmental impacts of the action and alternatives, and (4) the agencies and persons consulted during the consideration process (*see* 40 CFR 1508.9(b)).

1. Need for the action

The purpose of this NPRM is to propose amendments that authorize the transportation of Methane, refrigerated liquid, commonly known as liquefied natural gas (LNG), by rail in a DOT-113C120W tank car. This proposed rulemaking would facilitate

the transportation of LNG by rail in a packaging other than a portable tank. This action would facilitate the transportation of natural gas to markets where pipeline transportation is limited or unavailable.

2. Alternatives considered

Transportation of hazardous materials in commerce is subject to requirements in the HMR, issued under authority of Federal hazmat law, codified at 49 U.S.C. 5101 *et seq*. To facilitate the safe and efficient transportation of hazardous materials in international commerce, the HMR provide that both domestic and international shipment of hazardous materials may be offered for transportation and transported under provisions of the international regulations.

In proposing this rulemaking, PHMSA is considering the following alternatives:

Alternative 1: No Action Alternative

The No Action Alternative would not adopt the regulatory changes proposed in this NPRM. If PHMSA were to select this alternative, it would not proceed with any rulemaking on this subject and the current regulatory standards would remain in effect. If the current regulatory standards remain in effect, LNG would not be authorized for transportation by tank car. The No Action Alternative would not address AAR's petition for rulemaking or stakeholder comments to the October 2, 2017, notification of regulatory review. LNG transportation by highway and by rail—via a PHMSA special

permit[23] or an FRA approval[24]—would continue and perhaps increase over time. However, these alternatives typically have limited applicability because they only apply to the parties to the PHMSA special permit or FRA approval. The No Action Alternative would also fail to comply with the April 10, 2019 Executive Order, "Executive Order on Promoting Energy Infrastructure and Economic Growth." That E.O. orders the Secretary of Transportation to propose regulatory changes "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. The Secretary shall finalize such rulemaking no later than 13 months after the date of this order."

Alternative 2: Authorize LNG in DOT-113C120W and DOT-113C140W tank cars

This alternative would adopt the AAR petition in its entirety, including the authorization of the DOT-113C140W specification tank car into the HMR for the transportation of LNG. As discussed earlier, in the section "III. A. *Tank Car Specification"* section, the intended advantage to the DOT-113C140W tank car is that it would have a similar design and construction to the DOT-113C120W specification, but would potentially allow for five days of additional transportation time because the tank car would use a thicker inner tank material that would allow for a higher inner tank test pressure (140 psig) and higher pressure relief device settings. PHMSA and FRA believe that a complete engineering review of this specification is warranted, and that more

[23] On September 14, 2017, PHMSA announced it had received an application for a special permit to transport LNG by rail in DOT-113 tank cars from Energy Transport Solutions, LLC. The PHMSA-assigned application number is 20534-N. *See* 82 FR 43285. PHMSA is currently reviewing the application. Additionally, PHMSA issued a notice announcing the availability for public review and comment of the draft environmental assessment for this special permit request to transport LNG by rail tank car. *See* 84 FR 26507 and Docket No. PHMSA-2019-0100.

[24] FRA has granted approvals to Alaska Railroad and Florida East Coast Railroad allowing for the transportation of LNG by rail in ISO containers provided that the operators comply with certain operational controls.

research and supporting data are needed to demonstrate that this additional transportation timeframe benefits safety or justifies the addition of a new tank car specification to the HMR. While PHMSA is not opposed to considering this request for future action, it does not want to delay action on the DOT-113C120W tank car. Accordingly, this alternative was eliminated from full consideration in this rulemaking and draft EA.

Alternative 3: Proposed Alternative

The Proposed Alternative is the current proposal as it appears in this NPRM, applying to transportation of hazardous materials by rail. The Proposed Alternative would authorize the transportation of LNG by rail in a DOT-113C120W specification tank car. See sections "III. Changes Being Considered" and "IV. Section-by-Section Review" of this rulemaking for further discussion on the proposed amendments encompassed in this alternative.

3. Environmental impacts

Alternative 1: No Action Alternative

If PHMSA were to select the No Action Alternative, current regulations would remain in place and no new enabling provisions would be added. This alternative would not amend the HMR to allow shippers to transport bulk quantities of LNG by rail tank car. As such, the current regulatory requirements would require that LNG continue to be transported by highway, or for rail transportation, be limited to certain PHMSA special permit holders or LNG in portable tanks pursuant to the conditions of an FRA approval. This alternative would prevent the use of a tank car that was designed to address the hazards presented by cryogenic liquids, and has a demonstrated safety record.

Authorizing the transport of LNG by tank car via rulemaking has the potential to allow shippers to move a greater quantity of LNG more efficiently, as highway transportation requires the use of more vehicles to move the same amount of material as rail transportation, thereby increasing air pollutants, including greenhouse gases. In 2017, U.S. railroads moved a ton of freight an average of 479 miles per gallon of fuel. On average, railroads are four times more fuel efficient than trucks. Because greenhouse gas emissions are directly related to fuel consumption, moving freight by rail instead of truck reduces greenhouse gas emissions by an average of 75 percent. In addition, emissions of particulate matter and nitrogen oxides are significantly lower for railroads than for trucks.[25]

Furthermore, highway transportation may present a greater risk of accident and release of LNG for each movement, which creates a danger for both humans and the environment. From 2005 to 2017, there were eight incidents involving Methane, refrigerated liquid transported by cargo tank motor vehicle (CTMV).[26] No injuries or fatalities were reported to PHMSA. Two of the crashes were single vehicle rollovers. Furthermore, the total quantity spilled in these eight incidents was 11,296 gallons. For three of the eight incidents reported, a total of 165 people were evacuated. One of the three incidents (not a crash) involved 102 evacuations and 1,000 gallons spilled. One other incident of the three, a rollover incident, involved 50 evacuations and zero gallons spilled. The last of the three incidents involved 13 evacuations and 4,625 gallons spilled. In any of these incidents injuries or fatalities could

[25] AAR "Overview of America's Freight Railroads" (October, 2018) https://www.aar.org/wp-content/uploads/2018/05/AAR-Overview-Americas-Freight-Railroads.pdf.
[26] See pages 11 and 12 of the Preliminary Regulatory Impact Analysis for further discussion of incidents involving cryogenic liquids.

have occurred, especially if an ignition source had been present; the gallons spilled and the number of evacuations demonstrate that the incidents presented significant risk to human life and environmental resources in the vicinity of each incident. 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.

Alternative 3: Proposed Alternative

PHMSA proposes to amend the HMR to allow the transportation of LNG in DOT-113C120W rail cars. PHMSA understands that authorizing the rail transportation of LNG would reduce greenhouse gas emissions by requiring fewer trips to transport the same amount of material currently being transported by highway. Furthermore, fewer trips are anticipated to result in fewer accidents and spills of LNG during transportation.

PHMSA has collected data on the safety history of the DOT-113 tank car from its own incident database and from AAR, which compiles data provided by FRA. PHMSA has analyzed data regarding DOT-113 damage history. From 1980 to 2017 (a 37-year period), there were 14 instances of damage to DOT-113 tank cars during transportation. Of the 14 instances, there were three instances where a DOT-113 tank car lost lading from breach of both the outer and inner tanks. This is the most serious type of damage. Additionally, there were three instances in which a DOT-113 tank car lost lading from damage or other failure to the valves/fittings. The vast majority of incidents causing damage to the DOT-113 tank cars did not result in a loss of hazardous materials.

The first derailment that resulted in breach of an inner tank of a DOT-113 tank car took place in May 2011 in Moran, Kansas. Three DOT-113C120 specification tank cars

containing refrigerated liquid ethylene sustained damage. Two of the cars were breached in the derailment and initially caught fire. One of the fires consumed the entire contents of the DOT-113 tank car. The two remaining cars, that is, the one that had been breached in the derailment and the other that had been damaged but not breached, were mechanically breached to expedite the burning and consumption of the contents to expedite removal from the site of the derailment. The total quantity of refrigerated ethylene lost was approximately 45,000 gallons and the total damage estimate was calculated at approximately $231,000 in 2017. The other derailment that caused tank failure of a DOT-113 tank car 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 liquid 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. Depending on demand, the numbers of DOT-113 tank cars in operation under the proposed regulatory change could increase well beyond the numbers of DOT-113 tank cars currently in operation.

Though rare, 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. These releases can be considerably larger than releases from a CTMV that travels by highway. Nonetheless, considering that the DOT-113 tank car has a 50-year service history and with the understanding it is possible there are unreported incidents from years past, the safety history is noteworthy. 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.

LNG Characteristics and Hazards

With regard to how LNG could respond under accident conditions, when a large amount of LNG is spilled and its vapors come into contact with an ignition source, the vapors will ignite if the vapor concentration in a vapor-air mixture is between 5 and 15 percent and cause the spill to develop into a pool fire (if ignited immediately) or flash vapor fire if the vapor cloud is ignited at some distance from the spill location. Both types of fires present a radiant heat hazard. If there is no ignition source in the immediate vicinity of the release, the spilled LNG will vaporize rapidly forming a cold gas cloud that is heavier than air, which then mixes with ambient air, spreads and is carried downwind. The dispersion of the cloud due to the wind results in its temperature increase of the vapor due to mixing with air that gets entrained into the cloud; but the cloud temperature always remains lower than that of ambient air, because of exchange of heat between the air that is mixing and the virgin cold vapor. Also, the density of the cloud decreases due to continuous mixing with air; however, the cloud density is never lower than that of the ambient air. The result is that the cloud is always heavier than air and disperses hugging the ground (with highest vapor concentrations at ground level). The only way the vapor cloud can become either neutrally buoyant or buoyant is if external

heat (such as from solar heating or heating from the ground) is added to the cloud. These heat transfer mechanisms provide insufficient heat to the cloud in normal dispersion before the vapor cloud dilutes to concentration below lower flammability limit, LFL, of 5 percent by volume.

The dispersing cloud is visible as a white cloud due to the condensation of water vapor from the atmosphere and because in the initial stages the dispersing cloud is cold (starting from -260 degrees Fahrenheit). However, as the overall cloud temperature increases due to mixing with ambient air, and as the cloud temperature increases to above the "wet bulb" temperature corresponding to the relative humidity of the atmospheric air, the condensed water re-evaporates and the cloud becomes non-visible. The flammable region of the vapor cloud is enclosed within the visible vapor cloud if the ambient relative humidity is greater than or equal to 55 percent. For regions with relative humidity less than this value, the flammable cloud is outside the visible cloud. An ignition source can only ignite the vapor cloud when it is available and the vapor concentration is in the 5 to 15 percent average vapor concentration in air. Once ignited, the vapors will burn back, generally upwind, to the LNG source. 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 will occur. Unlike other flammable liquids and gases, a LNG vapor cloud will not ignite entirely at once. If ignited, the flash

fire that forms has a 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. The radiant heat effects from such a flash fire does not extend to distances significantly larger than the width of the flammable cloud. The slow burning 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 encounters structural obstructions (e.g., houses, trees, bushes, pipe racks, etc.) that can increase the flame turbulence significantly when the flash fire reaches the source of vapor (boiling LNG), if there is still a liquid pool of LNG evaporating at that time, a pool fire will result.

Methane in vapor state can be an asphyxiant when it displaces oxygen in a confined space. When LNG is spilled on the ground, into a confined area, such as bound by a dike, the LNG will initially boil-off rapidly forming a vapor cloud, but the boil-off will slow down as the ground cools due to heat being extracted from it to provide for the evaporation of LNG. If LNG is spilled on water, LNG will float on top of the water, spread in an unconfined manner, and vaporize very rapidly. This rapid vaporization will occur even at water temperatures near freezing since freezing water is significantly warmer than the spilled LNG.

LNG is stored and transported at -260° F (-160° C). Due to this extremely low temperature, contact with a cryogenic liquid can cause severe injury to human skin and eyes. It will also make ordinary metals, including carbon steel, subject to embrittlement and fracture when exposed to these temperatures. Transportation of cryogenic materials

require specialized double walled (tank within a tank) containers for transportation.

DOT-113 Tank Car Characteristics

The DOT-113 specification tank car is a specially designed rail tank car for the transport of cryogenic liquids. This tank car design has been in use for over 50 years. As noted above, there are only six documented derailments involving the transportation of the DOT-113 specification tank car that resulted in loss of tank contents.

DOT-113 specification rail tank cars are built to a double pressure-vessel design with the commodity tank (inner vessel) constructed to withstand a burst pressure of 300 psig and fabricated of ASTM A 240/A 240M, Type 304 or 304L stainless steel; the outer jacket shell (outer vessel) is typically constructed of carbon steel and is designed to withstand an external pressure (critical collapsing pressure) of 37.5 psig. See §§ 179.400-8(d) and 179.401-1, respectively. The inner vessel is designed with a minimum thickness of 3/16 inch and the outer shell thickness is greater than 7/16 inch. The rail tank car is manufactured with an insulated annular space holding a vacuum between the two pressure vessels. This vacuum area and the insulation on the outer wall of the inner tank significantly reduce the rate of heat transfer from the atmosphere to the liquid inside the tank car, thus minimizing the heating of the cryogenic (i.e., refrigerated) liquid in the tank car while being transported. Other key safety features of the DOT-113 specification tank car include, but are not limited to, the following:

- Several inches of aluminized Mylar super-insulation surrounding the inner tank.
- A vacuum environment/annular space between the inner and outer tanks for enhanced product pressure and temperature control.

- Specifically, designed loading and unloading equipment (piping, valves, gages, etc.) for use in cryogenic service.
- Safety equipment (pressure relief valves, safety vents, safety shut off valves, and remote monitoring systems) to prevent or limit overpressure issues or non-accident releases.
- Mandated in-transit tracking (time sensitive shipment) and car handling instructions.

Regulations controlling the movement of LNG in the DOT-113C120W packaging would be the same as those that apply to the transportation of other cryogenic liquids, including ethylene. Regulatory requirements governing these operational practices appear in 49 CFR part 174 and 49 CFR 173.319, which is administered by the FRA. In addition, the AAR has issued Circular OT-55, which sets forth Recommended Railroad Operating Practices for Transportation of Hazardous Materials for key trains. Rail carriers require compliance with the standard through AAR Interchange Rules. AAR Circular OT-55 (currently designated as version Q) calls for operational controls for trains carrying certain quantities of hazardous materials, such as LNG unit trains, which are sufficient to address the risks associated with moving LNG in DOT-113 tank cars. The operational controls recommended in OT-55 for the transport of hazardous materials regulate, among other things:

- "Key Trains" are 20 carloads or intermodal portable tank loads of any combination of hazardous materials.
- "Key Trains," including LNG-carrying unit trains, are subject to a maximum speed restriction of 50 mph;

- "Key Routes," which are lengths of track on which either (i) 10,000 car loads or more of hazardous materials or (ii) 4,000 car loadings of flammable gas (such as LNG, which is refrigerated (cryogenic) liquid methane, a Division 2.1 flammable gas) will travel over a one-year period and are subject to additional inspection and equipment requirements;
- Separation distance requirements relating to the spacing of loading and operations, loaded tank cars, and other storage tanks at rail facilities; and
- Community awareness and preparations for emergency planning/incident response actions.

DOT-113 Specification Tank Car Survivability

Due to its unique design requirements, the DOT-113 specification tank car is inherently more robust than other tank cars transporting other flammable liquids or liquefied gases. In the event of a DOT-113 specification tank car derailment causing only breach of the outer shell, the breach would cause the loss of the insulating vacuum between the inner and outer tank, allowing the inner tank and material to warm and build pressure. The resulting pressure build would lead to the activation of the pressure relief systems on the car and the controlled venting of LNG vapor. While this scenario is concerning, the controlled venting of LNG vapor involves less risk than the uncontrolled release of an entire LNG lading. Additionally, it is highly unlikely that damage to the tank car involved in a derailment would result in explosion due to a boiling liquid expanding vapor explosion (BLEVE). This event is highly unlikely due to the loading pressure requirements[27] for cryogenic materials, and due to the mandated requirements

[27] 49 CFR 173.319.

for redundant pressure relief systems (valves and safety vents) that are built into each car. This rulemaking proposes a 15 psig maximum loading pressure when LNG is offered for transportation in the DOT-113C120W tank car. This loading pressure, along with other safety requirements and operational controls reduce the potential of a BLEVE.

LNG Release Scenarios

Based on the review incident reporting and the 50 year history of transporting cryogenic liquids in DOT-113 specification tank cars, there are three (3) possible release scenarios that could occur during the transport of LNG by rail tank car. Ranked in order of probability, they are:

1. Non-accident release (NAR) from service equipment. Probability – Low; Consequence – Low

2. Outer tank damage resulting vapor release from Pressure Relief Device (PRD). Probability – Low; Consequence – Low to High (in the event that ignition of vented vapors led to failure/explosion of the tank car)

3. Inner tank damage resulting in large release. Probability – Low; Consequence – High

Although Scenario 3 has a low probability, a breached inner tank during a transportation accident could have a high consequence because of the higher probability of a fire due to the formation of a flammable gas vapor/air mixture in the immediate vicinity of the spilled LNG. This probability is based on the likelihood of ignition sources (sparks, hot surfaces, etc.) being generated by other equipment, rail cars, or vehicles involved in a transportation accident that could ignite a flammable vapor cloud.

Hazard Distances

As with any incident involving a hazardous material in transportation, the actual hazard distance created by a material that is spilled or burning will be influenced by many factors. These factors include, but are not limited to the following:

- Spill Size
- Weather (Wind, Temperature, Humidity, Precipitation)
- Terrain Contours (Hills, Valleys)
- Surface Cover (Vegetation, Structures)
- Soil (Dirt, Clay, Sand)

As stated previously, hazard distance of a vapor cloud dispersion of LNG is difficult to predict. Local weather conditions, terrain, surface cover (i.e., vegetation, trees, and buildings) will influence how a vapor cloud disperses, and how rapidly it diffuses.

Similarly, the actual hazard distance that radiant heat from a pool fire of LNG would impact is dependent on the same factors that influence a vapor cloud. Additionally, the impact of radiant heat from a fire on occupied structures will be influenced by local building codes that govern building setback requirements from railroad right-of-way. Depending on the jurisdiction, setbacks for occupied structures could be within fifty (50) feet of either side of a railroad track.

Regardless of the scenario, the recommended protective action distances[28] identified in the PHMSA Emergency Response Guidebook (ERG) for LNG would be appropriate for the initial protection of the public during an incident involving LNG.

[28] For a large spill, consider initial downwind evacuation for at least 800 meters. If a tank car is involved in a fire, isolate for 1600 meters in all directions; also, consider evacuation for 1600 meters in all directions.

However, these protective distances may encompass occupied structures along rail tracks, depending on the location of a failure and the proximity of occupied structures to a breached tank car.

Cascading Failure of Multiple DOT-113 Tank Cars

As stated previously, DOT-113 specification tank cars are inherently more robust when compared to other specification tank cars, due to their unique design, materials of construction, and their specific purpose to transport cryogenic liquids. The special design of the DOT-113 tank car reduces the probability of cascading failures of other undamaged DOT-113 specification tank cars being transported in a block or unit train configuration.

In the scenario where multiple DOT-113 specification tank cars are transported in a block or unit train configuration, fire/radiant heat exposure or cryogenic temperature exposure could potentially lead to the release of material or failure of otherwise undamaged tank cars.

Fire/Radiant Heat Exposure

In a scenario involving fire/radiant heat exposure, an undamaged DOT-113 specification tank car exposed to a radiant heat source could eventually build pressure that would trigger the activation of the tank car's PRD.

As stated previously, this scenario would result in the controlled venting of LNG vapor to the environment. Ignition of these vapors could occur if an ignition source is present, but would be contained to the proximity of the release point of the vapors from

the tank car. Additionally, as stated previously, it is highly unlikely that an undamaged DOT-113 tank car involved in a derailment would result in explosion due to a BLEVE. This event is highly unlikely due to the design of the tank car, the loading pressure requirements for cryogenic materials, the mandated requirements for redundant pressure relief systems (valves and safety vents) and insulation systems that are built into each car. It is not possible to state with certainty whether a BLEVE[29] is possible in the case of a LNG tank car derailment, and what conditions need to be present for such an event to occur. However, a recent full-scale test with a double walled portable cryogenic tank filled with liquid nitrogen (and PRDs operated as designed) and exposed to a greater than 200-minute engulfing propane pool fire was neither destroyed nor did a BLEVE occur. The number of cars that could be impacted by this type of exposure would be dependent on multiple factors. Some of these include, but are not limited to: the number or LNG cars in the consist, the locations of those tank cars, type of fire, exposure distance, and defensive actions of responders. Exposure to radiant heat from an LNG pool fire or being caught within the flash vapor fire could result in fatalities, serious injuries, and property damage. These risks also exist in the transportation of LNG via highway, existing rail transportation, and pipeline. However, given the safety history of the DOT-113C120W tank cars, it is expected that the risk of tank car failure and ignition is low.

[29] A BLEVE is not caused by a combustion explosion of a flammable material. As the name implies, it is the explosion caused by rapidly evolving vapor in relatively small space which leads to significant increase in pressure which may violently damage/destroy a container. When a container with a liquid in it is exposed to a fire and no pressure relief (or partial intermittent relief) occurs the liquid within it can be heated to superheat temperature conditions. If this is followed by a small breach of the container (due to, say, wall metal failure), the rapid depressurization that results leads to an extremely rapid boiling of the liquid, and release of a significant mass of vapor, in microseconds to milliseconds, into the container. This results in very high pressures inside the container leading to its burst, causing an "explosion" (an explosion is the release of energy in an extremely short duration of time). Whether such phenomena occur in a double walled tank car exposed to an external fire is uncertain.

Cryogenic Temperature Exposure

In a scenario involving cryogenic temperature exposure, the risk to an undamaged DOT-113 specification tank car is the embrittlement of the car's steel due to exposure to the extremely cold temperatures of the material. This type of exposure could lead to the failure of the tank car's outer carbon steel tank, but not the inner stainless steel tank. As stated previously, if a DOT-113 specification tank car has its outer tank compromised, the car would lose its insulating vacuum and would eventually start to build pressure within the product tank. This pressure build would eventually lead to the activation of the tank car's PRDs and the controlled venting of LNG vapors.

Air Pollution and Greenhouse Gases

The rulemaking could result in the manufacture of additional DOT-113C120W tank cars. Depending on demand, this manufacture process could result in minor increases in the emission of air pollution and increased emission of greenhouse gases (GHGs), due to the steel and insulating materials that the tank car is comprised of. Also, the transportation of rail tank cars filled with LNG would result in air pollution and GHG emissions associated with increased use of diesel-powered trains. However, transportation of LNG via rail instead of via highway would reduce the emission of air pollution and the emission of GHGs. In general, highway transportation requires proportionally more fuel and results in proportionally more emissions than rail transportation. According to AAR, moving freight by rail instead of truck lowers GHG emissions by 75%. Railroads move approximately one-third of U.S. exports and intercity

freight volume in the United States. Despite the large volume of freight moved, U.S. Environmental Protection Agency data show freight railroads account for only 0.5% of total U.S. greenhouse gas emissions and just 2% of emissions from transportation-related sources.[30] Furthermore, removing barriers for the transportation of LNG could promote the use of LNG over more polluting energy sources.

The failure of one or more DOT-113C120W tank cars filled with LNG would release a large amount of either burned methane or unburned methane hydrocarbons into the atmosphere. Unburned methane hydrocarbons are a potent GHG and a pollutant. However, as described above, the likelihood of such a failure is very low, given the safety record of DOT-113C120W tank cars. Nonetheless, unburned methane enters the atmosphere in the production and transportation of methane on a more frequent basis.

While the authorization of the DOT-113 specification tank car for LNG service will facilitate the transportation of LNG, natural gas and LNG is currently transported via pipeline, vessel, highway, and rail. Increased transport of LNG by rail may result in fewer GHG emissions when compared to transport by highway or construction of new pipeline infrastructure. Also, facilitating LNG transport by rail may discourage the polluting and wasteful practice of natural gas flaring during the production of oil by allowing the natural gas to reach a viable market. This rulemaking may further decrease GHG emissions by facilitating the utilization of natural gas over more polluting sources of energy. Nonetheless, any action that facilitates the use of a fossil fuel arguably could contribute to the emission of GHGs, which are the principle cause of global climate change. As a regulator of hazardous materials packaging safety, PHMSA lacks the

[30] https://www.aar.org/issue/freight-rail-and-the-environment/

expertise to perform a quantitative prediction of how this rulemaking could affect GHG emissions. The selection of either the no action alternative or the proposed action alternative could both increase and decrease GHGs directly and indirectly depending on various economic variables.

4. Agencies consulted

PHMSA has coordinated with the Federal Motor Carrier Safety Administration and FRA in the development of this proposed rulemaking. PHMSA will consider the views expressed in comments to the NPRM submitted by members of the public, State and local governments, and industry.

5. Conclusion and Proposed FONSI

PHMSA believes that the amendments proposed in this NPRM will ultimately reduce the environmental impact of the transportation of LNG. PHMSA proposes to make a finding that the proposed amendments would not result in a significant environmental impact. PHMSA welcomes any views, data, or information related to safety or environmental impacts that may result if the proposed requirements are adopted, as well as additional information on possible alternatives and their environmental impacts. PHMSA proposes to find that the proposed regulations allowing the transport of LNG via DOT-113C120W tank car will not result in a significant environmental impact.

K. Privacy Act

In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to

better inform its rulemaking process. DOT posts these comments, without edit, including any personal information the commenter provides, to http://www.regulations.gov, as described in the system of records notice (DOT/ALL–14 FDMS), which can be reviewed at http://www.dot.gov/privacy.

L. *Executive Order 13609 and International Trade Analysis*

Under Executive Order 13609 ("Promoting International Regulatory Cooperation"), agencies must consider whether the impacts associated with significant variations between domestic and international regulatory approaches are unnecessary or may impair the ability of American business to export and compete internationally. *See* 77 FR 26413 (May 4, 2012). In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, international regulatory cooperation can identify approaches that are at least as protective as those that are or would be adopted in the absence of such cooperation. International regulatory cooperation can also reduce, eliminate, or prevent unnecessary differences in regulatory requirements.

Similarly, the Trade Agreements Act of 1979 (Pub. L. 96-39), as amended by the Uruguay Round Agreements Act (Pub. L. 103-465), prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. For purposes of these requirements, Federal agencies may participate in the establishment of international standards, so long as the standards have a legitimate domestic objective, such as providing for safety, and do not operate to exclude imports that meet this objective. The

statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

PHMSA participates in the establishment of international standards in order to protect the safety of the American public, and we have assessed the effects of the proposed rule to ensure that it does not cause unnecessary obstacles to foreign trade. Accordingly, this rulemaking is consistent with Executive Order 13609 and PHMSA's obligations under the Trade Agreement Act, as amended. This rulemaking does not negatively impact international trade.

M. National Technology Transfer and Advancement Act

The National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) directs Federal agencies to use voluntary consensus standards in their regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., specification of materials, test methods, or performance requirements) that are developed or adopted by voluntary consensus standards bodies. This rulemaking does not incorporate by reference any voluntary consensus standards; however, the development of this proposed rule is based on the applicability of the operational controls in AAR Circular OT-55 to the bulk transport of LNG by rail in a train consist that is composed of 20 car loads or intermodal portable tank loads in which LNG is present along with any combination of other hazardous materials.

N. Executive Order 13211

Executive Order 13211 ("Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use") [66 FR 28355; May 22, 2001] requires Federal agencies to prepare a Statement of Energy Effects for any "significant energy action." Under the executive order, a "significant energy action" is defined as any action by an agency (normally published in the *Federal Register*) that promulgates, or is expected to lead to the promulgation of, a final rule or regulation (including a notice of inquiry, ANPRM, and NPRM) that (1)(i) is a significant regulatory action under Executive Order 12866 or any successor order and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action.

This NPRM is a significant action under Executive Order 12866, but it is not expected to have an annual effect on the economy of at least $100 million. Further, this action is not likely to have a significant adverse effect on the supply, distribution or use of energy in the U.S. For additional discussion of the anticipated economic impact of this rulemaking, please review the preliminary RIA. PHMSA welcomes any data or information related to energy impacts that may result from this NPRM, as well as possible alternatives and their energy impacts. Please describe the impacts and the basis for the comment.

List of Subjects

49 CFR Part 172

Hazardous materials table, Hazardous materials transportation, Labeling, Markings, Packaging and containers.

49 CFR Part 173

Hazardous materials transportation, Incorporation by reference, Packaging and containers, Cryogenic liquids, Reporting and recordkeeping requirements.

In consideration of the foregoing, PHMSA proposes to amend 49 CFR chapter I as follows:

PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, TRAINING REQUIREMENTS, AND SECURITY PLANS

1. The authority citation for part 172 continues to read as follows:

   Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81, 1.96 and 1.97.

2. In § 172.101, revise the table entry for "UN1972, Methane, refrigerated liquid" to read as follows:

§ 172.101 Purpose and use of the hazardous materials table.

* * * * *

§ 172.101 HAZARDOUS MATERIALS TABLE

Sym-bols	Hazardous materials descrip-tions and proper shipping names	Hazard class or division	Identi-fication Numbers	PG	Label Codes	Special Provisions (§ 172.102)	(8)			(9)		(10)	
							Packaging (§ 173.***)			Quantity limitations (see §§ 173.27 and 175.75)		Vessel stowage	
							Excep-tions	Non-bulk	Bulk	Passenger aircraft/rail	Cargo air-craft only	Loca-tion	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	*		*		*		*		*		*		*
	Methane, refrigerated liquid *(cryogenic liquid)* or Natural gas, refrigerated liquid *(cryogenic liquid), with high methane content)*	2.1	UN1972		2.1	T75, TP5	None	None	318, 319	Forbidden	Forbidden	D	40
	*		*		*		*		*		*		*

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

3. The authority citation for part 173 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81, 1.96 and 1.97.

4. In § 173.319, revise paragraph (d)(2) to read as follows:

§ 173.319 Cryogenic liquids in tank cars.

* * * * *

(d) * * *

(1) * * *

(2) *Ethylene, hydrogen (minimum 95 percent parahydrogen), and methane, cryogenic liquids* must be loaded and shipped in accordance with the following table:

PRESSURE CONTROL VALVE SETTING OR RELIEF VALVE SETTING

Maximum start-to-discharge pressure (psig)	**Maximum permitted filling density (percent by weight)**				
	Ethylene	**Ethylene**	**Ethylene**	**Hydrogen**	**Methane**
17				6.60	
45	52.8				
75		51.1	51.1		32.5
Maximum pressure when offered for transportation	10 psig	20 psig	20 psig		15 psig
Design service temperature	Minus 260 °F	Minus 260 °F	Minus 155 °F	Minus 423 °F	Minus 260 °F
Specification (see §180.507(b)(3) of this subchapter)	113D60W, 113C60W	113C120W	113D120W	113A175W, 113A60W	113C120W

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Drue Pearce,

Deputy Administrator,

Pipeline and Hazardous Materials Safety Administration