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Attention:

General Approvals and Permits, PHH-31
Pipeline and Hazardous Materials Safety Administration,
U.S. Department of Transportation, East Building
1200 New Jersey Avenue, SE.
Washington, DC 20590-0001

Purpose: New Special Permit Application for Approval to Transport Cryogenic Ethane via Rail Car

49 CFR 107.105(a)(2)

Applicant Name: Gas Innovations LNG Refrigerants Inc.

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Phone Number: 281-471-2200

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E-Mail Address: tmadray@gasinnovations.com

Phone Number: 281-471-2200

President: Ashley Madray

Dunn & Bradstreet #: 125035902

Physical address(es) associated with special permit use: Product (cryogenic ethane) would originate in Marcus Hook, PA. Application would include approval request to transport product to locations along Gulf Coast, Mexico, and Canada. Final destination for rail cars would be rail spurs near offload point near petrochemical, or LNG liquefaction facilities.

49 CFR 107.105(a)(3)

Not Applicable

49 CFR 107.105(a)(4)

Not Applicable

49 CFR 107.105(a)(5)

Not Applicable – application must provide the registration number or the name of the company to which the registration number is assigned if different from the applicant?

49 CFR 107.105(b)

Do we need to request confidential treatment?

49 CFR 107.105(c)(1)

49 CFR Parts 172, 173, 174, 179, and 180.

Document ID: PHMSA-2018-0025-0480

Effective Date: August 24, 2020

49 CFR 107.105(c)(2)

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Product will be loaded into rail cars in Marcus Hook, PA and transported to final destination at desired rail spur. Product would be transfilled from rail car into MC338 cryogenic transport hauled by tractor rig and carried to end user.

49 CFR 107.105(c)(3)

Rail cars would be properly labeled per DOT guidelines for cryogenic ethane. UN1972 Methane, refrigerated liquid and UN1038 Ethylene, refrigerated liquid are currently being carried in cryogenic form via rail cars. UN1961 Ethane, refrigerated liquid would follow same labeling criteria and fill guidelines for cryogenic liquids in tank cars as per 49 CFR Part 173.319.

49 CFR 107.105(c)(4)

End users are requesting cryogenic ethane currently. Major projects are ramping up in 2022 and 2023 that will require rail car cryogenic ethane. The requested duration is indefinite.

49 CFR 107.105(c)(5)

Ethane is a non-volatile organic compound (non-VOC). It is more stable (single bond vs double bond) compared to ethylene which is permitted for rail transit. Ethane also has a lower vapor pressure compared to ethylene (2.7% - 36% by volume). Ethane has lower flammability in air (3.0% - 12.5% by volume) compared to ethylene. Ethane also has higher ignition temperature (515 deg C) compared to ethylene (490 deg C). Bulk quantities are currently shipped via tractor pulled MC338 cryogenic transports. Rail transport of cryogenic ethane would ultimately reduce the environmental impact of the transport of cryogenic ethane. Alternative packaging for cryogenic ethane is via ocean going cargo tanker, T75 cryogenic ISO container, or tractor pulled MC338 cryogenic transport. Ocean going cargo tankers are not applicable for the volumes of interest as these locations do not require such large quantities. T75 cryogenic ISO containers can be placed on chassis and trucked, but there is a reduction in payload when compared to tractor pulled MC338 cryogenic transport. Long haul trucking is not preferred as the end users can require spot loads and the transit time from Marcus Hook, PA to end users in Baja, MX., Gulf Coast, U.S., would add burdensome lead times, additional cost and risk. Rail safety is preferred for these products over long haul trucking with T75 cryogenic ISO containers or tractor pulled MC338 cryogenic transports.

49 CFR 107.105(c)(6)

No

49 CFR 107.105(c)(7)

PSN: Ethane, refrigerated liquid

UN Number: UN1961

Hazard Class: 2.1 Flammable Liquid

Packing Group:

Estimate Quantity: 30,000 gallons per rail car

49 CFR 107.105(c)(8)

Packaging Description: DOT-113C120W9 and DOT-113C120W tank cars

Specification: 49 CFR 179.400

Standard:

Special Permit:

49 CFR 107.105(c)(9)

Not Applicable

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49 CFR 107.105(c)(10)

Number of Operations or Shipments: 25 per year

49 CFR 107.105(c)(11)

Number of packagings manufactured: 5 – 10

49 CFR 107.105(c)(12)

Not applicable

49 CFR 107.105(c)(13)

Not applicable

49 CFR 107.105(c)(14)

Applicant will be acting as shipper.

49 CFR 107.105(d)

Level of Safety required by regulations: UN1961 Ethane would meet all criteria for rail transportation as laid out in PHMSA-2018-0025-0480. UN1961 Ethane is acceptable to be stored and transported in DOT-113C120W9 and DOT-113C120W tank cars and consistent with specifications laid out in 49 CFR 179.400. For these reasons, UN1961 Ethane is as safe or safer for transportation via rail than UN1038 Ethylene.

Consistent with public interest: UN1972 Natural Gas, refrigerated liquid and UN1038 Ethylene, refrigerated liquid are permitted for transportation via rail in cryogenic form. UN1961 Ethane, refrigerated liquid is a non-volatile organic compound, however UN1038 Ethylene, refrigerated liquid, is a volatile organic compound. UN1961 Ethane has a lower vapor pressure and is more stable due to nature of single bond compared to double bond of UN1038 Ethylene, refrigerated liquid.

49 CFR 107.105(d)(1)

Shipping experience: Applicant has years of experience in the transportation of LP products via rail car; including: UN1265 IsoPentane, UN1011 n-Butane, UN1978 Propane, UN1077 Propylene. Applicant also has decades of experience in international shipment of ISO containers and hydrocarbons in cryogenic form; including; UN1972 Natural Gas, UN1038 Ethylene, UN1961 Ethane.

Incident experience: As per PHMSA report: [Federal Register :: Hazardous Materials: Liquefied Natural Gas by Rail](#)

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

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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.

49 CFR 107.105(d)(2)

Identification of Increased Risk: The transportation via rail of UN1961 Ethane is as safe or safer than UN1038 Ethylene due to its nature as a non-VOC, its lower vapor pressure, and increased stability.

Mitigation Factors: Approval for the special permit would not require any changes to PHMSA ruling or tank specifications for cryogenic liquids.

49 CFR 107.105(d)(3)(i)

The transportation via rail of UN1961 Ethane is as safe or safer than UN1038 Ethylene due to its nature as a non-VOC, its lower vapor pressure, and increased stability. Approval for the special permit would not require any changes to PHMSA ruling or tank specifications for cryogenic liquids.

49 CFR 107.105(d)(3)(ii)

Not Applicable.