PREDICT THE RISK

Safety / Security Risk Assessment

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA and FRA are applying the Rail Corridor Risk Management System (RCRMS) to the routes designated for transportation of LNG by rail in U.S. DOT Special Permit 20534.

Key Takeaways

- RCRMS is a government and industry -vetted methodology and geospatial information software that assists in analyzing the safety and security risks of rail routes.
- RCRMS generates a risk score for each route, and on a per-mile basis, by specifying the O-D pair, track profile, the hazardous material transported, annual commodity flow, and type of rail car or other hazmat packaging.
- RCRMS accounts for other risk factors, including maximum operating speeds, population exposure, proximity to environmentally sensitive areas and iconic targets, and commingled passenger rail traffic.
- Under the HMR, the rail carrier must select the practicable route posing the least overall safety and security risk, and review route selection and alternative routes annually.
- Preliminary RCRMS results demonstrate three viable routes between Wyalusing, PA and Gibbstown, NJ, with two deemed “most attractive” and one as “less attractive” based on risk scoring.

PREDICT THE RISK

Safety / Security Risk Assessment

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LNG BY RAIL TASK FORCE

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TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- How do PHMSA/FRA consider the 27 risk factors relative to the unique risks associated with LNG relative to other hazardous cargos?
- What are the unique risks associated with a short move that involves trackage rights from 4 railroads?
- Does RCRMS consider security as well as safety?

REDUCE THE RISK

Evaluation of Train Operational Controls

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA and FRA are evaluating use of existing operational controls and verifying compliance with railroad operating practices to ensure safe and effective transportation of LNG by rail.

Key Takeaways

- AAR Circular OT -55 is a joint effort between shippers, car owners, and the railroads to take a proactive approach to the safe transportation of hazardous materials.
- PHMSA and FRA engaged directly with multiple railroads to discuss compliance with Circular OT55 and key train requirements.
- The team developed a comprehensive checklist to guide DOT personnel during the review of rail carrier compliance of their operational controls, worst case scenario preparedness, and employee training.
- FRA is not aware of any instances of non-compliance with Circular OT-55, and AAR has noted they recommend compliance.
- Some railroads, like Norfolk Southern, use remote sensors to detect and monitor potential tank car failures, thereby being proactive to prevent future hazardous situations before they happen.
- Simulation data shows that unit trains operating under U.S. DOT Special Permit 23504 will travel at speeds above 40 mph for 13% of the distance between Wyalusing, PA, and Gibbstown, NJ.
- PHMSA and FRA will plan additional site visits nationwide to further inform best practices.

REDUCE THE RISK

Evaluation of Train Operational Controls

FRA / PHMSA

LNG BY RAIL TASK FORCE

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TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- Will there be an effort to find out this information from each U.S. Class 1 railroad:
- What percent of hazardous cars currently travel in OT-55 "key trains"?
- What percent of hazardous cars currently travel on OT-55 "key routes"?
- The intent here is to gather documentation as to whether OT-55 actually affects a significant portion of the traffic.

PREPARE FOR RISK

Validate Emergency Responder Opinions and Needs

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is engaging the emergency response community to ensure they have the information and tools to safely respond to an LNG-by-rail incident.

Key Takeaways

- PHMSA currently directs a comprehensive hazardous materials grants program to increase safety and efficiency when responding to transportation incidents involving hazardous materials, like LNG.
- PHMSA collaborated with USCG, USFA, and FRA to host a town-hall meeting with emergency responders to learn about responder concerns of LNG transportation by rail.
- There is no heightened concern in the response community regarding LNG or LNG transportation by rail.
- Emergency responders with Hazardous Materials Technician training are oriented to the challenges of LNG incident response.
- Experienced response personnel regularly handle materials that have greater potential hazardous results and/or impacts than LNG.
- Additional training may be necessary to prepare emergency responders below the Hazardous Materials Technician level for potential LNG release incidents.
- Future Philadelphia-area town-hall meetings are scheduled to ensure new concerns can be addressed.

PREPARE FOR RISK

Validate Emergency Responder Opinions and Needs

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is engaging the emergency response community to ensure they have the information and tools to safely respond to an LNG-by-rail incident.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- Is PHMSA planning to have focused training for communities where loading/unloading operations are expected? Will this training include personnel with limited hazardous materials response capability?
- How will this differ from training provided to personnel trained to the hazardous materials technician level?
- Is PHMSA planning on remote training opportunities due to delays around COVID19? What about "Just-in-Time" training applications or Job Aids to provide the operational community with guidance during an event?
- What are PHMSA's thoughts in relation to (a) First response activities and advanced intervention of tank cars and (b) First response equipment and specialized equipment?
- Are any funds being provided to support LNG-specific activities similar to those that were provided under the FAST Act for the HHFT issue?
- What is the anticipated timeline for conducting the additional Town Hall meetings? Alternative locations beyond east coast region?
- Is PHMSA still planning to continue and support the Annual HM Roundtable as was discussed following the 2019 Roundtable session?

PREPARE FOR RISK

Develop LNG Educational and Outreach Plan

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is compiling and producing materials to ensure emergency responders have the requisite training and knowledge to protect the public if an LNG incident were to occur.

Key Takeaways

- PHMSA enhances public safety and emergency preparedness through the development and dissemination of training materials, technical assistance, seminars and workshops, and outreach initiatives.
- PHMSA is developing a Reference Sheet for LNG Commodity Preparedness and Incident Management, as well as illustrations and prototype models of the DOT-113 tank car to better educate stakeholders on the packaging design, structure, and safety features.
- The LNG industry, trade associations, government agencies, and emergency responders have existing structures in place to develop education and outreach materials in collaboration with one another.
- PHMSA is facilitating increased coordination between stakeholders to improve education outcomes and ensure that emergency responders receive the necessary LNG response training.
- PHMSA will publish any relevant outreach and education materials, including links to external materials, to its LNG - dedicated webpage.

PREPARE FOR RISK

Develop LNG Educational and Outreach Plan

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LNG BY RAIL TASK FORCE

PHMSA is compiling and producing materials to ensure emergency responders have the requisite training and knowledge to protect the public if an LNG incident were to occur.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- There are several agencies and institutions focused on the training of First Responders for LNG Emergencies. Is there training oriented to emergency response during rail transportation of LNG other than fire combat operations? Are those levels of intervention already identified, such as training at community colleges or 'just in time' or Job Aid training?
- What's the plan for a comprehensive training program specific to LNG?

KNOW THE RISK

Empirical Review of International LNG Rail Transport

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is engaging shippers in countries where LNG has been transported safely to gain lessons learned and best practices that can be adopted domestically.

Key Takeaways

- Japan, Germany, Spain, and Portugal successfully transport LNG by rail in cryogenic tank cars and ISO portable tanks.
- Other European countries including UK, France, and Poland authorize transporting LNG by rail, but lack market demand.
- Canada authorizes a tank car equivalent to the DOT -113 for transporting LNG by rail, but LNG has not been transported by rail in Canada for economic reasons.
- Railroad operators around the world use LNG/diesel "dual fuel" locomotives as efficient alternatives to diesel locomotives.
- PHMSA met with the Japan Freight Railway Company (JR Freight) and Japan Oil Transportation (JOT) in February 2020 to discuss best practices that have enabled Japan to transport LNG by rail for two decades without accident.

KNOW THE RISK

Empirical Review of International LNG Rail Transport

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is engaging shippers in countries where LNG has been transported safely to gain lessons learned and best practices that can be adopted domestically.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- With regards to practices for track inspection and maintenance, how do the US and Japan differ? For instance, because North American passenger trains share freight track, and elsewhere freight trains share passenger track, one would suspect that these operating differences have a bearing on the safe transport of LNG.
- How does the Task Force account for differences in technical standards and safety culture?
- What are the statistics for incidents in other countries relevant to domestic LNG transport? For example, what are the
- statistics for rail transportation accidents in other countries with other cryogens, such as propane or ethylene?
- How does the DOT -113 railcar compare to those used in Japan and other countries for transport of LNG? Do any of them make changes to portable tanks or railcars for use with LNG?
- Literature reviews of LNG transport by rail cannot provide sufficient depth of understanding of all aspects of practice in other countries, so are direct personal engagement and site visits with key stakeholders in other countries being undertaken?

PREDICT THE RISK

Train Energy & Dynamics Simulator (TEDS)

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA and FRA are simulating train operations on routes designated for the transportation of LNG by rail in U.S. DOT Special Permit 20534.

Key Takeaways

- TEDS software simulates train operations and performance over a specified route. Results enhance safety evaluations and accident investigations by producing data about operating speeds, coupler and drawbar forces, and L/V ratios.
- FRA is simulating DOT-113 unit train operations on two routes between Wyalusing, PA and Gibbstown, NJ through Philadelphia, PA.
- The simulations assume a 100-car train configuration with one buffer car; three 4,400-horsepower locomotives; and a total train length of approximately 8,500 feet (1.6 miles) with a trailing tonnage of 13,300 tons.
- The simulation of route one has been completed and route two is in-progress.
- Route 1 results and analysis show that coupler forces and L/V values are reasonable and within industry safety norms.

PREDICT THE RISK

Train Energy & Dynamics Simulator (TEDS)

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA and FRA are simulating train operations on routes designated for the transportation of LNG by rail in U.S. DOT Special Permit 20534.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- Is the sole purpose of this study to the operation of a unit train of 100 DOT113's over the routes between Wyalusing PA and Gibbstown NJ to determine if there are any excessive in-train forces? If not, additional analysis on different railroads and routes need to be conducted including various power configurations, e.g., 1 X 0 X 1, 2 X 0 X 0, 2 X 0 X 1, 2 X 0 X 2. (Need to coordinate with the other railroads as to how they would configure power on their various routes.)
- Does the dynamic simulator consider the effects of partially filled tanks?
- Are there plans to investigate effects of the combined action of sloshing forces with other forces due to deteriorating conditions during emergency breaking?
- Are there plans to simulate different scenarios of track condition, car condition and train configurations (combination of empty/full/partially full cars)?

REDUCE THE RISK

Re-evaluate Costs and Benefits of ECP Brakes

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is evaluating the cost and benefits of requiring ECP brakes for LNG-by-rail transportation.

Key Takeaways

- PHMSA examined the costs and benefits associated with requiring ECP brakes on tank cars transporting LNG.
- The evaluation assumed equipment costs were zero to reflect the minimal cost of including ECP brakes on new tank car builds.
- The evaluation used brake effectiveness rates from the Transportation Research Board's review of ECP brakes.
- A breakeven analysis only considering training costs showed that the costs far exceeded all benefits and cost savings.
- Benefits were primarily business benefits.
- Including ECP Brake mounts on new tank car builds could yield long -term benefits by allowing the tank car fleet to switch when economic viability to do so exists.

REDUCE THE RISK

Re-evaluate Costs and Benefits of ECP Brakes

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is evaluating the cost and benefits of requiring ECP brakes for LNG-by-rail transportation.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- What is the cost breakdown of implementing ECP brakes?
- What are the assumptions regarding long-term cost savings?

REDUCE THE RISK

Automatic Track Inspection of LNG Routes

FRA / PHMSA

LNG BY RAIL TASK FORCE

FRA is using track geometry vehicles to survey routes designated for transportation of LNG by rail in U.S. DOT Special Permit 20534.

Key Takeaways

- FRA's ATIP geometry measuring vehicles have been used for over 40 years to inspect large quantities of track without risk of human error or bias.
- In 2019, FRA's fleet of 8 geometry measuring vehicles conducted operational surveys over more than 125,000 miles of the U.S. rail transportation network.
- Railroads have begun implementing a geometry car system to help locate and correct exceptions and as a quality assurance check on their track inspection and maintenance programs.
- With the increase in ATIP surveys and geometry measuring vehicles, FRA anticipates the number of cited track defects will decrease nationwide.
- FRA deployed ATIP vehicles to survey the designated routes from Wyalusing, PA to Gibbstown, NJ to ensure track quality, maintenance, and safety.
- Geometry car inspections are snapshots in time, so FRA will compare the March 2020 data with testing that has occurred over these two routes during the past 10 years.
- Comparative analysis to note any trends in track safety is underway.

REDUCE THE RISK

Automatic Track Inspection of LNG Routes

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LNG BY RAIL TASK FORCE

FRA is using track geometry vehicles to survey routes designated for transportation of LNG by rail in U.S. DOT Special Permit 20534.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- Is it feasible to integrate FRA -collected data with data collected by freight railroads?
- Although each of the monitored track parameters may remain less than acceptable tolerances and limits, the interaction of these parameters may lead to conditions that reach or exceed critical values (sum of parts). Please comment on any plans to address this in this study and the related methods of handling, storing and use of “large data sets” for better understanding of the mechanics and physics of the geometry defects. In the response, please comment on the development of appropriate machine learning techniques to obtain more in-depth information from the collected data and methods of protecting the collected data from external hackers/cyber protection of the data.

PREDICT THE RISK

Modal Conversion between LNG by Truck and Rail

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is performing geospatial analysis to compare the risk profile of LNG transportation by truck with the risk profile of LNG transportation by rail tank car.

Key Takeaways

- PHMSA used ArcGIS geospatial tools to compare LNG transportation by rail with LNG transportation by truck between Wyalusing, PA, and Gibbstown, NJ.
- The analysis assumed comparable endpoints and three truckloads for every tank car.
- Geospatial representations of rail routes were produced by overlaying route information from TEDS on the North American Rail Network.
- The Freight Analysis Framework was used to produce highway routes.
- Each mode has a unique exposure profile.
- Rail lines between LNG facilities tend to travel through rural areas and directly through cities.
- Truck routes between LNG facilities tend to travel through more moderately populated areas but avoid densely populated urban areas.
- Truck transportation produces more fatalities and injuries per ton -mile than rail transportation.

PREDICT THE RISK

Modal Conversion between LNG by Truck and Rail

FRA / PHMSA

LNG BY RAIL TASK FORCE

PHMSA is performing geospatial analysis to compare the risk profile of LNG transportation by truck with the risk profile of LNG transportation by rail tank car.

TRB LNG Committee Questions for PHMSA and FRA Regarding this task:

- Provide results of analyses completed on the respective truck and rail routings.
- Provide assessment of loading/unloading comparative risks, and assumptions regarding railcar loading – one car or multiple car loading?
- Provide information on how security issues were addressed beyond the proxy of population exposure.