I would like to comment on the proposal to approve the transport of liquefied natural gas (LNG) by rail across the US rail system. There are a number of topics of concern I wish to raise.

It is my understanding that LNG will be shipped by rail most likely first in manifest train "blocks" of 20 or more rail cars and eventually, as the crude oil industry adopted, by unit trains, one hundred or more rail cars at a time. The mere fact that a hazardous materials product that is odorless, colorless, and extremely flammable will be transported by rail through, in my community, residential neighborhoods is not only concerning, it is also alarming. As a Fire Chief, such potential for a catastrophic incident is my worst case scenario. If a unit train of LNG has a derailment, and a leak, and eventually a fire, the potential is very high for responding fire and police, as well as civilian **fatalities**.

Secondarily, the potential for widespread fire damage and property loss as a result of a fire in one or more LNG tank cars is of great concern. If a LNG unit train derails, we know that more than one rail car will most likely derail and stack up on each other, setting each other off in what experts call "cascading effects." Notwithstanding, if one or more tank cars are leaking, it is highly unlikely, if not impossible, to identify which rail car(s) are leaking. The fire service will not even be able to approach such an event. Only defensive operations (evacuation efforts) are possible.

In the meantime, the release of colorless, odorless natural gas can move great distances while seeking an ignition source. Once an ignition source is found, perhaps as little as a spark, then the ensuing natural gas fire poses major problems due to the intensity of the fire/heat as well as the greater risk of flame impingement on subsequent derailed LNG tank cars. Or, as the DOT Notice of Proposed Rule Making concedes, the downwind LNG vapor cloud can become "confined" in a ditch or at a wall and spontaneously explode. The proposed regulation documents give no guidance for how far such LNG vapor clouds might penetrate our communities.

On the topic of training for handling a leak or fire involving LNG, I am not aware of a single fire department that is trained or equipped to respond to, and mitigate, a derailment involving LNG, let alone a unit train of LNG. For anyone to assert that adequate training and/or equipment is in place to handle such an incident is totally misleading. As we sit here today, training for responding to and mitigating an LNG rail incident is totally lacking. Given the deadly mix in an LNG release of extreme cold, fire and explosion risks, creating adequate training modules will be an enormous challenge.

For more than twenty years, I was an instructor for various hazardous materials topics. For many years, I was a statewide coordinator for liquefied petroleum gas (LPG) firefighter training. As such, I am very familiar with properties of LPG. There are some similarities and stark differences between LNG and LPG. Both LNG and LPG are classified as flammable gases, with LPG stored and shipped as liquid under pressure. LNG on the other hand is liquefied not by pressure but by refrigeration down to -260 degrees F, which means any release from a breached tank car will boil violently into a vapor. Vapor density identifies the weight of a gas compared to the weight of air.

LPG has a vapor density of 1.6, meaning it is 1.6 times heavier than air. LNG has a vapor density of 1.8, meaning it's 1.8 times heavier than air, and will seek low lying areas outside of its container. Low lying areas would include terrain and potentially basements where ignition sources (i.e. gas furnaces, gas water heaters, fireplaces) are found. This contributes greatly to the risk of a gas release becoming a gas fire. Boiling point is the temperature at which a product releases vapors, which is actually what burns. The boiling point of LPG is -44 degrees F. A release of LPG at or above -44 degrees F will immediately change from a liquid to a gas outside of its container. The boiling point of LNG is -259 degrees F, which means that any product release from its container will instantly convert to gas.

On a scale of 0% to 100%, the flammable range identifies the ratio of product vapor mixture to air. The flammable range varies for a given product. The lower flammable limit (LFL) is the minimum percentage of product vapors mixed with air that will cause a fire if an ignition source is provided (i.e. flame, spark, or heated metal). The upper flammable limit (UFL) is the maximum percentage of product vapors mixed with air that will cause a fire if an ignition source is provided (i.e. flame, spark, or heated metal). The difference between the LFL and UFL is called the flammable range. Each product has its own unique flammable range. If the product vapor/air mixture is below its LFL, and an ignition source (i.e. flame, spark, or heated metal) is located, the product will not burn as the product vapor/air mixture is too lean to burn. If the product vapor/air mixture is above its UFL, and an ignition source (i.e. flame, spark, or heated metal) is located, the product will not burn as the product vapor/air mixture is too rich to burn. The hazard resides within the flammable range for a given product. The flammable range for LPG is 2.2% - 9.6%. The flammable range for a cold dense LNG vapor cloud is 5%-15%. The flammable range is 35% greater for LNG than LPG, which translates to greater risk of fire if LNG is released as a result of a derailment. LNG will readily ignite (burn) within that range, but will not explode unless “confined” by some “obstacle” that holds up the cloud in the terrain (many of which exist in any town or neighborhood). The ignition temperature is the minimum temperature at which a product exposed to hot metal will ignite without the need of a spark or flame. The ignition temperature of LPG is 1,000 degrees F. The ignition temperature for LNG is 999 degrees F. Both LNG and LPG pose the same risk when it comes to ignition temperature. LPG burns at 1,967 degrees F. LNG burns at 2,426 degrees F.

A fire involving LNG will burn 23% hotter than a fire involving LPG. The potential for fatalities and serious burn injuries, as well as subsequent property damage/loss is 23% greater at an LNG fire incident as opposed to an LPG fire incident. Both LNG and LPG are flammable gases, BUT take on liquid characteristics as long as they are within the confines of their respective container (e.g., a tank car). They are stored and shipped in this state. In the event of a tank car being punctured as a result of being struck by a vehicle or another train car, or a derailment, the LNG or LPG would be released and would revert to its gas state.

Once outside of its container, one gallon of LPG will convert to 270 gallons of gas vapors. Once outside of its container, one gallon of LNG will convert to 625 gallons of vapor. As a result, a release of LNG will create 2.3 times the volume of gas vapors compared to the same release of LPG gas vapors. For the fire service, this equates with 2.3 times the volume of product release, 2.3 times the volume of vapors to contend with, 2.3 times the volume of vapors seeking an ignition source, and 2.3 times the magnitude of fire should those vapors find an ignition source. The properties addressed herein further elevate the level of concern for transportation of LNG across rail lines. These concerns increase exponentially when one takes into account the fact that a derailment incident involving a unit train of LNG will most likely not involve an isolated rail car, but as we have by analogy seen with historical spate of derailments of the crude oil trains, more likely multiple LNG rail cars. The potential for a major loss of life incident is staggering and the implications should be seriously considered.

The Village of Barrington is located in the northwest Chicago suburbs. Locally, we have two Class 1 rail lines that come through Barrington. Both Union Pacific (UP) and Canadian national (CN) run freight trains through the community every day. Both rail lines go through residential neighborhoods, in many cases less than fifty feet from residences and business. Many schools are located short distances from these two rail lines. The Department of Transportation Emergency Response Guide (ERG) utilizes the same response guide for LNG and LPG (guide # 115). The ERG is meant to be a reference for **initial** actions, which means it is only a starting point for action steps. The ERG evacuation guidelines for a large LPG fire indicates an evacuation radius of one mile. Given the LNG properties identified above, I venture to say that an evacuation radius of one mile for a large LNG fire is inadequate. Is a two mile evacuation radius needed? That's what the Incident Commander ordered in the 2014 Plymouth, WA LNG facility fire/explosion catastrophe in a sparsely populated area. Is a two mile evacuation radius sufficient? The practicality of evacuating a two mile or greater radius, especially in residential and school areas, under emergency conditions where time is of the essence, is a monumental if not impossible task.

Before this proposal is approved, much more US DOT AGENCY due diligence needs to be devoted to the many implications associated with LNG unit trains utilizing existing rail lines. Fire departments are not trained or equipped to control, extinguish or mitigate a fire involving one or more LNG tank cars. It is not realistic to think that existing fire department resources, including response of mutual aid fire departments, can intervene and mitigate a fire caused by LNG tank cars in a timely manner.

I would be more than happy to expand upon my comments or answer any questions in the future.

Respectfully,

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