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**DEPARTMENT OF TRANSPORTATION**

**Pipeline and Hazardous Materials Safety Administration**

**49 CFR Parts 171, 172, 173, 174, 177, 178, 179 and 180  
[Docket No. PHMSA-2016-0077 (HM-251D)]**

**RIN 2137-AF24**

**Hazardous Materials: Vapor Pressure of Unrefined Petroleum Products and Class 3  
Materials**

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

**ACTION:** Advance notice of proposed rulemaking (ANPRM); withdrawal.

**SUMMARY:** PHMSA is withdrawing the January 18, 2017, ANPRM concerning vapor pressure for crude oil transported by rail. PHMSA's decision is based on comments received to the ANPRM, as well as an extensive study conducted by the Sandia National Laboratories which found that the vapor pressure of crude oil is not a significant factor in the severity of pool fire or fireball scenarios, and concluded that results of the study do not support creating a regulatory distinction for crude oils based on vapor pressure. In withdrawing the ANPRM, PHMSA is providing notice of its determination that the establishment of vapor pressure limits would not improve the safety of rail transportation of crude oil. Therefore, PHMSA is no longer considering vapor pressure limits for the transportation of crude oil by rail or any other mode. Furthermore, PHMSA is also providing notice that, after considering comments received to the ANPRM, it is no longer considering imposing vapor pressure standards for other unrefined petroleum-based products and Class 3 flammable liquid hazardous

materials by any mode.

**DATES:** As of [INSERT DATE OF FEDERAL REGISTER PUBLICATION], the ANPRM published on January 18, 2017 (82 FR 5499), is withdrawn.

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**SUPPLEMENTARY INFORMATION:**

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## **I. Background**

### **A. PHMSA Regulation of High-Hazard Flammable Trains**

On May 8, 2015, PHMSA published a final rule titled “Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains” [HM-251; 80 FR 26643]. The final rule addressed safety concerns that arose following high-profile rail incidents involving crude oil produced in the Bakken region of the United States.<sup>1</sup> The HM-251 rulemaking targeted the hazards associated with the shipment of flammable liquids by rail by establishing enhanced standards for the tank cars used to transport Class 3 flammable liquids, operational controls in the form of reduced operating speeds and enhanced braking requirements, rail routing risk assessment and notification, and requirements for more accurate classification of unrefined petroleum-based products. In the HM-251 notice of proposed rulemaking (NPRM) [79 FR 45015], that preceded the May 8, 2015 final rule, PHMSA sought comments from the public on the appropriate role of vapor pressure in classifying flammable liquids and selecting packagings, including the threshold question regarding whether vapor pressure limits should be established. After reviewing the comments to the NPRM, PHMSA determined that additional research was necessary, and accordingly, PHMSA decided not to establish new vapor pressure requirements in the final rule. However, PHMSA expressed its intent to consider the issues raised by the commenters in

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<sup>1</sup> The Bakken shale formation, a subsurface formation within the Williston Basin (spanning eastern Montana, western North Dakota, South Dakota, and southern Saskatchewan), is one of the top oil-producing regions in the country and in the world. The Bakken shale formation’s low permeability (i.e., it is a “tight” formation) requires hydraulic fracturing to produce oil (so-called “tight oil”) at commercial rates.

a future regulatory action depending upon the outcome of extensive research efforts being undertaken by the Department.

B. North Dakota Order

In December 2014, as PHMSA was in the process of developing the HM-251 final rule, the North Dakota Industrial Commission (NDIC) issued Oil Conditioning Order No. 25417 (NDIC Order), which requires operators in the State of North Dakota to separate the gaseous and light hydrocarbons from all Bakken crude oil produced in North Dakota. The NDIC Order requires the use of a gas-liquid separator and/or an emulsion heater-treater capable of separating the gaseous and liquid hydrocarbons; prohibits blending of Bakken crude oil with specific materials; and requires crude oil produced to have a vapor pressure (determined using ASTM D6377<sup>2</sup>) no greater than 13.7 pounds per square inch (psi), or 1 psi less than the vapor pressure of stabilized crude oil as defined in the latest version of ANSI/API RP3000.

C. New York Petition

On December 1, 2015, the New York State Office of the Attorney General (NYSOAG) submitted a petition for rulemaking (P-1669) requesting PHMSA establish a vapor pressure standard for crude oil shipped by rail [PHMSA-2015-0253-0001 (Dec. 3, 2015)]. Although PHMSA codified several additional safety requirements in the HM-251 final rule, the NYSOAG petition asserted that the measures implemented by the final rule were insufficient to reduce significantly the risk of high impact fires or explosions because they did not specifically address vapor pressure limits. The NYSOAG petition requested that PHMSA revise § 174.310 to establish a Reid Vapor Pressure (RVP) limit

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<sup>2</sup> ASTM D6377 refers to “ASTM D6377 – Standard Test Method for Determination of Vapor Pressure of Crude Oil: VPCR<sub>x</sub> (Expansion Method).”

that is less than 9.0 psi for crude oil transported by rail. The NYSOAG petition asserted that limiting the product's vapor pressure would reduce the risk of death or damage from fire or explosion in the event of an accident. While the NYSOAG petition did not provide any specific cost data, the petitioner cited increasing numbers of shipments of Bakken crude oil by rail, past train explosions involving shipments of Bakken crude oil, Bakken crude oil volatility and flammability, and the presence of existing technology to reduce the volatility of crude oil as justification for the requested revisions to the Hazardous Material Regulations (HMR; Parts 171-180).

D. Advance Notice of Proposed Rulemaking

On January 18, 2017, PHMSA published an ANPRM [HM-251D; 82 FR 5499] in response to the NYSOAG petition. The ANPRM solicited public comments on the merits of the petition based on the perceived safety benefits of establishing vapor pressure limits for unrefined petroleum-based products and potentially all Class 3 flammable liquid hazardous materials. PHMSA posed 39 questions requesting specific information regarding the options for, as well as the benefits of, limiting vapor pressure in transportation. PHMSA sought public comment to obtain the views of entities impacted by the NDIC Order, as well as those who were likely to be impacted by the changes requested in the NYSOAG petition, including those likely to benefit from, be adversely affected by, or potentially be subject to additional regulation.

i. Overview of ANPRM Comments

In response to the HM-251D ANPRM, PHMSA received comments from approximately 80 individuals and organizations. The following table categorizes the comments received according to commenters' background.

<b>Commenters to the ANPRM</b>		
<b>Commenters' Background</b>	<b>number of comments</b>	<b>Description and examples of category</b>
<b>Non-Government Organizations</b>	10	Environmental groups (2), Advocacy/lobby groups (5), and other non-governmental organizations (3).
<b>Governments</b>	6	Local (2), State (4)
<b>Individuals</b>	54	
<b>Carrier Industry Stakeholders</b>	4	Carrier related trade associations
<b>Shipper Industry Stakeholders</b>	9	Shippers and petroleum related trade associations

PHMSA asked specific questions regarding the general benefits, limitations, and impacts of establishing a maximum vapor pressure for crude oil or flammable liquids; the safety implications at play when considering the proposed vapor pressure standard; the merit and methods of measuring vapor pressure for transportation purposes; and general packaging questions. While the NYSOAG petition specifically requested that PHMSA set a vapor pressure standard for crude oil by rail, PHMSA solicited comment in the ANPRM about whether the scope of the safety standard should be broadened to include other Class 3 flammable liquids by different modes of transportation, such as highway. The ANPRM also asked whether risk factors other than vapor pressure should be considered in PHMSA's effort to increase the safety of transporting flammable liquids.

Most comments fit within one of three categories: (1) generalized support for a maximum vapor pressure limit with expressed concerns about the associated risks of transporting unrefined petroleum-based products in highly populated areas and sensitive environments; (2) not supportive of maximum vapor pressure limits citing to a lack of evidence demonstrating that limiting vapor pressure would reduce risks associated with the transport of unrefined petroleum-based products or other Class 3 materials and

suggesting that PHMSA should wait until the completion of a study on crude oil characteristics recently undertaken by Sandia National Laboratories (Sandia) before undertaking any rulemaking; or (3) not supportive of vapor pressure requirements being applied to shipments by highway.

ii. Comments in Support of the Vapor Pressure Standard

Approximately 60 commenters generally supported setting additional safety standards for the transportation of crude oil that would be based on specific measurable metrics, such as vapor pressure. Most commenters who expressed their support for the proposed RVP standard stated that a lower vapor pressure would minimize the severity of fires in the event of a train crash or derailment. Several commenters asserted that there is ample evidence demonstrating that a higher RVP corresponds to more detrimental explosions. However, the comments in support of this claim were ultimately anecdotal, providing little to no data to substantiate any such correlation. Most of the comments supporting the implementation of a vapor pressure standard were submitted by members of the public who were concerned about the effects that an accident in their community would have on the surrounding environment and personal property.

Most of the commenters in favor of vapor pressure limits expressed support for a vapor pressure limitation for crude oil by rail specifically. Many of these commenters referenced the conditioning requirements in the NDIC Order as evidence of the feasibility and necessity of implementing an RVP standard and encouraged PHMSA to follow suit. While many supporters of a vapor pressure standard were in favor of the standard proposed in the NYSOAG petition, some suggested that the standard should be as low as 4.0 psi. These commenters alluded to certain practices and requirements currently in

place in the oil production industry that require reducing the volatility of crude, such as pipeline operational standards and degasification requirements in place in Texas. One such commenter recommended setting a standard between 4-8 psi.

Similarly, commenters from David & Associates and the Natural Resources Defense Council (NRDC) pointed to certain national and State vapor pressure limitations that are in place for gasoline as evidence of the merit and feasibility of nationwide vapor pressure restrictions—stating that the restrictions would reduce the consequences of a potential incident by reducing the release of evolved gases from the transported product. However, David & Associates conceded that those restrictions were implemented with the intent of minimizing the pollution associated with volatile organic emissions rather than with the intention of mitigating safety risks during transportation. NRDC further urged PHMSA to set an interim standard until all necessary data is collected, rather than setting a permanent standard without sufficient evidence.

A small number of commenters stated that if a vapor pressure standard is implemented, it should not apply to transportation by highway. One commenter from the Scenic Hudson Group noted that the safety hazards by rail outlined in the NYSOAG petition are also concerns for shipments carried out on waterways, such as the Hudson River. One member of the public was in favor of setting the vapor pressure limit for all modes of transportation.

A commenter from the Department of Environmental Conservation of New York was in support of additional safety measures other than a vapor pressure limit for shipments of crude oil and suggested that direct limits on C1-C4 hydrocarbons would be more effective than restricting vapor pressure.

A comment jointly submitted by the Attorneys General of New York, California, Illinois, Maine, Maryland, and Washington (State AGs) supported a nationwide limit on the vapor pressure of crude oil transported by rail in the United States, noting that PHMSA is not required to determine that vapor pressure is the “best metric” to use in decreasing fire and explosion risks before developing a vapor pressure regulation.

### iii. Comments Opposed to Vapor Pressure Standards

Twenty-one commenters strongly opposed the proposed vapor pressure limitations on either crude oil or other Class 3 flammable liquids by highway or rail. Some commenters completely rejected the use of vapor pressure as a basis for classification, while others suggested that PHMSA wait until the completion of the Sandia Study after which data regarding the volatility of crude oil would be available. Several commenters noted the lack of empirical data to support the claims in the petition. PHMSA further categorized the comments received under the following topic areas.

#### *Vapor Pressure*

Several commenters rejected the premise of the NYSOAG petition and the concept that the volatility of crude oil is the primary cause of large explosions and uncontrollable fires in train accidents. In their comments, American Fuel & Petrochemical Manufacturers (AFPM), American Petroleum Institute (API), and NDIC similarly assert that vapor pressure is not the primary cause of ignition in crude oil by rail accidents. Instead, these commenters attributed the fires associated with the rail incidents cited in petition P-1669 to the presence of a flammable substance and source of ignition during the accidents. Commenters—such as the International Liquid Terminals Association (ILTA) and API—echoed that reducing the volatility of crude oil prior to

shipment would not decrease the expected degree, consequence, or magnitude of a release or the likelihood of a fire during an accident since the magnitude of a combustion event correlates to the flammability, rather than the vapor pressure, of the hazardous liquid released. To further the point, AFPM noted that there are several Class 3 flammable liquids that have low vapor pressures that present similar ignition risks to Bakken or Permian Basin crude oil and other unrefined petroleum-based products. API also expressed its belief that focusing on vapor pressure to mitigate or reduce severity would not achieve the desired results and, that if implemented, the rule would not significantly reduce the primary hazard of crude oil, since it would still be a flammable liquid regardless of the vapor pressure. API further stated that the more volatile compounds would have to be removed from crude oil and transported in pressurized tank cars or pipelines as a separate stream of flammable liquids or gases if a vapor pressure limit is set below current levels.

Several commenters cited the petition's lack of evidence or other scientific basis for its claim that reducing vapor pressure will improve safety. ILTA stated that there was no basis for the assertion that limiting the vapor pressure of crude oil prior to shipment would decrease the expected degree, consequence, or magnitude of a release or the likelihood of a fire during an accident. Similarly, the North Dakota Petroleum Council (NDPC) noted that there are currently no peer reviewed scientific studies supporting the belief that an appropriate level for vapor pressure is already known. API further recommended investing in and improving the methods for transporting crude safely, rather than imposing new unilateral RVP limits that are not based on any scientific evidence.

Other commenters stated that applying a vapor pressure limit to all modes would materially alter the products being transported and could have many unintentional consequences that could potentially disrupt the oil and natural gas supply chain, which would require both the industry and PHMSA to reevaluate the current system to determine whether the packaging specifications were still appropriate for a materially altered product.

*All Class 3 Flammable Liquids*

Certain commenters specifically opposed the proposal to extend vapor pressure limits to all Class 3 flammable liquids. Dow Chemical stated that establishing a vapor pressure limit to encompass all flammable liquids by any mode of transportation would not improve the safe transportation of chemical products. Their comment reiterated the point made by several other commenters that the HMR already address the risk of flammability based on the material's flashpoint and boiling point. Currently the HMR designate a liquid as "flammable" if it has a flash point of not more than 60 °C, regardless of vapor pressure.

API cautioned that imposing a vapor pressure limit for all Class 3 flammable liquids has potential to change fundamentally how all these products are classified and packaged. The American Coatings Associations (ACA) and Railway Supply Institute (RSI) added that crude oil presents unique risks because of its variable chemical properties that do not extend to [are not exhibited with] other Class 3 flammable liquids, such as manufactured goods which undergo strict quality assurance processes to ensure properties and characteristics are within defined parameters.

The Council on Safe Transportation of Hazardous Articles (COSTHA) opposed applying a vapor pressure standard to other Class 3 materials based on investigation and studies regarding crude oil. The ILTA and COSTHA noted that extending this classification criterion to other flammable liquids would have a significant impact on fuels, raw chemical products, consumer products, and even health services. RSI further added that without sound scientific information and data, an expansion of vapor pressure limits to all Class 3 flammable liquids would be an arbitrary change that would impose additional costs. ILTA added that limiting the vapor pressure of Class 3 flammable liquids would also cause conflicts between regulatory agencies and industry. For example, the Environmental Protection Agency (EPA) regulates fuel properties to ensure proper emissions performance, and ASTM International (ASTM) maintains standards for vehicle fuel that include specified limits on the RVP of gasoline, which exceed 9 psi. ILTA and RSI similarly warned that setting a limit conflicts with the vapor pressure limits mandated by one of these other entities would cause numerous commercial and regulatory burdens.

*Not by Highway*

While the NYSOAG petition requested a vapor pressure limit for shipments made by rail, PHMSA asked in the ANPRM whether the proposed limit should also apply to transportation by highway. Three of the four commenters that responded to this specific question were opposed to a vapor pressure limit by highway.

National Tank Truck Carriers (NTTC) stated that while trucks are the main method for transporting refined petrochemicals from the fuel rack to gas stations, refined fuel risks are inherently different than those associated with transporting crude oil.

PHMSA already considered the risks inherent in transporting refined fuels in its combustible fuel rulemaking and found them to be effectively managed under the current HMR. Accordingly, NTTC recommended Federal Motor Carrier Safety Administration (FMCSA) involvement as the agency tasked with regulating all highway transportation of goods in interstate commerce.

NDPC stated that imposing a vapor pressure reduction requirement on highway transportation will force oil and gas producers to conduct unnecessary and extremely burdensome additional sampling at the well site to ensure compliance with the new standard. NDPC expressed that imposing vapor pressure limitations by highway may make oil leases unprofitable.

NDIC further opposed a vapor pressure limit by highway because there have not been any crude oil truck transport Boiling Liquid Expanding Vapor Explosion (BLEVE) events in North Dakota.

#### *Regulatory Authority*

Several commenters in opposition to the proposed vapor pressure standard specifically stated that PHMSA did not have the authority to proceed with setting a vapor pressure limitation due to restrictions from recent executive orders and the Fixing America's Surface Transportation (FAST) Act (FAST Act; Pub. L. 114-94). Similarly, two commenters stated that granting the NYISOAG's petition would conflict with PHMSA's obligation to harmonize the HMR with international regulations.

Signed on January 30, 2017, Executive Order 13771, "Reducing Regulation and Controlling Regulatory Costs," directs agencies to repeal two regulations for every new regulation they issue. Commenters such as API stated that given the financial burden that

this rule would impose, it would be imprudent to move forward with a vapor pressure standard as it would severely limit PHMSA's ability to implement any other regulatory actions. In addition, on March 28, 2017, Executive Order 13783, "Promoting Energy Independence and Economic Growth," obligated PHMSA to identify and revise any regulatory actions that potentially burden domestic energy production. Citing the implementation costs that would be associated with the proposed vapor pressure limits, several commenters alluded to the restrictions imposed on PHMSA by Executive Orders 13771 and 13783. In its comment, NDPC noted that any new regulation that requires "stabilization" or sets a vapor pressure threshold for crude oil prior to transportation would impose substantial cost impacts on the oil and gas production and transportation industries. According to AFPM, accepting the petition would force offerors and carriers to treat crude oil or other flammable liquids as Division 2.1 flammable gases, or incur unreasonable pretreatment costs.

According to comments from AFPM, API, and NDPC, the foreseen economic burden would be due not only to the costs of the additional operational infrastructure and equipment that would be required to meet new vapor pressure limits, but also to economic losses caused by resulting conflicts with international standards. Similarly, NDPC further noted that crude oil is more valuable when it is allowed to be sold with all of its constituent hydrocarbons and that crude oils with greater concentrations of light ends can be more valuable because each of the constituents can be refined and sold at the most economically efficient location in the supply chain. NDPC explained that separating the oil prematurely into its individual hydrocarbon constituents earlier in the supply chain to comply with a regulatory vapor pressure standard can reduce the overall

value of a given barrel of oil as produced at the wellhead and removing light ends prior to transportation reduces the volume of crude oil that producers are ultimately able to sell to refiners and others in the marketplace.

Several commenters—including Independent Petroleum Association of America (IPAA) and the American Exploration and Production Council (AXPC)—urged PHMSA to reconsider the ANPRM and suggested that setting a vapor pressure standard prior to the completion of the Sandia Study would be premature and incongruous with congressional mandates outlined in the FAST Act. AFPM noted that the FAST Act reflects Congress’s judgment that the completion of the Sandia Study should be a condition precedent to any further regulation of the transportation of crude oil. NDIC, NDPC, AFPM, and several other commenters stated that PHMSA should delay any decision regarding a vapor pressure standard for crude oil until the results of the Sandia Study studies are available. To this point, AFPM added that Task 4 (of the Sandia Study) was specifically intended to examine whether tight oils might have an elevated risk of ignition in the event of a rail accident as compared to other crude oils.

Two others commented that implementing a vapor pressure standard would undermine international harmonization efforts and impact trans-border shipments. API stated that, per international agreement, PHMSA is obligated to ensure harmonization with the United Nations (UN) Recommendations on the Transport of Dangerous Goods Model Regulations, which are designed to enhance global trade, economic development, improve safety and compliance-enforcement capability while simplifying training requirements for multi-modal cross regional transport of dangerous goods. API noted that unilateral or arbitrary changes to the HMR domestically that do not align with UN

Model Regulations requirements would severely impact trans-border shipments and create significant regulatory uncertainty for shippers and carriers.

*HMR is Sufficient Based on Known Risks*

Several commenters stated that the existing regulatory framework of the HMR, which includes the system of hazard classification and packaging requirements, adequately addresses the risks associated with the transportation of hazardous materials. A commenter from Dow Chemical stated that the HMR provides a comprehensive framework to address the risks associated with the transportation of flammable liquids that includes defined criteria for the classification of flammable liquids and specification of appropriate packaging requirements. The commenter further stated that as defined in the HMR, a flammable liquid has a flash point of not more than 60 °C, regardless of vapor pressure. As such, a flammable liquid can ignite and burn regardless of vapor pressure.

In addition to the HMR's basic framework, several commenters opposed the establishment of a vapor pressure limit in consideration of the already completed HM-251 rulemaking. The HM-251 rulemaking adopted the DOT-117 tank car specification and other safety provisions that were found to be protective of human health and the environment, further strengthening the protections provided by the HMR. Commenters such as RSI suggested that given recently adopted measures from the HM-251 final rule, setting additional requirements at this time would be premature and economically burdensome. Specifically, RSI noted that PHMSA does not yet know the full effect of these regulatory efforts, many of which have only been implemented within the last few years or are still in the process of being implemented (i.e., the transition from DOT-111

specification tank cars to DOT-117s and DOT-117Rs). As such, RSI noted it would be premature to implement additional regulations impacting the transportation of crude oil and other flammable liquids by rail prior to full implementation of these regulatory initiatives and before PHMSA can analyze and understand their collective safety impact.

API stated that safety measures like the ones set forth in the HM-251 rulemaking were simply a better option for minimizing safety risks as compared to limiting vapor pressure to minimize safety risks. It further stated that PHMSA should invest in and improve the methods to transport crude oil safely, rather than impose new unilateral RVP limits that may not reduce accidents or casualties and are not based on any scientific evidence. A commenter from AWM Associates noted that the issue appears to be related to shippers failing to properly classify the Bakken crude oil and suggests that PHMSA should increase criminal prosecution of shippers that fail to properly classify their hazardous materials and those who ship the hazardous materials in unauthorized containers.

## **II. Crude Oil Characterization Research Study (Sandia Study)**

In addition to the ANPRM, DOT, the U.S. Department of Energy (DOE), and Transport Canada (TC) have conducted a collaborative research program designed to better understand the risks associated with large volume rail transport of crude oil in general, particularly unconventional (tight) oil. The research was carried out by Sandia, a DOE Federally Funded Research and Development Center. As a Federally Funded Research and Development Center, Sandia draws upon its deep science and engineering experience and serves as an independent, objective advisor to DOE and conducts research to inform the policy debate for decision makers. To carry out the objectives of the Sandia

Study, DOE called upon a multidisciplinary team with world-class experts and state-of-the-art facilities, instrumentation, and diagnostic capabilities to perform complex large-scale combustion testing and analysis.

A. Congressional Mandate

Section 7309 of the FAST Act requires the Secretaries of DOE and DOT to submit a report to Congress on the results of the ongoing Sandia study of crude oil characteristics within 180 days of its completion. Now completed, the results of the Sandia Study are summarized in Section B below.

B. Phases of the Sandia Study

i. Initial Phase

DOT and DOE began their effort by commissioning a review of available crude oil chemical and physical property data and literature. This review focused on crude oil's potential for ignition, combustion, and explosion. A partial list of properties surveyed included density (expressed as API gravity), vapor pressure, initial boiling point, boiling point distribution, flash point, gas-oil ratio, and "light ends" composition (dissolved gases—including nitrogen, carbon dioxide, hydrogen sulfide, methane, ethane, and propane—and butanes and other volatile liquids). Although the review yielded a large database encompassing a wide variety of crude oils and their properties, it also illustrated the difficulty in using available data as the basis for accurately defining and comparing crude oils due to the wide range in variability, specifically variability in the sample point, sampling methods, and analytical methods.

An important outcome of the first phase of this research was formal recognition of the wide-ranging variability in crude oil sample types, sampling methods, and analytical

methods and acknowledgement that these variabilities limit the adequacy of the available crude oil property data set for establishing effective and safe transport guidelines. To address this characterization and classification gap, DOT, DOE, and TC continued their research to improve the understanding of crude oil properties with a particular focus on “tight” crude oil. A Sampling, Analysis, and Experiment (SAE) plan was designed to characterize tight and conventional crude oils based on key chemical and physical properties, and identify properties that may contribute to increased likelihood and/or severity of combustion events that could arise during transport incidents. In addition to analytical procedures, this research program included experiment activity protocols such as: use of acquired chemical and physical property data in the development of computational models for predicting crude oil behavior in rail transport accident scenarios; and execution of experimental activities, including actual pool fires and fireballs, to validate and/or improve predictive models. The Sandia Study, as initially proposed, comprised four separate tasks, with an option to conduct additional Tasks 5 and 6 (proposing full scale combustion studies, and a comprehensive supply chain oil properties survey, respectively) based on the results of Tasks 1 through 4. Below, PHMSA describes Tasks 1 through 3 and the basis for the determination by Study sponsors DOE, DOT, and TC that Tasks 4-6 would no longer be necessary given the definitive results from the completion of the first three tasks, which are more fully described below.

ii. Task 1

Task 1 (Project Administration and Outreach) covered the initial procurement of crude oil samples, testing materials, equipment, and analytical lab contracts. It also

included coordination and outreach with sponsors, Steering Committees, technical associations, and subject matter experts. Task 1 was ongoing throughout the study.

iii. Task 2

Task 2 (Sampling and Testing) investigated which commercially available crude oil sampling and analysis methods can accurately and reproducibly collect and analyze crude oils for vapor pressure and composition, including dissolved gases. Results of Task 2 were published on November 1, 2017 as SAND2017-12482. Revision 1 – Winter Sampling, published on June 1, 2018 as SAND2018-5909, incorporated additional seasonal data and compositional analysis results that had become available since publication of the initial report. Both reports compared performance of commercially available methods to that of a well-established mobile laboratory system that currently serves as the baseline instrument system for the U.S. Strategic Petroleum Reserve Crude Oil Vapor Pressure Program. The experimental matrix evaluated the performance of selected methods for (i) capturing, transporting, and delivering hydrocarbon fluid samples from the field to the analysis laboratory, coupled with (ii) analyzing for properties related to composition and volatility of the oil, including vapor pressure, gas-oil ratio, and dissolved gases and light hydrocarbons. Several combinations of sampling and testing were observed to perform well in both summer and winter sampling environments, though conditions apply that need to be considered carefully for given applications. Methods that performed well from Task 2 were utilized subsequently in Task 3.

iv. Task 3

The purpose of Task 3 (Pool Fire and Fireball Experiments in Support of the US DOE/DOT/TC Crude Oil Characterization Research Study) was to compare combustion

behavior of several crude oil types spanning a measurable range of vapor pressure and light ends content representative of U.S. domestic conventional and tight crude oils.

Results of Task 3 were published on August 24, 2019 as SAND2019-9189.<sup>3</sup>

Task 3 consisted of an experimental observation of physical, chemical, and combustion characteristics of selected North American crude oils:

- The objective of the pool fire experiments was to measure parameters necessary for thermal hazard evaluation (namely, burn rate, surface emissive power, flame height, and heat flux to an engulfed object) by a series of 2-meter diameter indoor and 5-meter diameter outdoor experiments.
- The objective of the fireball experiments was to measure parameters required for thermal hazard evaluation (namely, fireball maximum diameter, height at maximum diameter, duration, and surface emissive power) using 400-gallons of crude oil per test.

Observed results were then extrapolated in calculating thermal hazard distances resulting from full scale 30,000-gallon pool fires and fireballs. The Sandia Study noted that the methodology described above incorporated steady-state assumptions that would tend to overstate calculated hazard distances.

The crude oil samples used for the experiments were obtained from several U.S. locations, including “tight” oils from the Bakken region of North Dakota and Permian region of Texas, and a conventionally produced oil from the U.S. Strategic Petroleum Reserve stockpile. These samples spanned a measurable range of vapor pressure

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<sup>3</sup> Available at <https://www.osti.gov/servlets/purl/1557808>. Task 3 results and conclusions were peer-reviewed by independent fire experts and sampling and characterization subject matter experts. *See id.* at 4. In addition, Task 3 results and conclusions were reviewed by PHMSA, Federal Railroad Administration, DOE, and TC scientists and engineers.

(VPCR<sub>x</sub>(T)) and light ends content representative of U.S. domestic conventional and tight crude oils.

Task 3 demonstrated that, even though the three crude oils studied had a wide range of vapor pressures, each had very similar calculated thermal hazard distances with respect to pool fire and fireball combustion. Furthermore, those crude oils evaluated in Task 3 were also found to have thermal hazard parameters (surface emissive power, etc.) consistent with the known thermal hazard parameters of a variety of other alkane-based hydrocarbon liquids--some with higher vapor pressures than any observed in the Sandia Study. Based on those data points, the Sandia Study concluded that vapor pressure is not a statistically significant factor in affecting the thermal hazard posed by pool fire and fireball events that might occur during crude oil train derailment scenarios. In sum, the Sandia Study demonstrated that lowering the vapor pressure of crude oil would not reduce the severity of pool fire or fireball scenarios, and concluded that results of the study do not support creating a regulatory distinction for crude oils based on vapor pressure.

#### v. Sandia Study Completion

The 2015 version of the SAE Plan for the Sandia Study framed the project in terms of six tasks, the first four of which were authorized by its sponsors. Task 4 was conceived as an opportunity to generate a comprehensive data set of vapor pressures for multiple crude oil types to better understand the thermal hazards for pool fires and fireballs. The value of Task 4, therefore, was premised on the faulty assumption that vapor pressure would be a significant factor determining the magnitude of thermal hazards from pool fire and fireball hazards posed by different crude oil types.

However, the relative independence of thermal hazards from vapor pressure observed in Task 3 eliminated the need for additional data that would have been collected in Task 4. Consequently, Sandia included within the Task 3 conclusions a recommendation against proceeding with Task 4.<sup>4</sup> Subsequently, the Sandia Study sponsors (DOT, DOE, and TC) agreed neither to proceed with Task 4 nor optional Tasks 5 and 6.

### **III. PHMSA's Decision**

PHMSA, after examining the results and conclusions of the Sandia Study closely, and in consideration of the public comments to the ANPRM from industry, stakeholders, and other interested parties, has determined that issuing any regulation setting a vapor pressure limit for crude oil transportation by rail is not justified because such a regulation would not improve the safety of transporting crude oil by rail. PHMSA further notes that the Sandia Study's finding that there was no meaningful link between crude oil vapor pressures and thermal hazards militates against the imposition of vapor pressure limits for transportation of crude oil in modes other than rail.

Furthermore, establishing a vapor pressure limit for crude oil by rail would unnecessarily impede rail transportation of crude oil without providing justifiable benefits. As explained by comments submitted in response to the ANPRM, vapor pressure limits on crude oil transported by rail would, *inter alia*, disrupt commodity markets for the dissolved gasses that drive crude oil vapor pressure, require conforming changes to contractual and equipment specifications throughout the value chain, and impose significant compliance costs on crude oil producers and rail transportation. None

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<sup>4</sup> *Id.* at 77-78. The full-scale combustion testing and supply chain analysis contemplated in Tasks 5 and 6 were not pursued for the same reason.

of those significant burdens, moreover, would be accompanied by a meaningful safety benefit. Thus, this notice of withdrawal provides PHMSA's determination that no regulation setting a vapor pressure limit for rail transportation of crude oil is necessary or appropriate.

PHMSA also has decided, based on its review of comments to the ANPRM and its existing regulations, against imposing vapor pressure limits for other unrefined petroleum-based products and Class 3 flammable liquid hazardous materials by any mode.

The administrative record similarly did not evince a compelling technical basis for imposing vapor pressure limits with respect to transportation by any mode of other unrefined petroleum-based products and Class 3 flammable liquid hazardous materials. As noted above, those comments calling for broader vapor pressure limits were predicated largely on anecdotal correlations or by way of analogy to vapor pressure limits imposed on either chemically distinct hazardous materials (e.g., refined petroleum products such as gasoline), or for reasons not always related to transportation safety (e.g., pollution control). PHMSA is therefore unconvinced those comments demonstrate that regulation of unrefined petroleum-based products and Class 3 hazardous flammable liquid materials on the basis of vapor pressure will result in meaningful safety improvements beyond those provided by existing HMR classification requirements predicated on flammability and initial boiling point. *See* 49 CFR 173.21(a). PHMSA further notes that the significant compliance and opportunity costs identified in comments submitted by diverse industry stakeholders also militate against imposing vapor pressure

limits on modal transportation of unrefined petroleum-based products and Class 3 hazardous flammable liquid materials.

Accordingly, PHMSA withdraws the January 18, 2017 ANPRM in its entirety.

#### **IV. Preemption of Non-Federal Laws**

PHMSA, in issuing this withdrawal, has affirmatively determined that a national vapor pressure limit for unrefined petroleum-based products is not necessary or appropriate. As explained further below, PHMSA believes that Federal law likely preempts any non-Federal law that attempts to set a vapor pressure limit for these materials. PHMSA is aware of two States that already have laws setting vapor pressure limits in place for crude oil: North Dakota and Washington. PHMSA is also aware of one State legislature that has introduced a similar bill that would regulate vapor pressure for oil or gas.<sup>5</sup> Moreover, six additional States: California, Illinois, Maine, Maryland, New Jersey, and New York have advocated for a vapor pressure limit.<sup>6</sup>

The Federal hazmat law contains express preemption provisions relevant to this proceeding. As amended by Section 1711(b) of the Homeland Security Act of 2002 (Pub. L. 107-296, 116 Stat. 2319), 49 U.S.C. 5125(a) provides that a requirement of a State, political subdivision of a State, or Indian tribe is preempted – unless the non-Federal requirement is authorized by another Federal law or DOT grants a waiver of preemption under section 5125(e) – if (1) complying with the non-Federal requirement

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<sup>5</sup> See House Bill 4105, 80<sup>th</sup> Oregon Legislative Assembly – 2020 Regular Session (February 3, 2020), <https://olis.leg.state.or.us/liz/2020R1/Downloads/MeasureDocument/HB4105/Introduced> (last visited Apr. 1, 2020).

<sup>6</sup> In this proceeding, the Attorneys General of California, Illinois, Maine, and Maryland filed joint comments with the Attorneys General of New York and Washington, supporting a national vapor pressure standard. *See* Comments by the Attorneys General of New York, California, Illinois, Maine, Maryland, & Washington, Document Id: PHMSA-2016-0077-0074. In addition, the Attorneys General of New York, California, Maryland, and New Jersey submitted comments against preemption in a proceeding involving Washington's law. *See* Docket No. PHMSA-2019-0149.

and the Federal requirement is not possible; or (2) the non-Federal requirement, as applied and enforced, is an obstacle to accomplishing and carrying out the Federal requirement.

Additionally, subsection (b)(1) of 49 U.S.C. 5125 provides that a non-Federal requirement concerning any of five subjects is preempted when the non-Federal requirement is not “substantively the same as” a provision of Federal hazardous material transportation law, a regulation prescribed under that law, or a hazardous materials security regulation or directive issued by the Department of Homeland Security.<sup>7</sup> The “designation, description, and classification of hazardous material” is a subject area covered under this authority. 49 U.S.C. 5125(b)(1)(A). To be “substantively the same,” the non-Federal requirement must conform “in every significant respect to the Federal requirement. Editorial and other similar *de minimis* changes are permitted.” 49 CFR 107.202(d).

The preemption provisions in 49 U.S.C. 5125 reflect Congress's long-standing view that a single body of uniform Federal regulations promotes safety (including security) in the transportation of hazardous materials. Some forty years ago, when considering the Hazardous Materials Transportation Act, the Senate Commerce Committee “endorse[d] the principle of preemption in order to preclude a multiplicity of State and local regulations and the potential for varying as well as conflicting regulations in the area of hazardous materials transportation.” S. Rep. No. 1192, 93rd Cong. 2nd Sess. 37 (1974). A United States Court of Appeals has found uniformity was the

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<sup>7</sup> Unless the non-Federal requirement is authorized by another Federal law or DOT grants a waiver of preemption under section 5125(e).

“linchpin” in the design of the Federal laws governing the transportation of hazardous materials.<sup>8</sup>

The current HMR requirements for the classification of unrefined petroleum-based products include proper classification, determination of an appropriate packing group, and selection of a proper shipping name. The HMR contain detailed rules that guide an offeror through each of these steps to ensure proper classification of hazardous materials. Moreover, for unrefined petroleum-based products, such as crude oil, additional requirements were implemented pursuant to a public notice and comment rulemaking proceeding.<sup>9</sup> These Federal requirements for classification of these types of materials do not mandate specific sampling and testing of vapor pressure, nor do they classify hazardous liquids based on vapor pressure. Moreover, there is no current Federal requirement to pre-treat or condition crude oil to meet a vapor pressure standard before it is offered for transportation.

Because the HMR does not designate, describe, or classify unrefined petroleum-based products differently based on vapor pressure, any non-Federal law setting a vapor pressure limit for such materials is likely preempted by 49 U.S.C. 5125(b)(1)(A). Indeed, PHMSA has affirmatively decided in this proceeding that a national vapor pressure limit is not necessary or appropriate, thereby confirming that non-Federal laws setting vapor pressure limits are likely not “substantively the same” as Federal law.<sup>10</sup> Such non-Federal laws may also be “handling” regulations preempted by 49 U.S.C. 5125(b)(1)(B),

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<sup>8</sup> *Colorado Pub. Util. Comm'n v. Harmon*, 951 F.2d 1571, 1575 (10th Cir. 1991).

<sup>9</sup> Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains, 80 FR 26643 (May 8, 2015).

<sup>10</sup> This notice of withdrawal also provides a basis for what courts have referred to as “negative” or “null” preemption. *See Norfolk & W.R. Co. v. Pub. Utils. Comm.*, 926 F.2d 567, 570 (6th Cir. 1991) (“the United States Supreme Court has recognized a form of negative preemption when a federal agency has determined that no regulation is appropriate.”) (citing *Ray v. Atlantic Richfield Co.*, 435 U.S. 151, 178 (1978)).

and may also be preempted under 49 U.S.C. 5125(a)(2) as obstacles to accomplishing and carrying out Federal law.

A person directly affected by a non-Federal requirement may apply to PHMSA for a determination that the requirement is preempted by 49 U.S.C. 5125. *See* 49 U.S.C. 5125(d); 49 CFR 107.203-107.213. PHMSA is currently considering a preemption application filed by North Dakota and Montana with respect to Washington's vapor pressure limit, and will consider any application filed with respect to other non-Federal vapor pressure limits.

Issued in Washington, DC on May 11, 2020, under authority delegated in 49 CFR part 1.97.

**Howard R. Elliott,**  
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