INDUSTRIAL COMMISSION OF NORTH DAKOTA

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March 20, 2017

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

The North Dakota Industrial Commission (NDIC) appreciates this opportunity to comment on the 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: Volatility of Unrefined Petroleum Products and Class 3 Materials; advance notice of proposed rulemaking (ANPRM).

The State of North Dakota is ranked 2nd in the United States in the production of oil and gas. North Dakota produces approximately 400 million barrels of oil per year and 465 billion cubic feet of natural gas per year.

The NDIC, Department of Mineral Resources, Oil and Gas Division is responsible for administering North Dakota's comprehensive oil and gas regulations found at North Dakota Administrative Code (NDAC) Chapter 43-02-03 which includes regulations of the drilling, producing, and plugging of wells; the restoration of drilling and production sites; the perforating and chemical treatment of wells, including hydraulic fracturing; the spacing of wells; operations to increase ultimate recovery such as cycling of gas, the maintenance of pressure, and the introduction of gas, water, or other substances into producing formations; disposal of saltwater and oil field wastes through the ND Underground Injection Control Program; and all other operations for the production of oil or gas.

The proposed rule could have significant impacts on North Dakota's ability to administer its oil and gas regulatory program. The State of North Dakota intends to defend its sovereign jurisdiction over oil and gas regulation in any manner necessary.

The impacts of the proposed rule on North Dakota's oil and gas regulatory program are explained below in response to questions presented within the ANPRM:

A. General Questions
1. To what extent, if at all, would requiring crude oil shipped by rail to have a RVP of no greater than 9.0 psi decrease the expected degree, consequence, or magnitude of a release or the likelihood of a fire during an accident? Please provide relevant scientific or other empirical information to support your comment.

The effect of requiring crude oil shipped by rail to have a RVP of no greater than 9.0 psi is not known. Available data does not provide a basis for accurately defining and comparing the behavior of crude oils.

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In 2014, the DOT and the U.S. Department of Energy (DOE) commissioned a review of available crude oil chemical and physical property data literature to characterize and define tight crude oils based on their chemical and physical properties, and identify properties that could contribute to increased potential for accidental combustion. Sandia National Laboratories (Sandia) conducted this review and focused on crude oil's potential for ignition, combustion, and explosion. A partial list of properties surveyed includes density (expressed as API gravity), vapor pressure, initial boiling point, boiling point distribution, flash point, gas-oil ratio, ''light ends'' (dissolved gases—including nitrogen, carbon dioxide, hydrogen sulfide, methane, ethane, and propane—and butanes and other volatile liquids) composition, and flash gas composition. An important outcome of the review was formal recognition of the wide ranging variability in crude oil sample type, sampling method, and analytical method, as well as the acknowledgement that this variability limits the adequacy of the available crude oil property data set as the basis for establishing effective and affordable safe transport guidelines. In recognition of the need for improved understanding of crude oil, and especially tight crude oil properties, the Sandia Studies are designed to characterize tight and conventional crudes based on key chemical and physical properties and to identify properties that may contribute to increased likelihood or severity of combustion events that could arise during handling and transport. The work scope represents a phased approach; knowledge gained from completing each task will inform the execution of subsequent tasks to maximize efficiency in achieving overall plan objectives. Through four tasks, the Sandia Studies will characterize tight and conventional crudes based on identified key chemical and physical qualities and identify properties that may contribute to increased likelihood or severity of combustion events that could arise during handling and transport. The Sandia Studies are currently in Task 2, which is designed to determine what methods of sampling and analysis are suitable for characterizing the physical and chemical properties of different crude oils.

The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

2. What, if any, peer-reviewed or other robust information is available that addresses the safety effectiveness and/or cost of setting vapor pressure limits for crude oil or other flammable liquids during transportation?

The NDIC is not aware of any peer-reviewed or other robust information that is available to inform the safety effectiveness or cost of setting vapor pressure limits for crude oil or other flammable liquids during transportation.

The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

3. How do the consequences resulting from accidents involving low-vapor pressure flammable liquids (e.g., ethanol) compare to accidents involving high vapor pressure flammable liquids (e.g., certain crude oil)? If the consequences are significantly similar, will adopting a vapor pressure limit address the magnitude of release or the likelihood of fire during an accident for both commodity types?

Extensive comments from the AMERICAN FUEL & PETROCHEMICAL MANUFACTURERS during formulation of NDIC Order No. 25417 stated in part "Regardless of the [packing group (PG)] , the risk associated with a train derailment of crude or ethanol risks loss of a large volume of flammable liquid, a fire, and other consequences. Whether a product is PGI, PGII or PGIII makes little difference to the risks posed by the consequences of a breach during a crude oil or ethanol derailment. That common-sense observation was recently confirmed by an FRA study of the consequences of ethanol and crude oil derailments. *See* FRA Ethanol/Crude Analysis. After noting that '[d]enatured alcohol is a packing group II material … and [c]rude oil from the Bakken shale play is typically a packing group I material,' FRA's study concluded:

There is little evidence supporting the position that crude oil (especially the extracted crude from the Bakken region) poses a heightened risk of a high energy or explosive event when tank cars containing the material are exposed to pool fire conditions. In fact, the failure rate (due to thermal damage) of tank cars containing denatured alcohol is 1.5x greater than that of a tank car transporting crude oil. *Id.* at 8."

Available data does not provide a basis for accurately defining and comparing the behavior of crude oils to ethanol and other high vapor pressure flammable liquids.

The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

4. Would adopting a vapor pressure limit impact trans-border shipments? If so, how?

Yes. The most recent data available to the NDIC shows the following volumes would be impacted:

- An average 130 truckloads = 29,000 barrels per day with a peak of 407 truckloads = 89,500 barrels per day of crude oil are trucked from North Dakota into Canada.
- Up to 106 carloads = 74,000 barrels per day of crude oil are moved by rail directly from North Dakota into Canada.
- An average 145,000 barrels per day with a peak of 180,000 barrels per day of crude oil are moved by pipeline from North Dakota into Canada.

5. What methods can be employed to measure environmental and human health effects of setting a vapor pressure limit for the transport of crude oil by rail? How would the benefits of setting a vapor pressure limit be quantified?

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6. What options are available for reducing the volatility of crude oil before it's offered for transportation and loaded into tank cars, such as existing consensus standards or operating practices used for conditioning (heating and treating) crude oil?

Oil Conditioning is a process that is performed at the well site. It uses NDIC prescribed temperatures and pressures to produce a consistent product prior to shipment. It can be done with no additional footprint to the surface, and the excess gas that is conditioned off the oil can be transported in existing or planned pipelines to existing or planned processing facilities.

Stabilization is a process developed for condensate that is produced along with natural gas from gas wells.

What voluntary measures has industry taken to reduce the volatility of crude oil shipped in interstate commerce by any mode? If so, what are they?

Extensive comments during formulation of NDIC Order No. 25417 indicated no voluntary measures utilized in North Dakota. However, even though Texas does not require stabilization, there are some parts of the Eagle Ford shale, where they produce condensate that use the method. This part of Texas is nearby the large, industrial facilities. They already have the pipelines needed to get the removed gases to market.

7. What other regulatory and industry marketability measures are in place that restrict the volatility of crude oil in transport, such as RVP limits set by pipeline operators, or the impact of volatile organic compound emission standards for storage tanks and other petroleum facilities?

In December 2014, the NDIC issued Oil Conditioning Order No. 25417 (Order), which requires operators of Bakken crude oil produced in the State of North Dakota to separate the gaseous and light hydrocarbons from all Bakken crude oil. The Order requires the use of a gas-liquid separator 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 (using ASTM D6377) no greater than 13.7 psi or 1 psi less than the vapor pressure of stabilized crude oil. The measurements taken under the Order use the ASTM D6377 with a vapor to liquid (V/L) ratio of 4 and a temperature of 100 °F (37.8 °C), which is equivalent to a Reid Vapor Pressure measurement. The Order requires the 13.7 psi limit to be measured as pounds per square inch absolute (psia) and not pounds per square inch gauge (psig). Psia is used to make clear that the pressure is relative to a vacuum rather than the ambient atmospheric pressure.

Pipeline operators routinely set upper limits on RVP levels for crude oil that will be accepted for transport. A sample of six North Dakota pipeline operators indicates that they have set RVP upper limits ranging from 9.0 to 14.7 psia for acceptable crude oil.

8. How many carloads and trains would be affected by setting a vapor pressure limit for the transport of crude oil by rail? What portion of current carloads would be out of compliance with the standard proposed in P–1669? Similarly, how many cargo ship shipments, truck shipments and barrels of oil transported by pipeline would be affected by adopting the standard proposed in P–1669?

The most recent data available to the NDIC shows the following volumes would be impacted:

- Average of 470 carloads = five unit trains = 390,000 barrels per day of crude oil produced in North Dakota would be affected by setting a vapor pressure limit for transport of crude by rail. Because the standard proposed in P-1669 is Reid Vapor Pressure which has been found to not be directly applicable as a material property of crude oil hydrocarbon mixtures, it is not possible to determine the portion of current carloads would be out of compliance with the standard proposed in P–1669. However, approximately 87% of North Dakota crude oil test results exceed 9 psia VPCR4 with only 6% exceeding 13.7 psia VPCR4.
- An average of 1,725 truckloads = 380,000 barrels per day of crude oil produced in North Dakota would be affected by adopting the standard proposed in P–1669.
- An average of 744,000 barrels per day of crude oil produced in North Dakota and transported by pipeline would be affected by adopting the standard proposed in P–1669.

9. What are the expected impacts of establishing a nationwide vapor pressure standard for crude oil intended for transportation in commerce? Should that standard apply to all modes of transportation or be limited to specific modes? What are the costs and benefits of those impacts? Please provide information and data, and include references and sources for information and data provided.

Based on testimony received during formulation of NDIC Order No. 25417, the estimated cost of crude oil conditioning is about $0.10 per barrel, while the cost of crude oil stabilization that would be necessary to achieve the standard proposed in P–1669 is estimated at $0.75-$2.00 per barrel. The increased cost for crude oil produced in North Dakota would exceed $1.4 million per day. Based on data collected by the NDIC, the crude oil transportation method after the first custody transfer after it leaves the lease is so highly variable that the application of the standard proposed in P-1669 would have to occur at rail car loading facilities.

Based on the absence of any crude oil truck transport Boiling Liquid Explosive Vapor (BLEVE) events in North Dakota, the NDIC recommends the standard proposed in P-1669 not be applied to truck transportation of crude oil.

10. Should there be different vapor pressure limits depending on the specific circumstances of the shipment, such as the mode, the quantity of material or whether the shipment will travel through populated areas?

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11. Are there other risk factors that should be considered instead of, or in addition to, vapor pressure (e.g., a material's flammability range, specific heat or heat of vaporization)? How do these risk factors affect the magnitude of release or the likelihood of fire resulting from an accident?

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12. While offerors would be legally responsible for compliance with a volatility standard, it may be that actual compliance would be more cost-effectively implemented at some other point in the supply chain. What physical, institutional, or legal arrangements would be needed for implementation of a vapor pressure standard?

The NDIC's jurisdiction and ability to track crude oil shipments extends only to the first custody transfer from the well site. Therefore, the NDIC does not have information that would inform a decision about compliance being more cost-effectively implemented at some other point in the supply chain or what physical, institutional, or legal arrangements would be needed for implementation of a vapor pressure standard.

13. What types of additional technology, equipment, labor, and changes to existing operations would be needed for the establishment of a nationwide vapor pressure standard for crude oil intended for transportation in commerce? What would be the initial and recurring, and fixed and variable costs? If changes to existing operations would involve additional labor, then please provide the additional time by activity and labor category.

Extensive comments from the AMERICAN FUEL & PETROCHEMICAL MANUFACTURERS during formulation of NDIC Order No. 25417 stated in part "Considering the lack of pipeline infrastructure at wellheads, the most practical way of stabilizing Bakken crude oil may be to stabilize it at the rail head prior to loading into rail tank cars. Gas derived from stabilization could be piped to a gas processing facility where natural gases could be further separated and piped into natural gas transmission lines for domestic or commercial use. Condensate and stabilized crude oil would then be transported by rail tank cars. Liquefied gases from gas processing facilities would most probably also need to be transported by rail. The rail tank cars used for condensates would be the same types authorized for crude oil and other liquid fractions. The rail cars used for LPG would be pressure tank cars. The total amount of crude oil liquids and gases transported would not be changed appreciably. The volatility of Bakken crude oil transported by rail would be reduced but this stabilized crude oil would continue to meet the criteria for a flammable liquid and would continue to pose similar risks as un-stabilized crude oil, in the event of a derailment. A considerable amount of condensate, other volatile liquids and LPG (a compressed flammable gas) would need to be transported by rail. Thus, stabilization would likely result in concentrating the more volatile components in fewer cars. There would be little or no difference in the total number of cars utilized. There would continue to be a risk of tank car rupture in the event of a rail accident such as derailment. Thus, stabilization would result in minimal overall reduction of risk posed by rail transportation."

Comments from HyCap Energy LLC during formulation of NDIC Order No. 25417 stated in part, "The technology will allow an in-line flow separation that collects the gasses produced, these gasses can be processed in the manner that the client requires. Our technology can be installed and operated for under $0.75 per barrel, or lower depending on volumes processed (Min 500 bbl/day) the process if fully scalable and can handle flows over 250,000 bbl/day, and in parallel operation there is no upper limit."

14. To what extent can a vapor pressure standard be implemented within the existing system? At what point would additional investments be required? What level of infrastructure change would be needed? Is this level affected by seasonal and market demands? How do the answers to these questions change if crude oil production returned to historically high volume levels?

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Based on data collected since NDIC Order No. 25417 was implemented, the NDIC believes there would be significant seasonal and market demand impacts on the additional investments required for implementing a vapor pressure standard on crude oil produced in North Dakota. Rapid growth in crude oil production and shifting patterns of development would greatly exacerbate the lack of infrastructure for implementing a vapor pressure standard on crude oil produced in North Dakota.

15. What additional types of training would be needed for the establishment of a nationwide vapor pressure standard for crude oil? What would be the initial and recurring costs?

The NDIC's jurisdiction and ability to track crude oil shipments extends only to the first custody transfer from the well site. Therefore, the NDIC does not have information that would inform a decision about types of training needed for implementation of a vapor pressure standard or the costs of such training.

16. Compared to the current baseline, what would be the changes to production, pretreatment, conditioning or stabilization, loading, and transport of petroleum crude oil if PHMSA establishes a nationwide vapor pressure standard?

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17. How should the effectiveness and benefits of a rulemaking establishing a nationwide vapor pressure standard for crude oil be measured?

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18. In order to estimate benefits of a rulemaking, what consequences would be mitigated or prevented by establishing a nationwide vapor pressure standard for crude oil? Have there been any U.S. crude-by-rail accidents where a lower vapor pressure would have made a difference in the outcome? If yes, please provide all relevant details to support the conclusion.

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19. If PHMSA were to adopt the vapor pressure threshold requested by the petitioner (or another threshold), what timeframe would be needed to comply with the new requirements to implement the needed treatment infrastructure throughout the network of offerors?

Available information is insufficient for NDIC to accurately estimate the timeframe needed to comply with the new requirements and to implement the needed treatment infrastructure.

20. If PHMSA were to establish a nationwide vapor pressure standard, should any other Class 3 hazardous materials besides crude oil be subject to a vapor pressure limit? If so, which ones? Please provide the basis for your comment.

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21. If PHMSA were to establish a nationwide vapor pressure standard, should it apply to the highway mode of transportation? What is the impact of a vapor pressure standard on the current highway fleet capacity? If highway transportation is included, what is the increased exposure for highway deaths and injuries? How does this compare to exposure in rail transportation?

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22. What other properties of Class 3 hazardous materials are important to consider when setting vapor pressure limits? For example, are the following properties important: Lower and upper explosive limits, evaporations rates, etc.?

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23. Would the flammable gases removed from the crude oil be transported by tank cars or cargo tanks? If so, how many additional tank cars or cargo tank shipments of flammable gases would be required? What are the safety consequences of transporting such materials or how might PHMSA quantify such consequences? How would this impact the overall risk assessment?

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24. Given the risks associated with transporting large quantities of flammable liquids, are there measures that PHMSA should consider as an alternative or in addition to addressing material properties such as vapor pressure or flammability range, etc.?

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B. Safety Questions

1. Do the current HMR adequately consider the risks that flammable liquids containing dissolved flammable or nonflammable gases present?

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2. Should vapor pressure be used to delineate gases (and liquids with high vapor pressures) from liquids with low vapor pressures? If so, is the current definition of a gas sufficient or should a different threshold (i.e., vapor pressure or temperature) be utilized? Answers should also include specification to measurement method (including V/L ratio) and sampling method, if necessary, for that determination when recommending different thresholds.

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3. Should unrefined petroleum products not completely gaseous at 20 °C but having a vapor pressure greater than 300 kPa at 50 °C be subjected to the testing in § 173.115(a)(2) to determine whether that material should be regulated as flammable gas? If yes, what affect would this have on other Class 3 hazardous materials?

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4. Should PHMSA consider adopting a new Hazardous Materials Table (HMT; § 172.101) entry for petroleum crude oil with a high concentration of dissolved gases that is similar to the entry for UN3494, Petroleum sour crude oil, flammable, toxic?

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5. Do flammable liquids containing dissolved flammable and nonflammable gases have implications for the response community, such as hazard communication or response considerations, that the agency should consider?

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6. If Petition P–1669 were adopted, would there be an impact in the transportation of other flammable products, and if so, what would they be?

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C. Vapor Pressure Questions

1. Would the use of RVP, True Vapor Pressure, VPCRx, or some other standard be the best method for measuring vapor pressure for classification and packaging? Does this method appropriately account for liquids containing dissolved flammable and nonflammable gases under non-equilibrium conditions? What volume to liquid ratio and temperature would be most suitable? Why?

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2. Would the definition for ''live'' and ''dead'' crude oils from ASTM D6377 and other standards be relevant or useful in setting a vapor pressure limit?

NDIC Order No. 25417 was based on the scientific testimony received. The goal is to produce crude oil that does not exceed a Vapor Pressure of 13.7 pounds per square inch (psi). National standards recognize oil with a Vapor Pressure of 14.7 psi or less as stable. Allowing for a Vapor Pressure of 13.7 psi or less, adjusts for an error margin of one psi in the sampling procedures and measurement equipment. It's important to note that winter blend gasoline has a Vapor Pressure of 13.5 psi. Gasoline is a product we all encounter every day, and is safe when properly stored and transported. There is only one definition of stable crude oil, and that is 14.7 psi. All other ratios, test methods, values and readings are unstable and unrepeatable techniques that don't include a standard for stable crude oil.

3. Is there a unit of measure for how much dissolved flammable and non-flammable gases contribute to the vapor pressure, volatility, and flammability of crude oil?

The Sandia Studies are designed to characterize tight and conventional crudes based on key chemical and physical properties and to identify properties that may contribute to increased likelihood or severity of combustion events that could arise during handling and transport. The work scope represents a phased approach, in that knowledge gained from completing each task will inform the execution of subsequent tasks to maximize efficiency in achieving overall plan objectives. Through four tasks, the Sandia Studies will characterize tight and conventional crudes based on identified key chemical and physical qualities and identify properties that may contribute to increased likelihood or severity of combustion events that could arise during handling and transport.

The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

4. Are there any materials currently classified as a flammable liquid within the HMR that would be impacted by a vapor pressure threshold?

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5. What are the observed vapor pressures of tight crude oil in various stages of production, stabilization, and transportation? Please explain the conditions under which sampling and testing was performed.

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The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

6. Have any other nations established vapor pressure limits for transporting crude oil or other flammable liquids by any mode? If so, which nations, what limits do they use, and what information did they use to support the specific limits?

The NDIC is unaware of any other nations establishing vapor pressure limits for transporting crude oil or other flammable liquids by any mode.

7. Petition P–1669 recommends a RVP of no greater than 9.0 psi. In contrast, the NDIC implemented a maximum vapor pressure threshold of 13.7 psi, ($VPCR_4$ as defined in ASTM D6377). If PHMSA were to establish a national vapor pressure limit, what should it be?

NDIC Order No. 25417 was based on the scientific testimony received. The goal is to produce crude oil that does not exceed a Vapor Pressure of 13.7 pounds per square inch (psi). National standards recognize oil with a Vapor Pressure of 14.7 psi or less as stable. Allowing for a Vapor Pressure of 13.7 psi or less, adjusts for an error margin of one psi in the sampling procedures and measurement equipment. It's important to note that winter blend gasoline has a Vapor Pressure of 13.5 psi. Gasoline is a product we all encounter every day, and is safe when properly stored and transported. There is only one definition of stable crude oil, and that is 14.7 psi. All other ratios, test methods, values and readings are unstable and unrepeatable techniques that don't include a standard for stable crude oil.

8. Has any source compiled comprehensive and reliable information regarding the vapor pressures of Class 3 flammable liquid hazardous materials involved in transportation accidents, as well as information about the nature, characteristics and consequences associated with those accidents? Has any source

conducted statistical or other scientific analysis regarding the relationship between vapor pressure and the consequences of transportation accidents?

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The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

D. Packaging Questions
1. Would further limiting the filling capacity be an effective method for reducing the risks associated with Class 3 hazardous materials containing dissolved gases?

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The NDIC recommends that the proposed rulemaking be delayed until the results of the Sandia Studies are available.

In conclusion, the North Dakota Industrial Commission recommends that PHMSA withdraw the ANPRM until the results of the Sandia Studies are available.

Sincerely,

North Dakota Industrial Commission

Doug Burgum, Chairman Governor	Wayne Stenehjem Attorney General	Doug Goehring Agriculture Commissioner