THE SECRETARY OF TRANSPORTATION
WASHINGTON, DC 20590

November 29, 2017

The Honorable John Thune
Chairman, Committee on Commerce,
Science, and Transportation
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

Enclosed is the Rail Liability Study as required by Section 7310 of the "Fixing America's Surface Transportation Act of 2015" (Public Law 114-94). The Act requires the Secretary of Transportation to conduct a study on the levels and structure of insurance for railroad carriers that transport hazardous materials.

The U.S. Department of Transportation, through the Pipeline and Hazardous Materials Safety Administration, has completed the study and issues this letter and the attached Report to present its findings.

Similar letters have been sent to the Ranking Member of the Senate Committee on Commerce, Science, and Transportation and to the Chairman and Ranking Member of the House Committee on Transportation and Infrastructure.

Sincerely,

Elaine L. Chao

Enclosure

THE SECRETARY OF TRANSPORTATION
WASHINGTON, DC 20590

November 29, 2017

The Honorable Bill Nelson
Ranking Member, Committee on Commerce,
Science, and Transportation
United States Senate
Washington, DC 20510

Dear Senator Nelson:

Enclosed is the Rail Liability Study as required by Section 7310 of the "Fixing America's Surface Transportation Act of 2015" (Public Law 114-94). The Act requires the Secretary of Transportation to conduct a study on the levels and structure of insurance for railroad carriers that transport hazardous materials.

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Sincerely,

Elaine L. Chao

Enclosure

THE SECRETARY OF TRANSPORTATION
WASHINGTON, DC 20590

November 29, 2017

The Honorable Bill Shuster
Chairman, Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Enclosed is the Rail Liability Study as required by Section 7310 of the "Fixing America's Surface Transportation Act of 2015" (Public Law 114-94). The Act requires the Secretary of Transportation to conduct a study on the levels and structure of insurance for railroad carriers that transport hazardous materials.

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Sincerely,

Elaine L. Chao

Enclosure

THE SECRETARY OF TRANSPORTATION
WASHINGTON, DC 20590

November 29, 2017

The Honorable Peter DeFazio
Ranking Member, Committee on Transportation
and Infrastructure
U.S. House of Representatives
Washington, DC 20515

Dear Congressman DeFazio:

Enclosed is the Rail Liability Study as required by Section 7310 of the "Fixing America's Surface Transportation Act of 2015" (Public Law 114-94). The Act requires the Secretary of Transportation to conduct a study on the levels and structure of insurance for railroad carriers that transport hazardous materials.

The U.S. Department of Transportation, through the Pipeline and Hazardous Materials Safety Administration, has completed the study and issues this letter and the attached Report to present its findings.

Similar letters have been sent to the Chairman of the House Committee on Transportation and Infrastructure and to the Chairman and Ranking Member of the Senate Committee on Commerce, Science, and Transportation.

Sincerely,

Elaine L. Chao

Enclosure

U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 0590

Hazardous Materials by Rail Liability Study
Report to Congress

A Report Pursuant to Section 7310 of the Fixing America's Surface Transportation (FAST) Act

Contents

List of Tables **3**

List of Figures **3**

Acronyms and Abbreviations **4**

Executive Summary **6**

1 Introduction **13**

1.1 Purpose 13

1.2 Background 14

2 Current Levels and Structure of Insurance **26**

2.1 Overview 26

2.2 Liability Framework 26

2.3 Insurance Level and Structure 30

2.4 Common Carrier Mandate and Rail Pricing 34

3 Necessary and Appropriate Levels of Insurance **36**

3.1 Overview 36

3.2 The Risk of Rail Hazardous Material Incidents 36

3.3 Efficiency of Risk Allocation in Hazmat Freight Rail Market 46

3.4 Summary 52

4 Alternative Insurance Models **55**

4.1 Overview 55

4.2 Requirements for Minimum Levels of Financial Responsibility 56

4.3 Insurance Pooling Among Railroads 61

4.4 Secondary Liability Pool Funded by Shippers 64

4.5 Government Provides Direct Insurance 77

4.6 Other Liability and Insurance Issues 79

4.7 Summary 85

5 Conclusion **87**

5Appendix A Fast Act Language **89**

5Appendix B Request for Comment Questions .....

List of Tables

Table 1. Railroad Profiles by Class (2012 Data) 15

Table 2. Average Railroad Statistics by Class (2012 Data) 15

Table 3. Rail Hazardous Materials Shipments as a Share of Total (2012) 16

Table 4. Hazardous Material Rail Shipment Share by Hazard Class (2012) 17

Table 5. Key Freight Rail Transportation Agencies and Authorities 21

Table 6. Top-Level Causes of Rail Incidents Involving Hazmat (2001-2016) 39

Table 7. Hazmat Incidents Differentiated by Railroad Class and Location (2001-2016) 39

Table 8. Table of Minimum Liability Insurance Coverage (volumes in tonnes per year) 66

List of Figures

Figure 1. Indexed Ton-Miles for Hazardous Materials and Crude Oil and Ethanol (1995-2014) 18

Figure 2. Refinery Receipts of Crude Oil by Rail (2010-2015) 19

Figure 3. Refinery Receipts of Crude Oil by Method of Transportation (2010-2015) 20

Figure 4. Indexed Ton-Miles for Rail Freight, Hazardous Materials, and Chlorine and Anhydrous Ammonia (1995-2014) 21

Figure 5. Number of Cars shipping Crude Oil and Ethanol (indexed to 1995) 42

Figure 6. Number of Cars shipping Chlorine and Anhydrous Ammonia (indexed to 1995) 42

Figure 7. Average Miles for Shipment for Crude Oil and Ethanol (indexed to 1995) 43

Figure 8. Average Miles for Shipment of Chlorine and Ammonia (indexed to 1995) 43

Figure 9. Rate of Hazmat Release Incidents per 100 Million Rail Hazmat Ton Miles 44

Figure 10. Revenue per Ton Mile for Anhydrous Ammonia, Chlorine, All Hazmat and All Traffic (indexed to 1995) 50

Figure 11. Revenue per Ton Mile for Crude Oil, Ethanol, All Hazmat and All Traffic (indexed to 1995) 51

Figure 12. Notional Representation of Sources for Damages Payments for a Small Railroad (baseline and with secondary liability pool) subject to a low probability, high consequence event 74

Figure 13. Notional Representation of Sources for Damages Payments for a Large Railroad (baseline and with a secondary liability pool) subject to a low probability, high consequence event 75

Acronyms and Abbreviations

AAJ	American Association for Justice
AAR	Association of American Railroads
ACC	American Chemistry Council
ACCE	Anhydrous Ammonia, Chlorine, Crude Oil, and Ethanol
ARRA	Amtrak Reform and Accountability Act
ASLRRA	American Short Line and Regional Railroad Association
BTS	Bureau of Transportation Statistics
BP	British Petroleum
CFR	Code of Federal Regulations
CFS	Commodity Flow Survey
CN	Canadian National Railway Company
CSXT	CSX Transportation Inc.
DHS	Department of Homeland Security
DOJ	Department of Justice
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAST Act	Fixing America's Surface Transportation Act of 2015
FDIC	Federal Deposit Insurance Corporation
FEMA	Federal Emergency Management Agency
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
HHFT	High-Hazard Flammable Train
HHS	Department of Health and Human Services
Hazmat	Hazardous Materials
HMR	Hazardous Materials Regulations
HRSA	Health Resources and Services Administration
HTUA	High Threat Urban Area
INPO	Institute of Nuclear Power Operations
MM&A	Montreal, Maine and Atlantic Railway
NS	Norfolk Southern
NEIL	Nuclear Electric Insurance Limited
NPFC	Nuclear Pollution Funds Center
NTSB	National Transportation Safety Board
OSLTF	Oil Spill Liability Trust Fund
OST	Office of the Secretary of Transportation
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIH	Poison Inhalation Hazard
RFC	Request for Comments
RPM	Revenue Passenger Miles
SEC	Securities and Exchange Commission
STB	Surface Transportation Board
TCWR	Twin Cities & Western Railroad
TFI	The Fertilizer Institute
TIH	Toxic Inhalation Hazard
TRIA	Terrorism Risk Insurance Act
TSA	Transportation Security Administration
UP	Union Pacific Railroad Company
URCS	Uniform Rail Costing System

U.S. DOT	United States Department of Transportation
VICP	National Vaccine Injury Compensation Program

Executive Summary

Legislative Background

Section 7310 of the "Fixing America's Surface Transportation Act of 2015" (FAST Act) requires the Secretary of Transportation to initiate a study to evaluate:

1. The level and structure of insurance, including self-insurance, available in the private market against the full liability potential for damages arising from an accident or incident involving a train transporting hazardous materials;
2. The level and structure of insurance that would be necessary and appropriate –
    a. to efficiently allocate risk and financial responsibility for claims; and
    b. to ensure that a railroad carrier transporting hazardous materials can continue to operate despite the risk of an accident or incident; and
3. The potential applicability, for a train transporting hazardous materials, of an alternative insurance model, including –
    a. a secondary liability coverage pool or pools to supplement commercial insurance; and
    b. other models administered by the federal government.[1]

The FAST Act requires the Secretary to complete a report to Congress one year after study initiation. This report, "Hazardous Materials by Rail Liability Study," presents the results of the above study. Information for the study is drawn from responses to the Request for Comments (RFC) in the *Federal Register* and a review of the existing literature, including academic studies, government reports and data sets, financial documentation, case dockets, and the news media.[2] While the study highlights a number of findings related to the three study areas outlined in the FAST Act, insufficient or unavailable data limited the ability to develop a complete baseline understanding of current levels and structure of insurance, therefore making analysis of the other two study areas more challenging. Key limitations included the unavailability of business-sensitive or proprietary information required to fully assess the FAST Act study requirements, the particularly limited information collected and available on Class II and Class III railroads, and the lack of information with which to estimate precisely the true probability and consequences of extremely low frequency but high-consequence hazardous materials rail incidents.

Hazardous Materials Transport by Rail

The freight transportation system is a crucial part of meeting the Nation's industrial, transportation, and consumer needs on a daily basis. The freight transportation system connects U.S. businesses with international markets and domestic consumers and suppliers, and, through these links, facilitates a significant portion of U.S. economic activity. Hazardous materials, a subset of this freight, are also essential to the U.S. economy; they provide direct utility to U.S. households in terms of automobile and home fueling, and they are integral to agricultural, manufacturing, medical, mining, and public utility

[1] Public Law 114-94 § 7310, FAST Act; FAST Act language is included in Appendix A. See also Pipeline and Hazardous Materials Safety Administration (PHMSA), Notice and Request for Comments, *Docket ID: PHMSA-2016-0074*, 2016.
[2] PHMSA *Docket ID: PHMSA-2016-0074*, 2016. RFC questions are listed in Appendix B.

sectors in a variety of applications.

According to the Federal Railroad Administration (FRA), approximately 722 freight railroads operated in the United States as of 2017.[3] These railroads, referred to as rail carriers, are classified by the Surface Transportation Board (STB) into three classes based on their annual adjusted operating revenues for three consecutive years. Class I railroads have an annual operating revenue threshold of $250 million in 1991 dollars.[4] There are currently only seven Class I railroads operating in the United States, but they represent two-thirds of total track mileage and account for more than 90 percent of rail employees and revenues. Class II railroads have an annual operating revenue threshold more than $20 million but less than $250 million in 1991 dollars.[5] Class II railroads include regional railroads, which may operate in multiple states. While Class II railroads are smaller than Class I railroads, they are typically significantly larger than Class III railroads, which have an annual operating revenue threshold of up to $20 million in 1991 dollars.[6] Class III railroads (also known as short lines) generally serve a smaller geographic area. Class II and Class III railroads play an important part in America's freight rail system, and serve a critical role in connecting locations off of the Class I main lines to the Class I rail network. Railroads of all classes are subject to a statutory common carrier obligation that requires railroads to provide service upon reasonable request by shippers.[7] The STB, which has long interpreted the common carrier obligation to include the transport of hazardous materials, rules on complaints brought by shippers or carriers concerning that obligation.

Railroads transport a variety of hazardous materials in nearly every hazard class, but the risk and potential impact associated with this transport can vary significantly depending on the type of material transported. This report addresses the commodities that were most commonly identified to be highest risk within the documents reviewed and from the responses to the RFC, specifically when considering questions about the necessary and appropriate level and structure of insurance to efficiently allocate risk and financial responsibility, and to ensure continuity of operations in the event of a major incident. Specifically, materials toxic by inhalation or poisonous by inhalation (TIH/PIH materials), including chemicals like chlorine gas and anhydrous ammonia, pose elevated risk due to exposure and potential effect on populations. Similarly, flammable liquids like petroleum crude oil, ethanol, and other fuels pose elevated risk to populations due to the possibility of fire following release, particularly as these products are frequently carried in high volumes in "unit trains" (a type of train-that may exceed 100 cars in length and carries only a single commodity), as well as to the environment. While anhydrous ammonia and chlorine ton-miles remained relatively flat over the period, crude oil and ethanol each increased over 1,600 percent in ton-miles between 1995 and 2014—although refinery receipts of crude oil shipped by rail in 2015

[3] This estimate is from monthly reporting by the railroads operating on the general system to FRA on Form FRA F 6180.55. We note that the Association of American Railroads (AAR) estimates approximately 570 freight railroads operated in the United States as of 2016, *Overview of America's Freight Railroads*, 2016: 1.
[4] After adjusting for inflation, the current annual operating revenue threshold for Class I railroads is $457,913,998 or more. https://www.stb.gov/stb/faqs.html
[5] Adjusting for inflation, the current annual operating revenue threshold for Class II railroads is $36,633,120 to $475,754,803. *Supra*.
[6] Adjusting for inflation, the current annual operating revenue threshold for Class II railroads is up to $36,633,120. *Supra*.
[7] See 49 U.S.C. 11101, *Common carrier transportation, service, and rates,* 2011.

show a small decrease from the volume peak in 2014.[8] Much of the growth in crude oil by rail shipment in the U.S. is attributable to exploration in the Bakken region of North Dakota and other unconventional shale plays.

Although freight rail transportation has been partially deregulated following the Staggers Rail Act of 1980, a significant number of safety, security, and economic regulations are in place. Table ES-1 summarizes key federal agencies and their respective authorities for freight rail transportation.

Table ES-1. Key Freight Rail Transportation Agencies and Authorities

Agency	Citation	Authority
Pipeline and Hazardous Materials Safety Administration	49 CFR Parts 105-180 (Hazmat)	Federal safety authority for the transportation of hazardous materials (hazmat). Develops and enforces regulations for the safe, reliable, and environmentally sound operation of the Nation's pipeline transportation system and shipments of hazardous materials by land, sea, and air. Part 174 specifically applies to carriage by rail.
Federal Railroad Administration	49 CFR Parts 200-299	Federal authority for ensuring the safety of the Nation's passenger and freight rail operations and infrastructure by promoting safe, efficient and accessible rail transportation. FRA promulgates and enforces rail safety regulations; enforces the hazardous materials regulations related to rail transport; consolidates government support of rail transportation activities; administers financial assistance programs; and conducts research and development in support of improved railroad safety and efficiency and national transportation policy, including improved intercity passenger service.
Surface Transportation Board	49 CFR 1000-1119 and 1200-1399	Independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers. The agency has jurisdiction over railroad rate and service issues and rail restructuring transactions (mergers, line sales, line construction, and line abandonments). The agency also has authority to investigate rail service matters of regional and national significance.
Department of Homeland Security and Transportation Security Administration	5 CFR 4600-4699 and 49 CFR 1580	Responsible for preventing terrorism and enhancing security; managing our borders; administering immigration laws; securing cyberspace; and ensuring disaster resilience. Part 1580 includes specific rail transportation security requirements.

[8] Energy Information Administration (EIA), *Annual Refinery Report*, *Form EIA-820 - Refinery Receipts of Crude Oil by Method of Transportation by PAD District, 2015*, 2016. Available for download at: https://www.eia.gov/dnav/pet/pet_pnp_caprec_dcu_nus_a.htm.

Study Findings

Current Levels and Structure of Insurance

The first study area addresses existing conditions in relation to the level and structure of insurance. Findings were drawn primarily from responses to the RFC,[9] interviews with agencies such as the STB,[10] and a review of academic studies, government reports, trade publications, and the news media. Data limitations that prevented presenting a comprehensive overview of the current state were a lack of detailed information on topics such as insurance costs, freight volumes, and the insurance market due to confidentiality and business sensitivity issues, as well as a lack of RFC responses from the insurance industry. Despite these limitations, the study identified a number of key findings:

- Insurance coverage is an important component of the railroad industry's overall approach to managing business risk and liability exposure—along with other practices such as employee training, infrastructure investments, and safety culture—leading firms to carry varying amounts of insurance coverage regardless of the lack of minimum requirements.
- Unlike the statutory provisions regarding trucking, there is no statute that requires minimum insurance for transportation of hazardous materials by rail or that directs a federal agency to establish such requirements. Accordingly, neither STB, PHMSA, nor FRA have imposed minimum required levels of insurance coverage for railroads.
- Insurance coverage levels and costs vary according to railroad class.
    - Class I railroads' liability coverage levels are typically in the range of $1 billion to $1.5 billion. Though the coverage generally applies to all commodities, railroads describe the selected coverage limits as reflective of the risks of hazardous materials in particular.[11]
    - Based on the limited available information, typical liability coverage limits for Class II railroads are in the range of $25 to $100 million, with retentions of $250,000 to $500,000, while Class III railroads have coverage of around $5 million and retentions around $50,000.[12] However, many Class II and Class III railroads are part of larger conglomerates or holding companies, which may have different insurance arrangements because of their corporate structure and ability to pool risk across entities.
- The market for railroad liability coverage appears to be a highly-specialized field, with a limited number of insurers who have the necessary industry expertise to assess risk and conduct underwriting. Concerns about the cost and availability of coverage from these insurers were expressed in the SEC filings and responses from Class I railroads, as well as the RFC response

[9] All submitted comments are available at: https://www.regulations.gov/docketBrowser?rpp=25&so=DESC&sb=commentDueDate&po=0&dct=PS&D=PHMSA-2016-0074. See also PHMSA Notice and Request for Comments, *Docket ID: PHMSA-2016-0074*, 2016. Available at: https://www.regulations.gov/docket?D=PHMSA-2016-0074. RFC questions are listed in 5Appendix B.

[10] While STB staff provided background information for this report, the views expressed in this report are those of U.S. DOT and not of the STB.

[11] Norfolk Southern (NS) response to PHMSA *Docket ID: PHMSA-2016-0074-0006.* NS noted that its coverage tier from $200 million to $1 billion was "primarily necessitated by hazardous material, principally TIH traffic."

[12] Insurance Information Institute, Inc., "Railway Liability Insurance," accessed 2016. Available at: http://www.iii.org/article/railway-liability-insurance. The Insurance Information Institute is an educational, fact-finding, and communications organization for the U.S. insurance industry with the mission of improving public understanding of what insurance does and how it works.

received from a Class III railroad.

Necessary and Appropriate Levels of Insurance

The second study area addresses the necessary and appropriate level and structure of insurance to efficiently allocate risk and financial responsibility for claims and to ensure a rail carrier transporting hazmat can continue to operate despite the risk of an accident or incident. Similar to the first study area, comprehensive analysis and the ability to draw full conclusions was limited by availability of information of proprietary or business-sensitive nature. These gaps include commodity flow data for Class II and Class III railroads, rail carrier practices, negotiated shipping rates, and the insurance market baseline. A further analysis challenge is that while catastrophic incidents are fortunately rare, this rarity makes understanding the true risk caused by the transportation of hazmat by rail difficult. Together, these gaps limit understanding of the extent to which risk lies with smaller railroads, who are financially less prepared for a costly incident than large railroads. Still, a large amount of information to support the analysis and draw preliminary conclusions could be drawn from responses to the RFC, academic articles, industry publications, and government reports, and was supplemented by STB waybill sample data and the FRA and PHMSA incident databases. Key findings for this study area are:

- Financial responsibility is critical in order to fairly compensate victims of a catastrophic rail incident and to protect the continued operation of railroads. The projected costs of simulated worst case hazmat rail incident scenarios are extremely high due to the potential liability for personal deaths and injuries, property damage, environmental contamination and cleanup costs, evacuation costs, response costs, and transportation system disruption.
- Class I railroads appear to have access to insurance policies that would cover up to $1.5 billion. With this amount of insurance, combined with substantial corporate resources to self-insure, Class I railroads are likely to have the ability to cover the vast majority of foreseeable incidents.
- Based on current insurance structures and levels, Class II and Class III railroads do not appear to hold insurance that would cover the worst case-scenario and do not have sufficient company resources to self-insure against such an event.
- Insurance is a contractually based form of risk-sharing. Since the pricing structure of hazmat rail transportation affects the allocation of risk (related to insurance), it was also examined by the study team. Given the available information, it appears that pricing for hazmat rail transportation may not efficiently allocate risk in such a way that would incentivize parties to reduce contribution to that risk due to market failure.
- Class II and Class III railroads do not always have a diversified base of clients. While they are currently able to recover their insurance costs, a large change in cost structure might impact their client base in a way that would impact the viability of the railroad.
- Class II and Class III railroads are unlikely to remain solvent following a catastrophic rail incident, absent support from a holding company or business partner. Class II and Class III railroads have trended toward consolidation in recent years, and increased insurance costs following a major incident might accelerate this pressure.

Alternative Insurance Models

The third study area addresses secondary liability pools and other insurance models administered by the federal government. Information for this analysis was drawn from responses to the RFC, research of other

insurance models, and interviews with staff at government agencies responsible for administering the programs. The study reviewed information on the various types of federal insurance programs, and focused on those insurance programs related to corporations—as opposed to individuals or households—and that dealt with the risk of low-probability, high-consequence events. As a result of that review, the study team selected the following types of insurance models and policies for analysis: 1) Requirements for minimum levels of financial responsibility; 2) Insurance pooling among railroads; 3) Secondary liability pools funded by shippers; and 4) Federal government providing direct insurance. The analysis of each alternative model provides a description, examples of the insurance model in practice, applicability of the model both to the transport of hazmat by rail and the findings related to the necessary and appropriate levels of insurance, and the expected categories and direction of impacts. Key findings for this study area are:

- The models and policies reviewed are not mutually exclusive alternatives – they can build on or complement each other as part of a broader set of liability related policies and programs. The Price-Anderson Act of 1957 for example, requires commercial nuclear power plants to hold the maximum amount of insurance available in the market, imposes a strict liability requirement, and creates a secondary liability pool. The Safe and Accountable Rail Act requires railroads to hold minimum amounts of liability insurance, sets a liability cap for railroads, and requires shippers to fund a secondary liability pool.
- The alternative models and policies reviewed address the key issues identified in this report: adequacy of current levels and structure of insurance for social costs, efficient allocation of risk, and ability of railroads to continue operations—namely increasing the compensation available to potential victims of incidents on those railroads with lower levels of insurance:
    - Requiring a minimum level of insurance could increase the amount of compensation available to potential victims of incidents on smaller railroads.
    - Smaller railroads might pool together in order to obtain higher levels of insurance coverage at lower cost.
    - A secondary liability pool funded by shippers would incorporate a requirement for minimum levels of financial responsibility and would also provide additional compensation to potential victims of incidents on both small and large railroads. The secondary liability pool could also be structured to provide compensation to victims where no party is found to be at fault.
    - A secondary liability pool would add a good deal more certainty to the costs and liability of a potential incident, which could benefit both railroads and shippers.
- There is support from both hazmat shippers and railroads for a secondary liability pool funded by shipper taxes. Shippers however want assurances they will not be required to pay twice for the same financial liability related to hazmat shipments. Safety advocates caution any new program should not reduce levels of safety.
- Further analysis and investigation would be required to fully flesh out an alternative insurance model addressing exact dollar amounts of coverage provided, taxes or premiums collected, circumstances excluded or included, potential differential treatment of various hazmat commodities, and potential differential involvement by size of rail carrier or shipper.

Conclusion

At the highest level, the study findings reveal a complex, interconnected set of issues involving a large number of stakeholders and safety, security, and economic authorities and regulations. Any further decisions or action taken must be accompanied by additional analysis and investigation and the full participation and representation of all affected parties and stakeholders.

1 Introduction

1.1 Purpose

On December 4, 2015, President Barack Obama signed legislation entitled "Fixing America's Surface Transportation Act of 2015" (the FAST Act). Section 7310 of the FAST Act requires the Secretary of Transportation to initiate a study to evaluate:

1. The level and structure of insurance, including self-insurance, available in the private market against the full liability potential for damages arising from an accident or incident involving a train transporting hazardous materials;
2. The level and structure of insurance that would be necessary and appropriate –
    a. to efficiently allocate risk and financial responsibility for claims; and
    b. to ensure that a railroad carrier transporting hazardous materials can continue to operate despite the risk of an accident or incident; and
3. The potential applicability, for a train transporting hazardous materials, of an alternative insurance model, including –
    a. a secondary liability coverage pool or pools to supplement commercial insurance; and
    b. other models administered by the federal government.[13]

This report presents the results of the above study. Section 1 provides an overview of the rail industry, hazardous materials transport by rail, and the current regulatory structure of rail transportation in the United States. Section 2 provides a summary of current levels and structure of insurance and liability for rail carriers transporting hazardous materials. Section 3 addresses the level and structure of insurance necessary and appropriate to efficiently allocate risk and financial responsibility and the ability of a railroad carrier to continue to operate despite the risk of an incident. Section 4 provides an analysis of alternative insurance models for rail transport of hazardous materials. Section 5 summarizes the results of the study.

The FAST Act required the Secretary to complete a report to Congress one year after study initiation. This Hazardous Materials by Rail Liability Study presents the results of the above study. Information for this study is drawn from responses to the Request for Comments (RFC) and a review of the existing literature, including academic studies, government reports and data sets, financial documentation, case dockets, and the news media.[14] While the study highlights a number of findings related to the three study areas outlined in the FAST Act, insufficient or unavailable data limited the ability to develop a complete baseline understanding of current levels and structure of insurance, therefore making analysis of the other two study areas more challenging. Key limitations included the unavailability of business-sensitive or proprietary information required to fully assess the FAST Act study requirements, the particularly limited information collected and available on Class II and Class III railroads, and the lack of information with which to estimate precisely the true probability and consequences of extremely low frequency but high-consequence hazardous materials rail incidents.

[13] Public Law 114-94 § 7310, FAST Act; FAST Act language is included in 5Appendix A. See also PHMSA, Notice and Request for Comments, *Docket ID: PHMSA-2016-0074*, 2016.
[14] PHMSA, *Docket ID: PHMSA-2016-0074*, 2016. RFC questions are included in 5Appendix B.

1.2 Background

1.2.1 Railroad Industry Overview

The freight transportation system is a crucial part of meeting the U.S. economy's industrial, transportation, and consumer needs on a daily basis. It connects U.S. businesses with international markets and domestic consumers and suppliers and, through these links, facilitates a significant portion of U.S. economic activity. Freight transport by rail is a particularly economical way to transport raw materials and heavy freight over long distances to final destinations and intermodal connections. The Commodity Flow Survey (CFS), which was most recently conducted in 2012, reports that rail carries over 40% of all freight on a ton-mile basis.[15]

According to the Federal Railroad Administration (FRA), approximately 722 freight railroads operated in the United States as of 2017.[16] These railroads, referred to as rail carriers, are classified by the Surface Transportation Board (STB) into three classes based on their annual adjusted operating revenues for three consecutive years. The adjustment to revenue eliminates the effects of inflation by applying a deflation factor that is based on the annual average Railroad Freight Price Index for all commodities.[17] According to annual inflation-adjusted index factors published by STB for 2015, the estimated classification thresholds for each class are:

Class I	$457.4 million or more
Class II	$36.6 to $457.4 million
Class III	Less than $36.6 million[18]

Class II and Class III railroads (often referred to as regional railroads and short lines) are not required to report yearly revenue data to the STB. Nonetheless, FRA determined that there are 10 domestic Class II railroads from available data and interviews with carriers. While not required to report revenue data, Class II and Class III carriers are required to report to the STB if they qualify for reclassification.[19]

AAR classifies non-Class I railroads as Regional and Local railroads. Regional carriers are line-haul railroads that operate at least 350 miles of road and earn at least $20 million in revenue or earn at least $40 million in revenue (regardless of road mileage). Local carriers are line-haul railroads that do not qualify as regional railroads, plus switching and terminal carriers.[20] Table 1, which reflects AAR

[15] Bureau of Transportation Statistics (BTS), *2012 Commodity Flow Survey*, Table 1a. Available at: https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/commodity_flow_survey/2012/united_states/table1a.

[16] This estimate is from monthly reporting by the railroads operating on the general system to FRA on Form FRA F 6180.55. We note that the Association of American Railroads (AAR) estimates approximately 570 freight railroads operated in the United States as of 2016, *Overview of America's Freight Railroads*, 2016: 1.

[17] Surface Transportation Board (STB), "FAQs, Economic and Industry Information," accessed October 2016. Available at: https://www.stb.gov/stb/faqs.html. The adjustment formula is: *Current Year's Revenues* x *1991 Avg. Index* / *Current Year's Avg. Index*. The Railroad Freight Price Index is developed by BLS.

[18] STB, "Indexing the Annual Operating Revenues of Railroads," *81 FR 42784*, 2016. Available at: https://www.gpo.gov/fdsys/pkg/FR-2016-06-30/html/2016-15546.htm.

[19] FRA, *Summary of Class II and Class III Railroad Capital Needs and Funding Sources*, 2014: 2-3.

[20] See AAR, *Railroad Facts 2016 Edition*, 2016: 3. Regional and Local carriers nearly match Class II and Class III classifications, respectively.

classifications and data, shows the size of Class I carriers as compared to Class II and Class III carriers; although there are only seven Class I railroads, they represent approximately two-thirds of total track mileage and account for more than 90 percent of rail employees and revenues.[21]

Table 1. Railroad Profiles by Class (2012 Data)

Railroad Class	Number of Railroads	% of Total	Miles of Road	% of Total	Number of Employees	% of Total	Revenues (billion dollars)	% of Total
Class I	7	1.2%	95,264	68.8%	163,464	90.2%	$67.6	94.4%
Regional	21	3.7%	10,355	7.5%	5,507	3.0%	$1.4	2.0%
Local	546	95.1%	32,858	23.7%	12,293	6.8%	$2.6	3.6%
Total	574		138,477		181,264		$71.6	

Table 2 explores the difference in magnitude between Class I, Class II, and Class III railroads for the statistics shown in Table 1. While there is roughly one order of magnitude difference between the classes in average rail mileage and between Class II and Class III for all three measures, Class I carriers are approximately two orders of magnitude larger than Class II carriers in terms of average employees and average revenues.[22]

Table 2. Average Railroad Statistics by Class (2012 Data)

Railroad Class	Number of Railroads	Average Miles of Road	Average Number of Employees	Average Revenues (million dollars)
Class I	7	13,609	23,352	$9,657.1
Regional	21	493	262	$66.7
Local	546	60	23	$4.8

Class II carriers are typically significantly larger than Class III carriers, and may operate in multiple states, while Class III railroads generally serve a smaller geographic area. Despite having a smaller scope than Class I carriers, Class II and Class III railroads play an important part in America's freight rail system, and they serve a critical role in connecting locations off of the Class I main lines to the Class I rail network.[23]

The number of Class III railroads more than doubled following the Staggers Rail Act of 1980, growing from approximately 220 to more than 540 in 2013. However, 27 holding companies controlled nearly half (270) of all short lines in 2012.[24] Shippers, state and local governments, and Class I railroads control nearly 100 of the short lines,[25] and the rest are owned independently.

To enable a freight shipment, the firm that produces the freight (shipper) contracts with the railroad carrier. Shippers frequently own or lease rail cars and provide for loaded cars to be delivered to the

[21] AAR, *Railroad Facts*, 2016: 3.
[22] AAR, *Railroad Facts*, 2016: 3.
[23] American Short Line and Regional Railroad Association (ASLRRA), *Short Line Regional Railroad Facts and Figures, 2012 Edition*, 2012: 15-16.
[24] AAR, *Railroad Ten-Year Trends, 2003-2012*, 2014: 169-178.
[25] ASLRRA, 2012: 11.

railroad. From there, the carrier takes custody of the freight and is responsible for transport, which may require movement across multiple rail lines. This arrangement can complicate insurance coverage and other considerations, especially when the freight is dangerous, as is the case with some types of hazardous materials (hazmat).

1.2.2 Hazardous Material Transport by Rail

Hazardous materials are essential to the U.S. economy; they provide direct utility to U.S. households in terms of automobile and home fueling, and they are integral to agricultural, manufacturing, medical, mining, and public utility sectors in a variety of applications.[26] The Code of Federal Regulations (CFR) divides hazardous materials into nine general classes based on their associated risks.[27]

Class 1	Explosives
Class 2	Flammable, compressed nonflammable, and poisonous gases
Class 3	Flammable and combustible liquids
Class 4	Flammable and combustible solids
Class 5	Oxidizers and organic peroxides
Class 6	Poisonous and infectious materials
Class 7	Radioactive materials
Class 8	Corrosive materials
Class 9	Miscellaneous hazardous material

Hazardous materials are a significant part of freight transport activity, as shown in Table 3. Hazardous materials represented approximately 10% of all freight ton-miles and 7% of rail ton-miles in 2012.[28]

Table 3. Rail Hazardous Materials Shipments as a Share of Total (2012)

	Tons (thousands)			Ton-miles (millions)		
Freight type	**All modes**	**Rail**	**% Rail**	**All modes**	**Rail**	**% Rail**
Hazmat	2,579,580	110,987	4.3%	307,523	84,843	27.6%
All freight	11,299,409	1,628,537	14.4%	2,969,506	1,211,481	40.8%
% hazmat	22.8%	6.8%		10.4%	7.0%	

1.2.3 Hazardous Materials Commodity Flows and Recent Trends

Rail carries a significant share of each hazardous material class, excluding Class 1 (explosives and pyrotechnics) and Class 7 (radioactive materials). Table 4 shows the tons and ton-miles of all classes of hazardous material carried by all modes and by rail according to the latest Commodity Flow Survey,

[26] U.S. Department of Transportation (U.S. DOT), *The Transportation of Hazardous Materials: Insurance, Security, and Safety Costs*, 2009: 1-2.
[27] See 49 CFR Part 173, *Hazardous Materials Classes and Index to Hazard Class Definitions*, 1993.
[28] BTS, *2012 Commodity Flow Survey*, Table 1a; and BTS, *2012 Commodity Flow Survey Hazardous Materials*, Table 1a. Available at: https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/commodity_flow_survey/2012/hazardous_materials/table1a.

conducted in 2012.[29]

Table 4. Hazardous Material Rail Shipment Share by Hazard Class (2012)[30]

	Tons (thousands)			Ton-miles (millions)		
Hazard Class	**All modes**	**Rail**	**% Rail**	**All modes**	**Rail**	**% Rail**
Class 1	4,045	6	0.1%	1,012	N/a	N/a
Class 2	164,794	16,799	10.2%	33,157	12,261	37.0%
Class 3	2,203,490	46,100	2.1%	204,573	37,085	18.1%
Class 4	11,321	3,719	32.9%	5,804	4,607	79.4%
Class 5	12,025	4,603	38.3%	5,479	3,260	59.5%
Class 6	7,612	3,072	40.4%	3,607	2,376	65.9%
Class 7	N/a	0	0.0%	39	0	0.0%
Class 8	125,287	28,389	22.7%	37,784	16,769	44.4%
Class 9	51,006	8,299	16.3%	16,068	8,485	52.8%

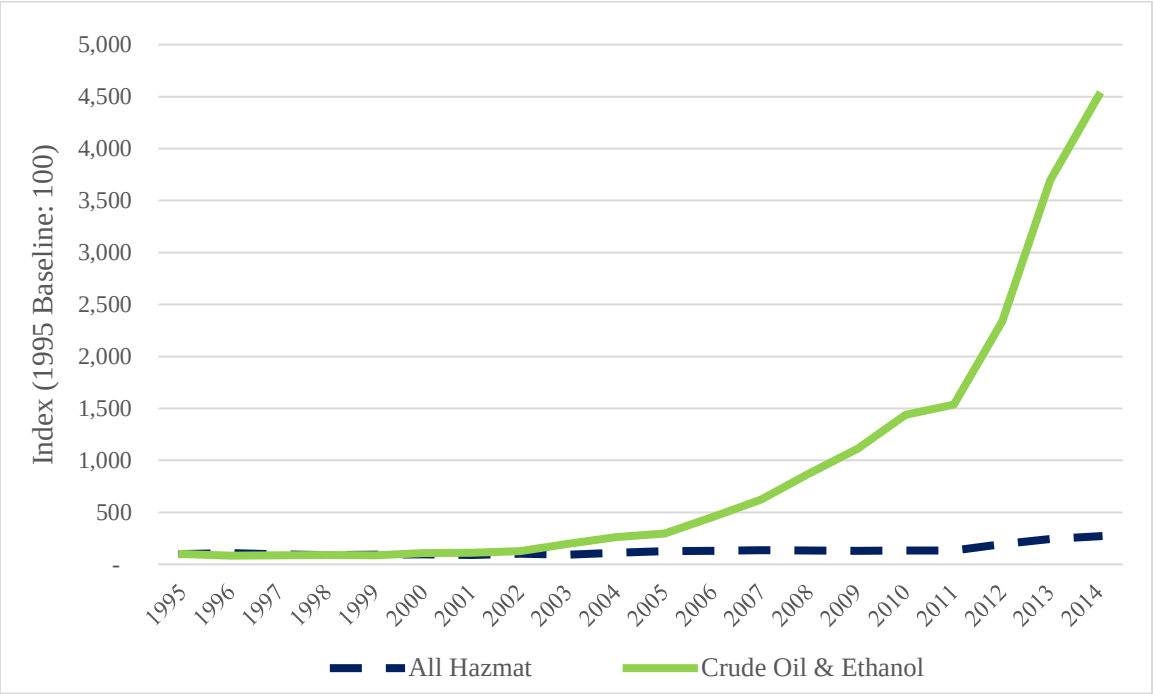
Railroads transport a variety of hazardous materials in nearly every hazard class, but the risk and potential impact associated with this transport can vary significantly depending on the type and quantity of material transported. In the documents reviewed for this study and responses to the RFC, certain commodities were identified as having the highest risk. Specifically, toxic inhalation hazards or poison inhalation hazards (TIH/PIH), including chemicals like chlorine gas and anhydrous ammonia, pose elevated risk with respect to exposure and potential effect on populations. Similarly, flammable liquids like petroleum crude oil, ethanol, and other fuels pose elevated risk to populations and to the environment due to the possibility of fire following release, particularly as these products are frequently carried in high volumes in "high hazard flammable unit trains" (a type of train transporting 70 or more loaded cars containing Class 3 flammable liquid). Therefore, this report addresses certain commodities accordingly, especially in Section 3, as it deals with questions about the necessary and appropriate level and structure of insurance to efficiently allocate risk and financial responsibility, and to ensure continuity of operations in the event of a major incident.

Data from the STB Carload Waybill Sample—a stratified sample of waybills submitted by carriers of commodity lists for all U.S. rail traffic—show that between 1995 and 2014, hazardous material traffic increased faster than all rail freight. Two commodities in particular, crude oil and ethanol, have far outpaced other hazardous material traffic growth over that period.

Figure 1 While overall rail ton miles have increased 43% and hazardous materials by rail ton miles have increased by 170% since 1995, crude oil and ethanol ton miles have increased by 13,309% and 1,632%, respectively, since 1995. Figure 1 displays ton-miles for all hazardous material rail traffic, and crude oil and ethanol rail traffic, indexed to 1995 data.[31]

[29] BTS, *2012 Commodity Flow Survey Hazardous Materials*, Table 6. Available at: https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/commodity_flow_survey/2012/hazardous_materials/table6.
[30] The BTS Commodity Flow Survey withheld the data points for *Ton-miles of Class 1 Hazmat by Rail* and *Tons of Class 7 Hazmat by All modes* because the estimates did not meet publication standards.
[31] See STB, *Industry Data, Economic Data: Waybill.* More information at stb.gov/stb/industry/econ_waybill.html.

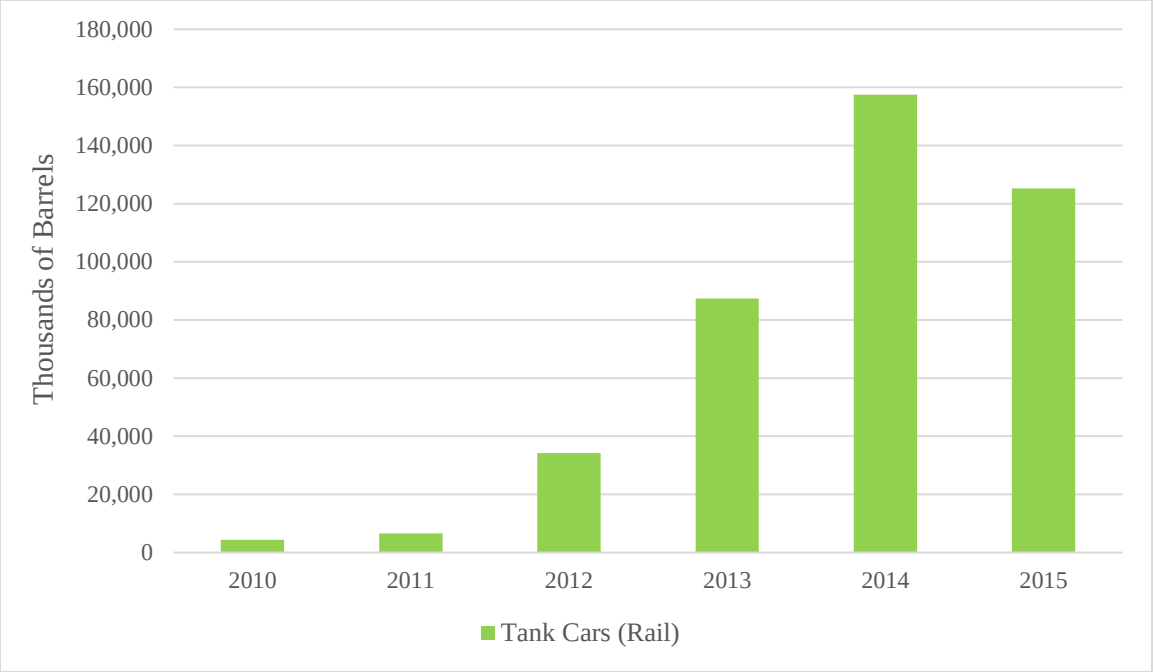
Figure 1. Indexed Ton-Miles for Hazardous Materials and Crude Oil and Ethanol (1995-2014)



The increase in crude oil ton-miles shipped by rail since the early 2000s largely accounts for the significant growth in ton-miles during this period. As shown in Figure 2, refinery receipts of crude oil shipped by rail increased over 2,700 percent between 2010 and 2015, despite a small decrease from the volume peak in 2014.[32]

[32] Energy Information Administration (EIA), *Annual Refinery Report, Form EIA-820 - Refinery Receipts of Crude Oil by Method of Transportation by PAD District, 2015*, 2016. Available for download at: https://www.eia.gov/dnav/pet/pet_pnp_caprec_dcu_nus_a.htm.

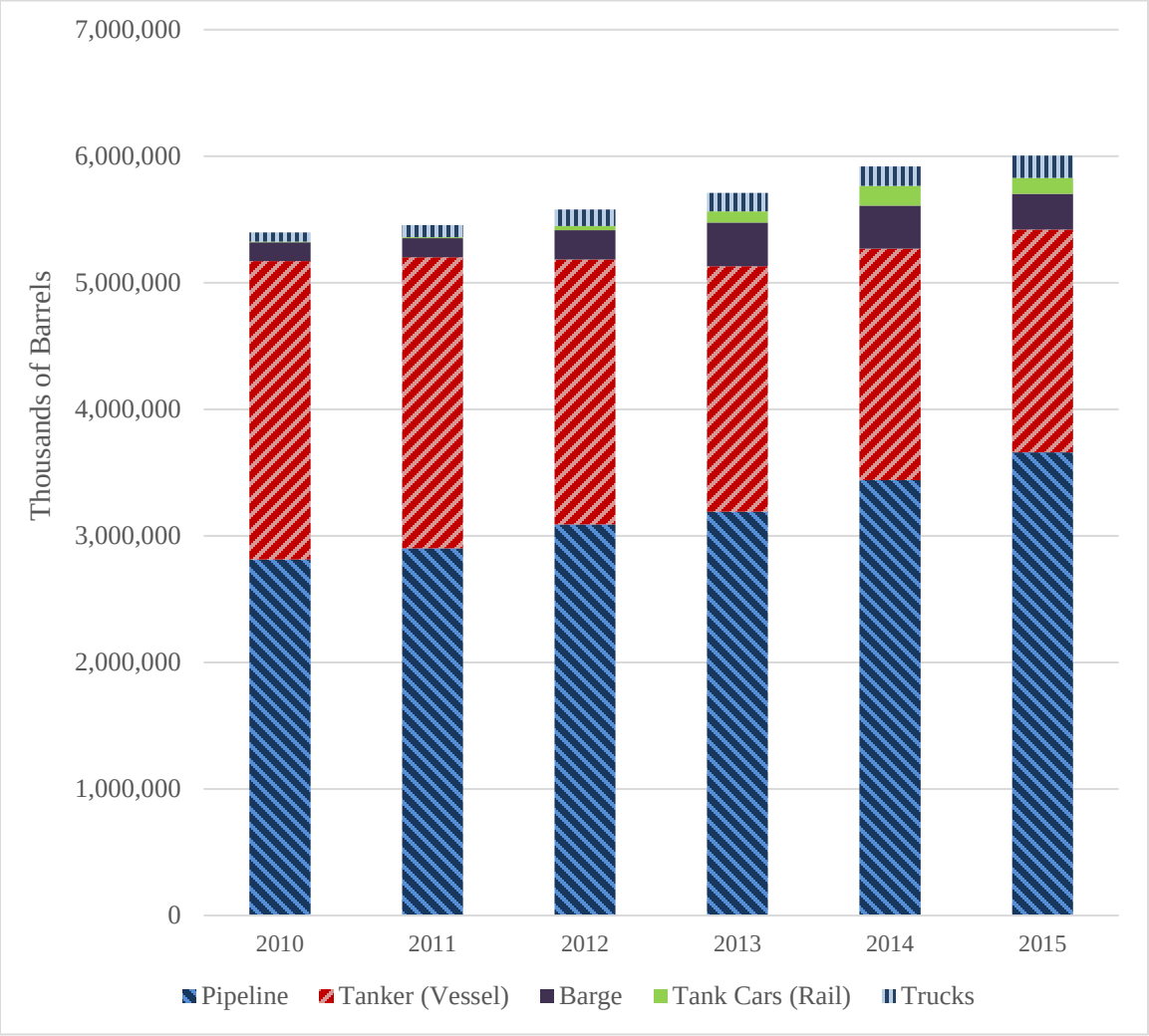
Figure 2. Refinery Receipts of Crude Oil by Rail (2010-2015)



For comparison, Figure 3 shows refinery receipts of crude oil shipped by rail and four other modes over the same period. While rail remains a small portion of the overall crude oil transportation volume, rail market share increased 2,500 percent between 2010 and 2015.[33] One source of increasing production, the Williston Basin's Bakken and Three Forks formations, accounts for much of the overall growth in crude oil transport by rail. Since 2007, advances in drilling methods and technology such as hydraulic fracturing or fracking, plus a better overall understanding of the Bakken, have led to output of over 1 million barrels/day since March 2014, despite fluctuating crude oil prices over the last ten years.[34]

[33] EIA, *Annual Refinery Report*, 2016.
[34] EIA, *Petroleum & Other Liquids Drilling Productivity Report, Production by Region*, released January 17, 2017. Available at: http://www.eia.gov/petroleum/drilling/#tabs-summary-2.

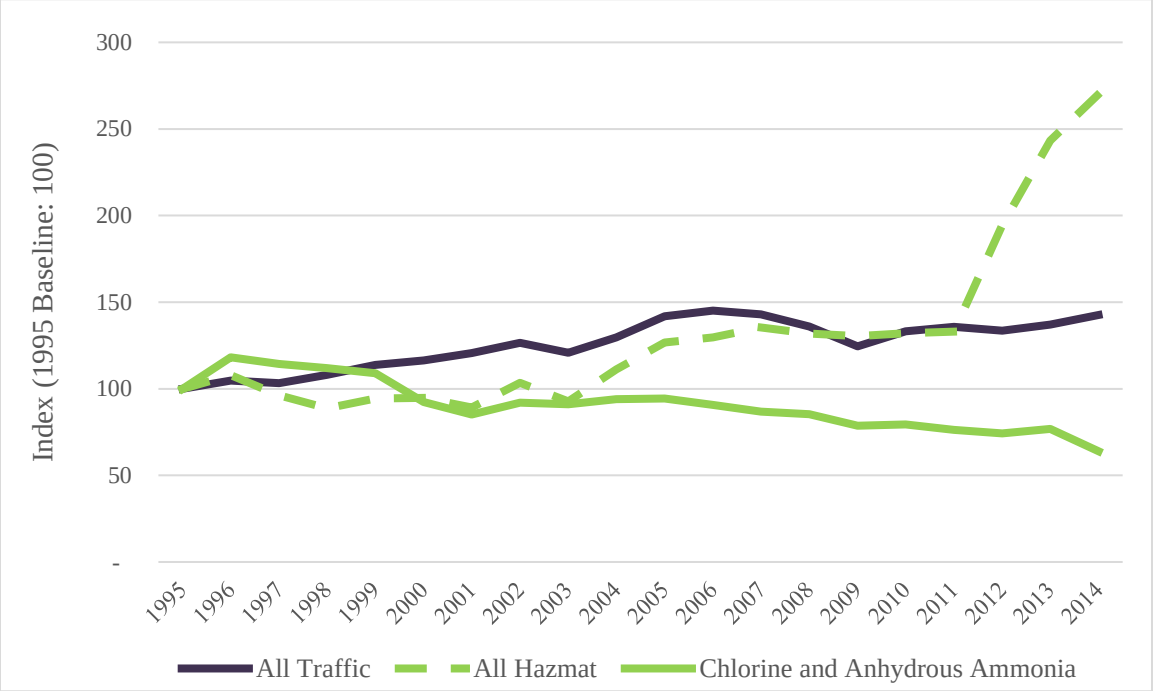
Figure 3. Refinery Receipts of Crude Oil by Method of Transportation (2010-2015)



Chlorine and anhydrous ammonia are two TIH/PIH commodities that pose elevated risk with respect to exposure and potential effects on populations. However, unlike crude oil and ethanol volumes of transport, chlorine and anhydrous ammonia ton-miles have remained relatively flat (or declined) since 1995, as shown in Figure 4.[35]

[35] See STB, *Industry Data, Economic Data: Waybill.*

Figure 4. Indexed Ton-Miles for Rail Freight, Hazardous Materials, and Chlorine and Anhydrous Ammonia (1995-2014)



1.2.4 Existing Federal Authority and Regulations

Regulatory Authority

Although freight rail transportation has been partially deregulated following the Staggers Rail Act of 1980, a significant number of safety, security, and economic regulations are in place. These statutory/regulatory authorities are summarized in Table 5 and described in more detail below.

Table 5. Key Freight Rail Transportation Agencies and Authorities

Agency	Citation	Authority
Pipeline and Hazardous Materials Safety Administration	49 CFR Parts 105-180 (Hazmat)	Federal safety authority for the transportation of hazardous materials. Develops and enforces regulations for the safe, reliable, and environmentally sound operation of the nation's pipeline transportation system and shipments of hazardous materials by land, sea, and air. Part 174 specifically applies to carriage by rail.
Federal Railroad Administration	49 CFR Parts 200-299	Federal authority for ensuring the safety of the Nation's passenger and freight rail operations and infrastructure by promoting safe, efficient and accessible rail transportation. FRA promulgates and enforces rail safety regulations; consolidates government support of rail transportation activities; administers financial assistance programs; and conducts research and development in support of improved railroad safety and efficiency and national transportation policy, including improved intercity passenger service.

Surface Transportation Board	49 CFR 1000-1119 and 1200-1399	Independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers. The agency has jurisdiction over railroad rate and service issues and rail restructuring transactions (mergers, line sales, line construction, and line abandonments). The agency also has authority to investigate rail service matters of regional and national significance.
Department of Homeland Security and Transportation Security Administration	5 CFR 4600-4699 and 49 CFR 1580	Responsible for preventing terrorism and enhancing security; managing our borders; administering immigration laws; securing cyberspace; and ensuring disaster resilience. Part 1580 includes specific rail transportation security requirements.

PHMSA regulates the transport of hazardous materials by rail in terms of general operating rules, product classification, handling and loading of tank cars, tank car standards, and specific requirements for various classes of hazmat.

FRA focuses on the safety, reliability, and efficiency of transporting people and goods by rail. For hazmat transport by rail, FRA coordinates with PHMSA to ensure that federal regulations are followed in general freight rail operations. FRA also employs a broad jurisdictional reach under the Hazardous Materials Regulations (HMR), which dictate the requirements for any hazmat shipment by rail. HMR applies to hazmat movements, packaging, training, and security in transportation.[36]

The Department of Homeland Security (DHS) also maintains oversight of hazmat movements. In 2010, the Transportation Security Administration (TSA) of DHS consulted with PHMSA in the published final rule (HM-232F),[37] which addresses security plan requirements applicable to the commercial transportation of hazardous materials by air, rail, vessel, and highway.[38]

In late 2008 and 2009, TSA, PHMSA, and FRA published final rules—in consultation with each other—that established security requirements, and codified a set of voluntary measures.[39] For example, the TSA rule requires hazmat carriers and facilities that handle movements within High Threat Urban Areas (HTUAs) to implement a chain of custody to ensure a secure exchange of specified hazmat and report shipment information to TSA upon request.[40] Following the September 11, 2001 terrorist attacks, Federal government agencies asked railroads to voluntarily take action to increase the security of transporting certain hazmat.

The STB retains economic regulatory authority over certain aspects of railroad service and rate issues. In

[36] See 49 CFR Parts 171–180 *Subchapter C–Hazardous Material Regulations*; FRA, *Hazardous Materials Compliance Manual*, 2011: 2-1–2-3.
[37] PMHSA, "Hazardous Materials: Risk-Based Adjustment of Transportation Security Plan Requirements," Final Rule, *75 FR 10974*, 2010.
[38] See also 49 CFR Part 172 *Hazardous Materials Table,* 2011 as adjusted by 75 FR 10974 – Final Rule.
[39] See TSA, "Rail Security Requirements," Final Rule, *73 FR 77531*, 2008; PHMSA, "Hazardous Materials: Improving the Safety of Railroad Tank Car Transportation of Hazardous Materials," Final Rule, *74 FR 1770*, 2009.
[40] See also 49 CFR Part 1520 *Protection of Sensitive Security Information*, 2010 and 49 CFR Part 1580 *Rail Transportation Security*, 2011 as adjusted by 73 FR 77531 – Final Rule and 74 FR 1770 – Final Rule.

particular, the STB is charged with determining the reasonableness of rates in cases of disagreement between shippers and carriers when such disagreement occurs on a route for which there is "market dominance" (defined as "an absence of effective competition" from other railroads or other transport modes).[41] Market dominance can arise particularly in rail contexts given the inefficiency of building multiple sets of parallel tracks; therefore, a single railroad may dominate the market for freight movements in areas where other modes like trucking are not cost-effective alternatives.

Access to Rail Transportation

To ensure shipper access to rail transportation, the United States Code (U.S.C.) includes a common carrier obligation that requires railroads to provide transportation on reasonable request by shippers.[42] The STB, which has long interpreted the common carrier obligation to include the transportation of hazardous materials, rules on complaints brought by shippers or carriers that concern this obligation.[43]

The common carrier obligation to transport TIH/PIH commodities has implications for risk and insurance. Previous decisions and rulings from court cases and STB and its predecessors have allowed few qualifying exceptions for TIH/PIH commodities from the obligation.[44] In general, if U.S. DOT and TSA regulate safety of transporting the commodity in question, there is a heavy burden on the carrier to prove why the regulations are insufficient and the carrier should not be required to complete the request.

Shippers and carriers are free to negotiate contracts that address the rates and other terms of transportation, including any special handling or operational practices for hazmat. Shipments moving under contract may also include insurance provisions or other elements of risk-sharing between the shipper and the railroad.

Safety Regulations

In addition to economic regulation, federal agencies also regulate the safety of rail hazmat shipments, as shown in Table 5. The HM-251 final rule,[45] for example, implemented the phase out of older, DOT-111 tank cars when used in certain train configurations referred to as a High-Hazard Flammable Trains (HHFT) and required revisions to operational controls (e.g., routing analyses and speed restrictions).[46] Agencies periodically revisit and update these regulations, issue new rules, or take other action in response to identified trends in hazardous materials movements or incidents in an effort to address specific underlying factors. Federal legislation also addresses hazmat; in August 2016, PHMSA published

[41] See 49 U.S.C. 10707(a), *Determination of market dominance in rail rate proceedings*, 2008. The STB lacks jurisdiction to regulate rates that produce a revenue-variable cost percentage that is less than 180 percent. See also 49 U.S.C. 10707(d), 2008. Approximately two-thirds of freight rail traffic moves at rates below that level.
[42] See 49 U.S.C. 11101, 2011.
[43] See 49 U.S.C. 11101, 2011.
[44] See STB Decision, *STB Finance Docket No. FD 35517*, 2013, in which the Board directed a carrier not to enforce a blanket lower speed limit for TIH/PIH shipments; STB Decision, *STB Finance Docket No.* 35219, 2009, in which the Board stated rail carriers have an obligation to "transport hazardous materials where the appropriate agencies have promulgated comprehensive safety regulations" and that carriers have a high burden of proof to establish that such movements require additional railroad-imposed safety measures (carriers must show that U.S. DOT and TSA safety regulations are unsatisfactory or inadequate to mitigate the safety and security risks of shipment).
[45] PHMSA, "Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains," Final Rule, *80 FR 26664*, 2015.
[46] See also 49 CFR Parts 171, 172, 173, 174, and 179 as adjusted by 80 FR 26664 – Final Rule.

HM-251C, which codified FAST Act requirements for flammable liquids and rail tank cars and expanded the phase out plan to include all DOT-111 tank cars used to transport Class 3 hazardous materials, regardless of inclusion in an HHFT.

Financial Responsibility

Although the current regulatory environment for the transport of hazardous materials includes a number of regulations, these regulations do not include a minimum financial responsibility requirement. The term "financial responsibility" refers to the demonstrated ability of an entity to pay damages up to a certain level for an accident it causes. Generally, entities can prove financial responsibility with valid insurance policies, surety bonds, or certifications that sufficient cash reserves are available to cover a set liability amount.[47] In comparison, federal aviation regulations,[48] trucking regulations,[49] and Canadian rail regulations[50] all require carriers to maintain minimum insurance coverage to operate. In practice, most railroads carry insurance at some level, though the amount of insurance varies greatly between Class I and Classes II and III. Section 2 of this report explores the availability and structure of current private market insurance to address the first study area outlined in the FAST Act on the current levels and structure of insurance available. Section 4 of this report discusses a number of alternative insurance models to address the third study area outlined in the FAST Act.

Financial responsibility is critical in order to fairly compensate victims of a catastrophic rail incident and to minimize the financial risk to the business operating a railroad. The projected costs of simulated worst case hazmat rail incident scenarios are extremely high due to the potential liability for personal deaths and injuries, property damage, environmental contamination and cleanup costs, evacuation costs, response costs, and transportation system disruption.[51] While the complexity of any rail incident and the number of factors involved necessitates rough approximations of damages when evaluating potential outcomes, modeled scenarios are illustrative when considered alongside the rare catastrophic incidents that have occurred in recent years. Section 2 describes a few of these incidents in some detail.

At least one of these incidents, occurring in Lac-Mégantic, Quebec, resulted in damages that exceeded the ability of the railroad responsible for the incident to pay. A Class II railroad was responsible for the incident, yet its assets and insurance coverage only provided a small fraction ($44.25 million) of the total damages the incident caused.[52] The costs of the incident greatly exceeded that amount, and contributions

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[47] Rawle O. King, "Deepwater Horizon Oil Spill Disaster: Risk, Recovery, and Insurance Implications", *Congressional Research Service*, 2010: 2. The Oil Pollution Act of 1990 mandates that lease holders of a covered offshore facility must demonstrate a minimum amount of financial responsibility; the cited report provides options for doing so.

[48] See 14 CFR Part 205, *Minimum coverage*, 1992.

[49] See 49 CFR Part 387, *Financial responsibility, minimum levels*, 2008.

[50] Canada Transportation Act, Division II, Subsection 92, Schedule IV: *Minimum Liability Insurance Coverage*, 2015. Available at: http://laws-lois.justice.gc.ca/eng/acts/c-10.4/FullText.html#h-116.

[51] See Anthony Michael Barrett, *Mathematical Modeling and Decision Analysis for Terrorism Defense*, (Carnegie Mellon University, 2009), as cited and discussed in Lewis M. Branscomb et al., *Rail Transportation of Toxic Inhalation Hazards: Policy Responses to the Safety and Security Externality*, (Harvard University Kennedy School of Government, 2010). Estimates place loss of life in the tens of thousands and total insurance losses over $5 billion.

[52] Tom Bell, "What does buyer see in small, bankrupt Maine railway?" *Portland Press Herald*, Jan. 30, 2014. Available at:

by shippers, the Canadian Government, and other entities to a $460 million settlement fund were necessary to more fully compensate the victims and community.[53] In addition, the Quebec provincial government submitted a claim of $400 million for cleanup and reconstruction.[54] These amounts greatly exceed the total assets of the railroad, which was forced into bankruptcy by the incident.

Section 3 explores the possibility of modeling worst case scenarios and translating incident outcomes into overall monetary damages. In the event of a catastrophic incident, shippers may be held partly or fully liable for damages in certain cases; however, there is a high likelihood that the carrier will be held at least partially liable,[55] and without sufficient insurance protection to cover very large expenses, the carrier may choose or be forced to enter bankruptcy proceedings.[56]

http://www.pressherald.com/2014/01/30/what_does_buyer_see_in_small__bankrupt_maine_railway__/. The sums included $25 million in insurance and $14.25 million in proceeds from sale

[53] http://www.cbc.ca/news/canada/montreal/lac-megantic-federal-government-settlement-1.3561924

[54] http://www.cbc.ca/news/canada/montreal/quebec-government-cp-lawsuit-lac-megantic-1.3815854https://www.thestar.com/news/canada/2014/06/16/quebec_claims_400_million_for_lacmgantic_train_disaster.html

[55] See Agis Salpukis, "CSX and Others Ordered to Pay Billions in '87 Rail Chemical Fire," *New York Times*, Sept. 9, 1997. Available at: www.nytimes.com/1997/09/09/business/csx-and-others-ordered-to-pay-billions-in-87-rail-chemical-fire.html.

[56] See Section 3.4.3; Robin Jeweler, "Railroad Reorganization Under the US. Bankruptcy Code: Implications of a Filing by Amtrak," *Congressional Research Service Report for Congress*, updated 2005: CRS-2–CRS-4.

2 Current Levels and Structure of Insurance

2.1 Overview

This section addresses the first requirement of Section 7310 of the FAST Act, namely the "level and structure of insurance, including self-insurance, available in the private market against the full liability potential for damages arising from an accident or incident involving a train transporting hazardous materials." Information in this section is drawn primarily from responses to the RFC,[57] interviews with agencies such as the STB, and a review of the existing literature, including academic studies, government reports, and the news media. Information available from these sources has been organized by topic area and summarized in Sections 2.2 through 2.4.

The discussion of existing conditions has several important limitations:

- The analysis is primarily limited to U.S. law, regulation, and industry practices, though there is some discussion of trans-border issues and Canadian developments.
- More detailed information on topics such as insurance costs, freight volumes, and rates cannot be presented because it is business-confidential or proprietary. Detailed information related to the insurance market, including underwriting considerations, was also unavailable due to confidentiality issues and the lack of RFC responses from the insurance industry.
- Among publicly available sources and RFC responses, there is more information on Class I railroads than Class II and Class III railroads, making it more difficult to develop a complete and precise understanding of the current insurance baseline of the freight rail industry involved with hazardous materials transportation.
- There can be rapid developments in the insurance market and in rail freight more generally, such that even relatively recent information may no longer be current.
- Major incidents involving hazmat rail transportation are low-probability, high-consequence events, meaning there is limited available information on incident costs and the assignment of liability.

2.2 Liability Framework

As a general rule, the underlying legal framework for assigning responsibility for hazmat rail incidents is based on common law theories of tort, principally those of negligence. This means in the event of a hazmat rail incident, a railroad, shipper, or other entity could be found legally liable for the ensuing property damage, personal injuries, or other losses if a court determines that party was negligent. There is no statutory liability cap for hazmat rail incidents, so there is no formal upper bound on the potential

[57] All submitted comments are available online at: https://www.regulations.gov/docketBrowser?rpp=25&so=DESC&sb=commentDueDate&po=0&dct=PS&D=PHMSA-2016-0074. See also PHMSA Notice and Request for Comments, *Docket ID: PHMSA-2016-0074*, 2016. Available at: https://www.regulations.gov/docket?D=PHMSA-2016-0074. RFC questions are listed in 5Appendix B.

financial liability from a given incident.[58]

Some environmental laws assign responsibility for cleanup costs to the parties responsible for the pollution, irrespective of intent or negligence, using a strict liability approach, sometimes called the "polluter pays" principle.[59] Aside from these statutes, liability for hazmat rail incidents is generally determined according to the normal operation of tort law. Alternatively, financial responsibility for incident damages can be settled without litigation through a mutually-agreed settlement among the parties and their insurers, an approach used for some recent high-profile incidents (see Section 2.2.1 for a discussion of the Graniteville, South Carolina, and Cherry Valley, Illinois incidents).

Liability determinations are made by the courts, and the law in this area varies to some extent across the 50 states. In the hazmat rail context, shippers and carriers are responsible for complying with federal regulations related to hazard identification, hazard communication, packaging, emergency response, and rail safety. Although the exact division of responsibilities can vary, entities in the supply chain are generally responsible for the portions of the transportation that are under their control (often described as "care, custody, and control" in liability insurance settings). That is, a hazmat shipper would be responsible for preparing its product for transportation in appropriate packaging, while the carrier would be responsible for its safe transport across the rail network. Railroads describe this division of responsibilities as representing a challenge for them because of the inherent risks of transporting hazardous materials over long distances, in some cases with safety issues caused by trespassers or the actions of other third parties that are difficult for the railroad to control.

As an empirical matter, human error by railroad employees and defects in track and structure have been the most common causal factors for railroad accidents.[60] Still, shippers could be held liable for incident damages to the extent that the incident is caused by improper preparation for transportation, incorrect product labeling (duty to warn), or other breach of the shipper's duty of care.[61] Other parties involved in the transportation and handling, such as a railcar owners, lessors, manufacturers, and maintenance contractors, or an originating railroad, could also potentially be held liable based on the facts and circumstances of the incident.

2.2.1 Liability in Selected Past Incidents

The study team reviewed a selection of high-consequence hazmat rail incidents to better understand

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[58] U.S. DOT, *The Transportation of Hazardous Materials: Insurance, Security, and Costs*, Report to Congress, 2009: 14. Available at: https://www.transportation.gov/sites/dot.gov/files/docs/The%20Transportation%20of%20Hazardous%20Materials%20-%20Insurance%2C%20Security%2C%20and%20Safety%20Costs%20--%20Dec%202009.pdf

[59] Examples include the Clean Water Act (so known following 1972 amendments); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known also as Superfund (1980); and the Oil Pollution Act (1990).

[60] See U.S. DOT, 2009: 22; and FRA, *FRA Incident Database: Accident Data as Reported by Railroads*, 2001-2016. Available for download at: http://safetydata.fra.dot.gov/officeofsafety/publicsite/on_the_fly_download.aspx. Train Operations / Human Factors and Track, Roadbed and Structure causes were cited in over 66.7% of all incidents in the queried data from 2001 to 2016.

[61] H.M. Chouest, P.R. Hitchcock, and M.J. Warren, "Shipper Liability for Hazardous Materials Incidents During Transportation and the Need for a Legislative Solution," *Transportation Law Journal*, 2014: Vol. 41, 129-155.

previous liability decisions and motivating factors. Each incident is unique, and the list below is not intended to be a comprehensive review or representative sample; instead, these incidents present salient examples of the different ways in which legal and financial responsibility have been resolved in high-consequence hazmat rail incidents.

- *New Orleans, Louisiana, September 9, 1987*: A pressurized tank car containing butadiene (a flammable gas) parked on CSX Transportation Inc. (CSXT) interchange tracks in a residential area leaked and ignited, creating a fire that burned for two days. The cause of the incident was traced, in part, to the improper substitution of a gasket by the tank car maintenance contractor. CSXT was also held partly liable for failing to inspect the car for leaks or remediate the leak. All told, nine defendants shared responsibility in the range of 5% to 15% of compensatory damages, including the shipper, carrier, and tank car owner. The court applied a different standard with respect to punitive damages, following a specific provision of Louisiana law.[62] This incident illustrates how liability may be allocated across multiple parties, particularly when the incident is attributed to defective packaging or similar factors.

- *Graniteville, South Carolina, January 6, 2005*: A Norfolk Southern (NS) manifest (mixed cargo) train left the main line and struck a parked NS train. During the crash sequence, multiple cars derailed, including a chlorine car that was breached, releasing toxic chlorine vapors. The incident led to 9 fatalities, 75 hospitalizations, a major evacuation effort, millions of dollars in property damage, and environmental damage that required an estimated $500,000 in remediation costs.[63] The National Transportation Safety Board (NTSB) determined the primary cause was the failure of NS employees to return a main line switch to the normal position after completing work at an industry track, in violation of the railroad's procedures and safe practice.[64] Based on media accounts and NS financial disclosures, it appears NS bore primary legal responsibility for the incident, as would be expected based on NTSB's findings. NS faced multiple lawsuits, including class actions and a lawsuit from a textile mill that went out of business after the incident, due in part to equipment damage caused by chlorine exposure. Most of these cases were resolved via confidential out-of-court settlements.[65] Although the total amount of claims is not public, NS issued a statement that it expected its insurance coverage was adequate to cover all claims, and that its portion (i.e., self-insured retention plus uninsured components) was in the range of $30 to $40 million.[66] Some portions of the claims were disputed between NS and its insurer and taken to

[62] *In re: New Orleans Train Car Leakage Fire Litigation*, Court of Appeal of Louisiana, Fourth Circuit, No. 2000-CA-0479, June 27, 2001.
[63] See the PHMSA Office of Hazardous Materials Safety, incident database entry for incident I-2005020751. This estimate from the report filer, Norfolk Southern, comprises remediation costs and may not reflect the total societal costs of environmental damage.
[64] National Transportation Safety Board (NTSB), "Collision of Norfolk Southern Freight Train 192 with Standing Norfolk Southern Local Train P22 with Subsequent Hazardous Materials Release," *Railroad Accident Report RAR-05-04*, Nov. 29, 2005. Available at: www.ntsb.gov/investigations/AccidentReports/Pages/RAR0504.aspx.
[65] "Most Norfolk Southern lawsuits settled in Graniteville tragedy", *Augusta Chronicle*, Jan. 3, 2015. Available at: http://chronicle.augusta.com/news/metro/2015-01-03/most-norfolk-southern-lawsuits-settled-graniteville-tragedy.
[66] "Norfolk Southern Estimates Graniteville Costs", *Norfolk Southern via PR Newswire*, Jan. 24, 2005. Available at: http://www.prnewswire.com/news-releases/norfolk-southern-estimates-graniteville-costs-54099732.html.

arbitration, with a ruling in favor of the insurer.[67] Separately, NS also agreed to pay a $4 million penalty to the Oil Spill Liability Trust Fund as part of a settlement with the Department of Justice (DOJ) and Environmental Protection Agency (EPA) for alleged violations of environmental law and notification requirements.[68]

- *Cherry Valley, Illinois, June 19, 2009*: A Canadian National Railway Company (CN) train derailed at a highway-rail grade crossing. Nineteen ethanol cars derailed, of which 13 were breached or lost product. A fire ensued, resulting in a fatality, several injuries, and an evacuation. The NTSB determined the direct cause of the derailment was a washout of the track structure due to heavy rain in the local area, along with CN's failure to notify the train crew about the known washout, plus other communications and maintenance failures.[69] At least one of the affected families sued CN and later settled the case for $36.2 million.[70] One of the reportedly important factors in the outcome of the case was that CN had been informed of the washout prior to the incident but did not take actions to avoid the incident.[71]

- *Lac-Mégantic, Quebec, July 6, 2013*: A Montreal, Maine and Atlantic Railway (MM&A) train containing crude petroleum experienced a brake failure while parked overnight. It rolled down a grade into the town center, where it derailed and exploded, leading to 47 fatalities and widespread property damage. Multiple lawsuits were filed and MM&A, faced with $200 million or more in liability and only $25 million in insurance coverage, ultimately declared bankruptcy.[72] Much of the cleanup and reconstruction costs fell to the provincial government, which is now seeking reimbursement from MM&A as well as other parties, including the Canadian Pacific Railway, which had served as the carrier for the first part of the train's journey, and other entities involved with the shipment. A group of firms including the shipper, refiner, and railcar lessor, while not acknowledging liability, have agreed to contribute to a compensation fund in exchange for immunity from lawsuits.[73] Litigation is pending in both the U.S. and Canada. Insights from this incident may be limited due to differences between the U.S. and Canadian legal systems.

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[67] "Norfolk Southern receives Graniteville ruling", *Norfolk Southern*, Mar. 21, 2011. Available at: http://nscorp.com/content/nscorp/en/news/norfolk-southernreceivesgranitevilleruling.html.
[68] "Railroad Company to Pay $4 Million Penalty for 2005 Chlorine Spill in Graniteville, SC", *Environmental Protection Agency*, Mar. 8, 2010. Available at: https://yosemite.epa.gov/OPA/ADMPRESS.NSF/d0cf6618525a9efb85257359003fb69d/18e25155f0e3cd90852576e00066a885!OpenDocument.
[69] NTSB, "Derailment of CN Freight Train U70691-18 With Subsequent Hazardous Materials Release and Fire, Cherry Valley, Illinois, June 19, 2009," *Railroad Accident Report RAR-12-01*, Feb. 14, 2012. Available at: http://www.ntsb.gov/investigations/AccidentReports/Reports/RAR1201.pdf.
[70] S. Driscoll, "NTSB issues final report on 2009 Cherry Valley train wreck", *Rockford Register Star*, May 23, 2012. Available at: http://www.rrstar.com/x587876582/NTSB-issues-final-report-on-2009-Cherry-Valley-train-wreck.
[71] R. Wronski, "Safety panel faults railroad for 2009 derailment," *Chicago Tribune*, Feb. 15, 2012. Available at: http://articles.chicagotribune.com/2012-02-15/news/ct-met-cn-derailment-20120215_1_zoila-tellez-tank-cars-derailment.
[72] "Lac-Mégantic rail disaster company MM&A files for bankruptcy", *CBC News*, Aug. 7, 2013. Available at: www.cbc.ca/news/business/lac-m%C3%A9gantic-rail-disaster-company-mm-a-files-for-bankruptcy-1.1338481.
[73] R. Gold and D. George-Cosh, "Oil Firms Agree to Pay Millions in Compensation for Quebec Train Blast," *Wall Street Journal*, June 10, 2015. Available at: https://www.wsj.com/articles/big-oil-firms-put-millions-into-compensation-fund-for-train-blast-1433980259.

2.3 Insurance Level and Structure

2.3.1 Insurance Concepts

Insurance is a contractually-based form of risk-sharing; the insured, in exchange for payment of a premium, receives from the insurer a promise of payment (or reimbursement) in the event of a covered loss, as defined in the contract. An "actuarially fair" premium is defined as one that exactly equals the expected covered loss, which is the product of the magnitude of that loss and the probability it will occur. Insurance underwriters use sophisticated risk models to assess these factors and make coverage and pricing determinations. However, for some coverage types, insurance may not be available because information limitations make the coverage too difficult or unprofitable to price correctly.

Adverse selection and *moral hazard* are two insurance-related terms that will be relevant to the following discussions of insurance levels, structures, and alternative models. Adverse selection is a consequence of asymmetric information between the insurer and insured, with the latter often having more knowledge of their risk and thus the actual likelihood of a claim. As a result, insurance coverage at any given premium level will be more attractive to higher-risk entities than to lower-risk ones. To the extent higher-risk entities cannot be screened out, their disproportionate presence in the insurer's risk pool will raise overall expected losses and necessitate higher premiums. This process can be self-reinforcing to the point where the insurer must pull out of the market entirely.

Moral hazard refers to behavioral changes that occur in the presence of insurance coverage, usually in the form of greater risk-taking on the part of the insured. In other words, because the insurance coverage insulates the insured from some of the financial consequences of their actions, the insured may not be as vigilant about minimizing risks. Most insurance policies have elements designed to reduce moral hazard by realigning the incentives between insurer and insured, such as deductibles and copayments. Insurers may also directly monitor an insured's activities. In the hazmat rail context, mandatory safety regulations from FRA and PHMSA—as well as contractual provisions and industry standards—can also reduce moral hazard.

In many industries, federal, state, and/or local regulations require firms engaged in activities that could put others at risk of injury or financial loss to carry liability insurance (or to use a similar mechanism, such as a surety bond). Such requirements are designed to insure that third parties who suffer injuries and losses as a result of the company's activity are appropriately compensated. In the absence of such a requirement, such losses could go uncompensated, particularly if the company is not sufficiently capitalized to cover such costs through self-insurance or asset sales.

Within the transportation field, some federal agencies require regulated entities to maintain liability insurance. For example, the Federal Motor Carrier Safety Administration (FMCSA) sets minimum financial responsibility requirements for all interstate motor carriers. (Section 4.2 provides more information on these and other agencies' requirements.) There is no federal statute requiring minimum insurance coverage levels for freight railroads, and neither STB, PHMSA, nor FRA have imposed minimum required levels of insurance coverage for railroads. Nonetheless, insurance coverage is an important component of railroads' overall approach to managing business risk and liability exposure, along with other practices such as employee training, infrastructure investments, and safety culture, leading firms to carry varying amounts of insurance coverage despite the lack of minimum requirements.

Insurance coverage levels and costs vary according to railroad class and are addressed separately for Class I and Class II/III railroads below, followed by a discussion of broader trends in this market.

2.3.2 Class I Railroads

According to the Insurance Information Institute, Class I railroads typically purchase policies covering five major areas: 1) bodily injury and property damage liability; 2) cargo loss or damage; 3) damage to others' rolling stock; 4) evacuation expenses, which includes environmental cleanup costs; and 5) coverage for worker injuries.[74]

All five coverage areas could be relevant to a particular incident, though much of the discussion of hazmat rail insurance is focused on the first area of bodily injury and property damage liability. For Class I railroads, liability coverage levels are typically in the range of $1 billion to $1.5 billion. Though the coverage generally applies to all commodities, railroads describe the selected coverage limits as reflective of the risks of hazardous materials in particular.[75] These policies typically feature a self-insured retention level of around $50 million, which must be covered by the insured (i.e., the railroad) before the insurance coverage begins to pay claims.[76] As illustrated by the incident summaries in Section 2.2.1 above, the self-insured retention has been an important component of the railroads' overall insurance structure.

The $1.5 billion coverage level appears to be the maximum coverage available in the private insurance market[77] and represents a 50% increase from the roughly $1 billion maximum coverage level that prevailed around 2008.[78] Media reports from 2014 indicated the presence of a new $1 billion supplemental liability coverage product from at least one insurer, which would raise the total coverage level to about $2.5 billion.[79] At this time, however, limited information exists as to whether railroads have availed of this coverage; one railroad noted, without mentioning a specific provider or policy, that such supplemental coverage generally has high premiums that make it "uneconomic to carry."[80]

Very little specific information was available on the level of liability coverage Class I railroads would obtain in the absence of risks from hazmat generally, or from TIH/PIH and flammable liquids more specifically. In the past, however, railroads have estimated coverage of roughly $250 to $300 million would be adequate if they were not subject to risk from TIH/PIH shipments.[81] NS noted in its comments that coverage over the $200 million level was "extraordinary coverage that is primarily necessitated by hazardous material, principally TIH/PIH traffic."[82]

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[74] Insurance Information Institute, Inc., "Railway Liability Insurance," accessed 2016. Available at: http://www.iii.org/article/railway-liability-insurance.
[75] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006.* NS noted that its coverage tier from $200 million to $1 billion was "primarily necessitated by hazardous material, principally TIH traffic."
[76] Insurance Information Institute, Inc., 2016; CSXT response to PHMSA *Docket ID: PHMSA-2016-0074-0021*; NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*.
[77] Insurance Information Institute, Inc., 2016; CSXT response to PHMSA *Docket ID: PHMSA-2016-0074-0021*.
[78] U.S. DOT, 2009; CSXT response to PHMSA *Docket ID: PHMSA-2016-0074-0021*.
[79] Zachary Tracer, "AIG Boosts Railroad Excess Liability Coverage to $1 Billion," *Insurance Journal*, Oct. 9, 2014. Available at: http://www.insurancejournal.com/news/national/2014/10/09/343131.htm.
[80] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*.
[81] U.S. DOT, 2009: 17.
[82] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*.

Railroads did not provide information on the current cost of their liability insurance coverage in the non-confidential portions of their responses. Railroads' annual reports to STB (R-1 filings) include some financial data on overall insurance costs, but do not allow liability insurance to be separated from other elements of insurance costs. As of 2008, Class I railroads were paying in the range of $18 to $25 million per year for coverage levels of $750 million to $1 billion.[83]

Class I railroads have noted in their filings with the Securities and Exchange Commission (SEC) that even $1 to $1.5 billion in coverage may not be adequate to cover a particularly high-cost hazmat incident. As one example, CSXT states in the Risk Factors section of its Annual Report (10-K) for 2015, "A train accident involving the transport of hazardous materials could result in significant claims arising from personal injury, property or natural resource damage, environmental penalties and remediation obligations. Such claims, if insured, could exceed existing insurance coverage."[84] All publicly traded Class I railroads have similar language in their filings, though the emphasis can vary. An additional risk factor often mentioned is that liability insurance is available only from a limited number of specialized providers, and that it may become prohibitively expensive or altogether unavailable at some point in the future – for example, after a future high-profile incident.[85]

2.3.3 Class II and Class III Railroads

Based on the limited available information, typical liability coverage limits for Class II railroads are in the range of $25 to $100 million, with retentions of $250,000 to $500,000, while Class III railroads have coverage of around $5 million and retentions around $50,000.[86] As with Class I railroads, these coverage limits are generally applicable to all commodities carried, including hazardous materials. The study team was generally unable to find further information on the distribution of coverage within this range, but one available example from media accounts of the Lac-Mégantic accident is that MM&A (a Class II railroad) had liability coverage of $25 million.[87]

Many Class II and Class III railroads are part of larger conglomerates or holding companies, which may have different insurance arrangements because of their corporate structure and ability to pool risk across entities. For example, Genesee & Wyoming is a public company which operates two Class II and 103 Class III railroads; the company noted in its 2015 Annual Report that it maintains liability insurance,[88] and although the coverage level was not stated, the self-insured retention level of $2.5 million per incident suggests the overall coverage limit is higher than for a typical Class II or Class III railroad.[89]

Class II and Class III railroads may also have business relationships with Class I railroads that can affect

[83] U.S. DOT, 2009: 17. This appears to be the most recent publicly available data on the cost of coverage for Class I railroads, as distinct from coverage limits.
[84] CSX, "10-K Annual Filing," 2015. Available for download at: https://www.csx.com/index.cfm/investors/sec-filings/?rptyr=2015. The annual report provides a comprehensive overview of the company for the past year.
[85] CSX, "10-K Annual Filing," 2015; also noted in CSXT response to PHMSA *Docket ID: PHMSA-2016-0074-0021,* and NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006.*
[86] Insurance Information Institute, Inc., 2016.
[87] "Lac-Mégantic rail disaster company MM&A files for bankruptcy," *CBC News,* Aug. 7, 2013. Available at: http://cbc.ca/news/business/lac-m%C3%A9gantic-rail-disaster-company-mm-a-files-for-bankruptcy-1.1338481.
[88] Genesee & Wyoming Inc., "Form 10-K for fiscal year ending Dec. 31, 2015," 2015.
[89] Genesee & Wyoming Inc., "Form 10-K for fiscal year ending Dec. 31, 2015," 2015.

their insurance situation. Twin Cities & Western Railroad (TCWR, a Class III railroad) noted in its response to the RFC that one of their Class I partners sought to make access to its tracks contingent on TCWR obtaining a minimum of $100 million in liability coverage, because TCWR originates unit trains of ethanol. TCWR described that coverage level as costing $200,000 or more per year, which would substantially raise the cost of their operations and potentially make them non-competitive in the market.[90]

2.3.4 Shippers

Shippers of hazmat ordinarily have insurance coverage for liability exposure that occurs in the course of their business. However, these policies vary widely, and relatively little information is available on shippers' coverage levels specifically for incidents that may occur during (or related to) rail transportation. The Fertilizer Institute (TFI) noted "many rail carriers require TFI members to indemnify them for certain types of losses that may occur while the TFI members' rail cars are under their care, custody and control even in the absence of any negligence on the part of the TFI member" and shippers retain insurance to cover these potential indemnity obligations.[91] These contracts are non-public and no information was received on the details of these indemnity provisions. In addition to contractual provisions, indemnity requirements can also be found in some railroads' tariff rates, a practice that has been the subject of cases before the STB.[92]

2.3.5 Insurance Market Developments and Considerations

Several sources describe the market for railroad liability coverage to be a highly specialized field, with a limited number of insurers who have the necessary industry expertise to assess risk and conduct underwriting. Railroads work together with the insurance industry on a continuous basis to provide information, share data, review operations, and tour facilities.[93] These efforts are described as addressing the information gaps that may otherwise be present in this specialized insurance market.

No responses were received directly from the insurance industry, and little to no information was available on the details of underwriting or the extent to which insurance costs vary according to risk factors. Railroads note that the insurance market is "dynamic" and subject to changes in underwriting considerations, product offerings, and rates.[94] TCWR stated liability coverage became more expensive, and high-value coverage more difficult to obtain, after the catastrophic rail accident at Lac-Mégantic, Quebec, in 2013.[95] Similar concerns about the cost and future availability of coverage were expressed in

[90] TCWR response to PHMSA, *Docket ID: PHMSA-2016-0074-0017*.
[91] TFI response to PHMSA *Docket ID: PHMSA-2016-0074-0011*.
[92] See STB Decision, *STB Finance Docket No. 35504*, 2014. Available at: https://www.stb.gov/home.nsf/case?openform&caseID=29809&caseDocket=FD_35504_0. In the case, the STB initially declined UP's request to issue a declaratory order acknowledging the reasonableness of the indemnification provision. In a follow-up action, STB declined a request from the American Chemistry Council, the Chlorine Institute, the Fertilizer Institute, and the National Industrial Transportation League to issue a show-cause order that would have required UP to demonstrate the tariff was reasonable. STB ruled the shipper groups could file a complaint seeking to show the tariff was unreasonable.
[93] CSXT response to PHMSA *Docket ID: PHMSA-2016-0074-0021*.
[94] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*.
[95] TCWR response to PHMSA *Docket ID: PHMSA-2016-0074-0017*.

the SEC filings and responses from Class I railroads.

Even where coverage remains available, small changes in the provisions of insurance policies can significantly affect liability exposure. For example, there is conflicting information about whether damages due to terrorism and other situations are covered under current policies,[96-97] and those provisions could conceivably change.

2.4 Common Carrier Mandate and Rail Pricing

As noted in Section 1.2.4, railroads have a legal requirement to provide transportation upon reasonable request, at their tariff rates, and for tariff rates and service terms to be available upon request.[98] This so-called "common carrier mandate" is often mentioned in the context of hazmat rail liability and insurance, because it means railroads cannot decline to transport certain materials simply because they are hazardous or because they expose the railroad to liability. Class I railroads' financial filings note this as a business risk over which they have little control (i.e., they must continue to accept certain hazmat shipments due to the common carrier provisions) and their responses to the RFC note it as a factor in their choice of liability insurance coverage limits.[99]

The common carrier mandate is not absolute, and the STB has authority to determine whether a request for service is reasonable.[100] In general, however, the STB and its predecessors have ruled that railroads operating under the common carrier mandate may not refuse to carry particular hazmat commodities. There may be limits to railroads' ability to shift legal liability to the shipper via their tariff provisions, as such tariffs could be challenged by shippers in cases where the STB has jurisdiction.[101] Similarly, while railroads may also apply other conditions to hazmat shipments, such as lower speed limits or smaller shipment sizes, where warranted by safety concerns, the reasonableness of such conditions may be reviewed by STB upon appeal by shippers.[102] These tariff provisions are important because they influence, either directly or indirectly, railroads' choices with respect to the amount of liability insurance coverage they purchase.

When adjudicating the "reasonableness" of a challenged rate on a route with market dominance, STB applies statutory criteria,[103] supported by the Uniform Rail Costing System (URCS) model and other costing approaches. URCS is a statistical model that uses data from Class I railroads' annual reports to generate estimates of the system-wide variable cost of a rail shipment based on factors such as ton-miles, terminal and switching costs, locomotive and freight car costs, crew costs, and special handling.[104] Rates

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[96] Insurance Information Institute, Inc., 2016.
[97] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*.
[98] See 49 U.S.C. 11101, 2011.
[99] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*.
[100] AAR response to PHMSA *Docket ID: PHMSA-2016-0074-0008*, citing Interstate Commerce Commission (ICC), "Classification Ratings of Chemicals, Conrail" *3 I.C.C.2d*, 1986: 331, 337.
[101] U.S. DOT, 2009: 10, in part citing Akron, Canton & Youngstown RR v. ICC, *611 F.2d 1162*, 1979; NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*, citing STB *Docket Nos. FD 35705, FD 35504*, and *NOR 42130*.
[102] See STB Decision, *STB Finance Docket No. 35517*, 2013. Available at: https://www.stb.gov/home.nsf/case?openform&caseID=29809&caseDocket=FD_35517_0.
[103] See 49 U.S.C. 10701, *Standards for rates, classifications, through routes, rules, and practices*, 2007.
[104] More detail on the URCS model is available via the STB's online user manual, "Railroad Cost Program," available at:

that produce revenue-to-variable cost ratios of less than 180 percent for the shipment in question, based on the URCS estimate, are presumed to be reasonable and are outside of the STB's jurisdiction. Rates with higher ratios can be challenged by shippers and reviewed by the STB on a case-by-case analysis. In practice, it can be a lengthy, costly process for a shipper to challenge a rate with the STB,[105] particularly under the Stand Alone Cost methodology used in the largest rate disputes.

Other than an adjustment for potential cargo loss and damage, the URCS model estimates railroad costs largely independent of commodity type. In particular, the model allocates annual insurance costs across all shipments roughly equally rather than according to individual shipment risk characteristics.[106] Railroads argue the URCS model does not therefore reflect the additional risk associated with hazmat.[107] However, because railroads' annual reports to the STB do not break out insurance expenses by commodity type, there is currently no way for the model to support a more accurate allocation of insurance costs to shipment types.

https://www.stb.gov/stb/docs/URCS/2011/Railroad%20Cost%20Program%20Release/Railroad%20Cost%20Program_User%20Manual_Dec2011.pdf.

[105] InterVISTAS, *Surface Transportation Board: An Examination of the STB's Approach to Freight Rail Rate Regulation and Options for Simplification*, Project FY14-STB-157, 2016: 13, 16.

[106] U.S. DOT, 2009: 19, fn 41.

[107] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*, 2016: 6. For example, the NS response notes that "the rate regulatory regime at the STB treats the risks associated with a catastrophic event involving hazardous materials the same as it treats a derailment of coal."

3 Necessary and Appropriate Levels of Insurance

3.1 Overview

This section addresses the second requirement of Section 7310 of the FAST Act, namely "the level and structure of insurance that would be necessary and appropriate to: 1) efficiently allocate risk and financial responsibility for claims; and 2) ensure that a railroad carrier transporting hazmat can continue to operate despite the risk of an accident or incident." The section briefly describes the nature of the risk of hazmat rail incidents, including causes and factors affecting the likelihood and consequences of a hazmat rail incident. Next, the market for hazmat freight by rail and the extent to which risk is efficiently allocated under the current market structure are discussed. Finally, the question of the adequacy of the current insurance structure is considered in the context of the current market.

Source data is drawn from responses to the RFC and a review of existing literature, including academic articles and government reports. A number of data sources were used to supplement this, including the STB waybill sample and the FRA and PHMSA incident databases.

Analysis in this section was limited by a lack of publicly available information on insurance and commodity flow data for Class II and Class III railroads. Incident data is available for all railroad classes, although PHMSA data on hazmat release does not include railroad class. Without knowledge of Class II and Class III commodity flows, it is challenging to understand the extent to which risk lies with smaller railroads (who are financially less prepared for a costly incident) than large railroads.

Like Section 2, limitations in available information of proprietary or business-sensitive nature, including rail carrier practices, negotiated shipping rates, and the insurance market baseline affects conclusions. In particular, a lack of responses from the insurance industry and limited information regarding insurance market conditions makes it challenging to assess the suitability of current insurance levels.

3.2 The Risk of Rail Hazardous Material Incidents

The FAST Act requires an assessment of the structure and level of insurance necessary to efficiently allocate the risk associated with hazardous material rail transportation.[108] Insurance is a contractual method of distributing risk between parties, and some understanding of the risk generated by the transportation of hazardous materials by rail is necessary to ascertain the adequacy of an insurance structure to allocate that risk.

Risk is an anticipation that an adverse event may occur in the future (i.e., risk is *ex ante*, before the fact). The expected value of risk can be thought of as the probability of an incident occurring (chlorine gas escaping, ethanol igniting, etc.) multiplied by the expected consequence of that incident.

Actors that are party to a hazmat shipment have steps they can take to either reduce the probability of an incident occurring or mitigate the consequences if an incident does occur, effectively reducing the total amount of risk associated with a shipment. For instance, a host railroad can perform preventative maintenance on a track to reduce the likelihood of derailment, an operating railroad can develop operating

[108] Section 7310 of the FAST Act. Available online at: https://www.gpo.gov/fdsys/pkg/BILLS-114hr22enr/pdf/BILLS-114hr22enr.pdf

procedures and checklists, a shipper can use a more robust container, or a municipality or railroad can train first responders to most effectively respond to a hazmat incident.

Each actor chooses to engage in mitigation through some evaluation of the costs of mitigation and the benefits. Railroads face significant incentives from internal costs to behave safely, as accidents damage their property and delay and obstruct their shipments. The extent actors are held liable for possible external costs also influences the extent actors chose to mitigate preventable risk.

The economically efficient allocation of risk occurs when all of the parties to the risk are held accountable for their contribution to the risk. The main means for accountability is financial responsibility: the requirement to pay for damages creates an incentive to avoid preventable risk. For all aspects of risk, the parties ideally face incentives to internalize the risk and pass it on in the cost of their services to the shippers, who are the ones to decide whether the risk is worth incurring in order to secure the benefits of the transport. Shipper efforts to reduce the preventable risk generally are reflected in the prices charged to shippers by carriers.

This section seeks to understand the risk of incident from hazmat transportation by rail. This includes the factors that affect the likelihood and consequence of an incident, and the entities who have some control over those factors. This section also includes an examination of present risk, through analysis of exposure trends and the costs from worst case scenarios.

3.2.1 Factors Affecting Hazmat Rail Incident Risk

Understanding the risk of hazmat rail incidents is useful to assess whether risk of hazmat incidents is efficiently allocated and adequately met by the current insurance structures for the railroad industry. This section describes the factors affecting both the likelihood and consequence of a hazmat rail incident, and examines the parties that have control over these factors under the current regulatory and liability framework.

It is important (while perhaps obvious) to note that a release of hazmat is contingent on the presence of hazmat. Many of the situations that result in a hazmat release could occur with an inert substance and have drastically less harmful consequences. In that sense, as the party initiating and benefiting from the shipment, at least a portion of the risk is due to the shipper.

Hazmat incidents on rail can occur in a number of ways, including:

- **Packaging failure:** A faulty package (in this case, a tank car or component of a tank car) could cause a release of hazmat.
- **Rail accident:** Most serious rail hazmat incidents occur with a derailment, where a train leaves the track and a railcar is punctured or ruptured.[109] Other rail accidents that can result in hazmat release without derailment include collisions between trains, or an automobile or other external vehicle colliding with a hazmat car and causing release.
- **Act of God**: A weather event such as a flood or storm could cause a release of hazmat or an accident resulting in a derailment.

[109] It should be noted that hazardous materials packages are designed to withstand conditions normally incident to transportation. 49 CFR § 173.24(b). Accidents are not normally incident to transportation.

- **Terrorism/external threats**: External threats such as weapons or explosives could be used to force a release of hazmat.

These incidents can occur while a train is stationary or moving, including during loading and unloading phases.

Factors Affecting Incident Likelihood

There are a variety of factors that can affect the likelihood and magnitude of consequences of a hazmat rail incident. These include:[110]

- Railroad equipment design
- Packaging equipment design
- Track quality
- Track type
- Train operations human factors
- Signaling and communication human factors
- Method of train operation[111]
- Traffic exposure
- Routing

Table 6 shows the number of incidents by top-level cause, as well as the number of those incidents that involved damage or derailment to cars carrying hazmat. These incidents are collected from FRA incident data, which is focused on all train accidents that result in injury, death, or damage to equipment or roadbed.[112] This database records information on whether the trains in question included hazmat cars (and if these cars released), but only for incidents that resulted in death, injury, or railroad equipment damage. PHMSA also collects data on hazmat releases, which include all incidents where hazardous material releases related to rail transportation. There is some overlap between these two databases, particularly in the case of severe incidents, but they focus on two different universes of incidents.[113]

[110] See the FRA Incident database, 2001-2016; AAR response to PHMSA *Docket ID: PHMSA-2016-0074-0008*; Christopher P.L. Barkan, C. Tyler Dick, and Robert Anderson, "Railroad Derailment Factors Affecting Hazardous Materials Transportation Risk," *Transportation Research Record 1825 Paper No. 03-4429*, 2003; Xiang Liu, M. Rapik Saat, and Christopher P.L. Barkan, "Integrated risk reduction framework to improve railway hazardous materials transportation safety," *Journal of Hazardous Materials 260*, 2013: 131-140.

[111] The FRA Incident Database includes 16 methods of operation: Advanced Train Control System (ATCS), auto train control, auto train stop, cab signals, traffic control, interlocking, automatic block rules, current of traffic, time table/train orders, track warrant control, direct traffic control, yard limits, special instructions other than main track, positive train control (PTC), and other.

[112] FRA, *FRA Guide for Preparing Accident/Incident Reports*, 2011: 1.

[113] The PHMSA hazmat incident database only includes incidents involving release of a hazardous material, and hence derailments involving trains carrying hazmat that do not result in a release are not reported. The FRA database contains all derailments that meet certain reporting thresholds, including a minimum cost threshold. The reporting entity must report whether hazardous materials were present on the train, even if no release occurred; however, the reporting entity is not required by FRA to report the type of hazardous materials present if no release of hazardous materials occurred.

Table 6. Top-Level Causes of Rail Incidents Involving Hazmat (2001-2016)[114]

Top Level Cause	Number of Incidents involving Hazmat	% of total	% of Incidents involving Damage or Derailment of Hazmat Cars	Average Number of Hazmat Cars Damaged or Derailed
Train Operations / Human Factors	5,317	41.8%	47.9%	2.1
Track, Roadbed and Structure	3,410	26.8%	53.9%	3.3
Mechanical and Electrical Failures	1,503	11.8%	35.9%	2.6
Signal and Communication	300	2.4%	52.6%	1.9
Miscellaneous Causes Not Otherwise Listed	2,175	17.1%	31.5%	2.2
Totals	**11,198**		**45.4%**	**2.5**

The presence of hazmat itself is not a major factor affecting the likelihood of a rail accident, though it is obviously a precondition for a hazmat release and can impact the level of consequences of the rail accident.[115] Most of these causal factors are attributable to railroad behaviors, with the exception of any incidents resulting from noncompliant packaging or packaging failures (which would be included in the "miscellaneous causes" list). Track issues (which might result in derailment) are the most likely to result in damage or derailment of hazmat cars.

Class II and Class III railroads accounted for 17% of the incidents involving damage or derailment of hazmat cars between 2001 and 2016. Without data on ton-miles carried for Class II and Class III railroads, it is difficult to understand if Class II and Class III railroads have a different exposure-weighted likelihood of release than Class I railroads. Table 7 shows the numbers of incidents and locations for Class I and Class II and Class III railroads during this time period. Incidents involving release were much more likely to take place on the mainline than in a yard.

Table 7. Hazmat Incidents Differentiated by Railroad Class and Location (2001-2016)[116]

		Hazardous Materials Incidents with Damage or Derailment of Hazmat Cars	Average Proportion of Hazardous Materials Cars that Released
Class I Railroads	Mainline	1,051	10.7%
	Yard	2,742	2.8%
Class II & III Railroads	Mainline	296	16.5%
	Yard	465	2.0%

[114] Sourced from the FRA incident database, 2001-2016 data. Note that the total sum of hazmat incidents by top-level cause does not equal the total sum of hazmat incidents due to the 1,507 incidents with two top-level causes.
[115] Branscomb et al., 2010.
[116] FRA incident database, 2001-2016.

Factors Affecting Incident Consequence

A number of factors can determine the consequences of an incident, including the size of the release, the properties of the material released, the environmental conditions at the site of release, and any mitigation and response.

Factors Affecting Size of Release

Some factors affecting the size of the release include:

- **Number of hazmat cars:** The presence of multiple hazmat cars logically increases the potential for as well as the size of release. The number of hazmat cars is generally negotiated between shippers and carriers.
- **Train speed:** Generally, moving at a higher speed increases the damage to the train in the event of an impact or derailment, which can increase the likelihood that multiple cars rupture or are damaged. Train speed is primarily regulated by FRA. The train speed of particular shipments is negotiated to a limited extent between shippers and carriers. Ultimately, railroad employee operators control the speed of a given hazmat train during its course.
- **Train length:** A longer train weighs more, increasing momentum and therefore affecting the ability of rail operators to avoid impact.
- **Placement of hazmat cars:** Placement of hazmat cars in a train can affect the size of a release. One required practice involves the placement of buffer cars filled with non-hazardous material on trains to limit the size of a possible explosion or fire in the event of an accident.[117]

Many of these factors are regulated by FRA or as part of the HMR.[118] These practices are also negotiated between shippers and carriers, although in practice, there has been substantial litigation over the extent carriers may, consistent with their common carrier obligations, insist on safety measures that exceed existing FRA and PHMSA regulations for safety.[119]

In Table 7, there is some indication mainline incidents that occur on Class II and Class III railroads have been more severe in terms of the average number of hazmat cars releasing than accidents on Class I railroads. This may reflect differences in preparation and response for rail accidents between carriers. The Mosier, OR fire chief noted in his response to the RFC that the UP had a response crew that was helpful in mitigating the damage from the incident in his jurisdiction.[120]

Properties of Material Released

As discussed in Section 1.2.3, not all hazmat are equally hazardous. TIH/PIH and flammable liquids pose a particularly large threat when released. Materials that are TIH/PIH can be devastating when released in

[117] See 49 CFR § 174.85, *Position in train of placarded cars, transport vehicles, freight containers, and bulk packagings,* 2005. Unit trains refers to the practice of shipping a single commodity via a train running between a single origin and destination, which can provide operational efficiencies. Buffer cars are required as placarded hazmat cars are not allowed within six cars of the engine or caboose (if occupied), when train length permits.
[118] Branscomb et al., 2010.
[119] See STB Decision, *STB Finance Docket No. 35517,* 2013.
[120] Jim Appleton response to PHMSA *Docket ID: PHMSA-2016-40070074007-0010.*

close quarters. Multiple publications analyzing issues of catastrophic risk for rail carriers focus on TIH/PIH, and rail carriers have repeatedly focused on TIH/PIH as an area of concern (see Section 3.2.2). Common TIH/PIH materials include chlorine (which is used for drinking water purification and a variety of industrial uses) and anhydrous ammonia (a main ingredient in fertilizer, among other uses).[121]

Crude oil and flammable liquids can catch fire or ignite under the right conditions. Increasingly, crude oil is carried via high hazard flammable unit trains, which exacerbate the size of a possible fire. The Lac-Megantic disaster, described in Section 2.2.1, is one example of a high hazard flammable unit train incident; of 72 consecutive crude oil cars, 63 derailed, and almost all of them were damaged.[122]

Much of the growth in crude oil by rail shipment in the U.S. is attributable to exploration in the Bakken region of North Dakota. Rail shipments of crude oil out of this region are typically shipped in high hazard flammable unit trains.

Environmental Conditions at the Site of Release

Features or conditions at the site of the release can dramatically affect the consequences of an incident. Proximity to a HTUA could mean significantly higher numbers of fatalities, injuries, and more property damage. TSA regulates the handoffs of TIH materials in HTUAs. Routing of hazmat is regulated by PHMSA and enforced by FRA, with regulations in 2015 specifically affecting routing of trains carrying large volumes of flammable liquids like crude oil and ethanol.[123]

3.2.2 Understanding Present Risk

Analysis of the trends and flows of hazmat (and the trends in recent incidents) gives another picture of current risk. Understanding the consequences of worst case incidents helps to understand what levels of insurance are necessary to adequately meet societal need.

Exposure Trends and Rate of Incidents

Exposure to hazardous materials has changed dramatically in recent years, with significant increases in crude oil-by-rail traffic and, to a lesser extent, ethanol traffic. For both commodities, this represents a significant increase in the number of cars shipped, rising to 14 times 1995 levels for ethanol by 2014 and, for crude oil, to 44 times 2009 levels by 2014 (as shown in Figure 5). Carloads for TIH/PIH (represented with chlorine and anhydrous ammonia, shown in Figure 6) have remained relatively flat, although showing some decline. The total number of carloads for chlorine and ammonia was about 68,000 in 2014, a very small portion of all traffic, though as noted above a release of a single carload of TIH/PIH can be deadly and result in a costly incident.

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[121] Branscomb et al., 2010.
[122] Transportation Safety Board of Canada, "Lac-Mégantic runaway train and derailment investigation summary," last modified Oct. 28, 2014. Available at: http://www.tsb.gc.ca/eng/rapports-reports/rail/2013/r13d0054/r13d0054-r-es.asp.
[123] PHMSA, "Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains," Final Rule, *80 FR 71952*, 2015. This final rule affects 49 CFR Parts 171, 172, 173, 174, and 179. Available at: https://www.transportation.gov/sites/dot.gov/files/docs/final-rule-flammable-liquids-by-rail_0.pdf.

Figure 5. Number of Cars shipping Crude Oil and Ethanol (indexed to 1995)[124]

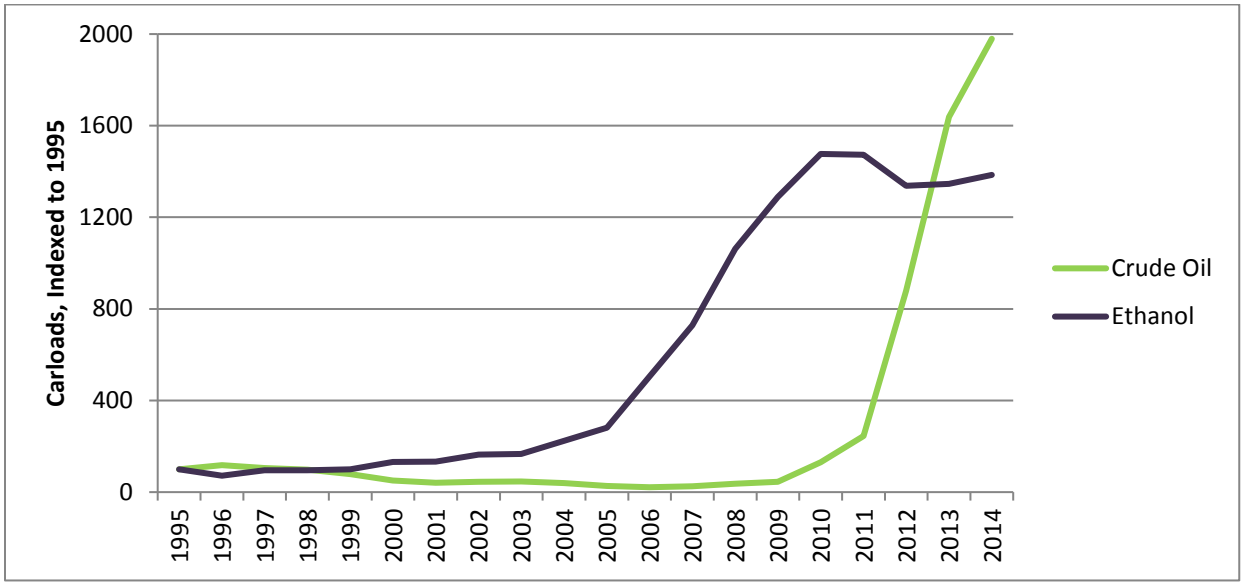
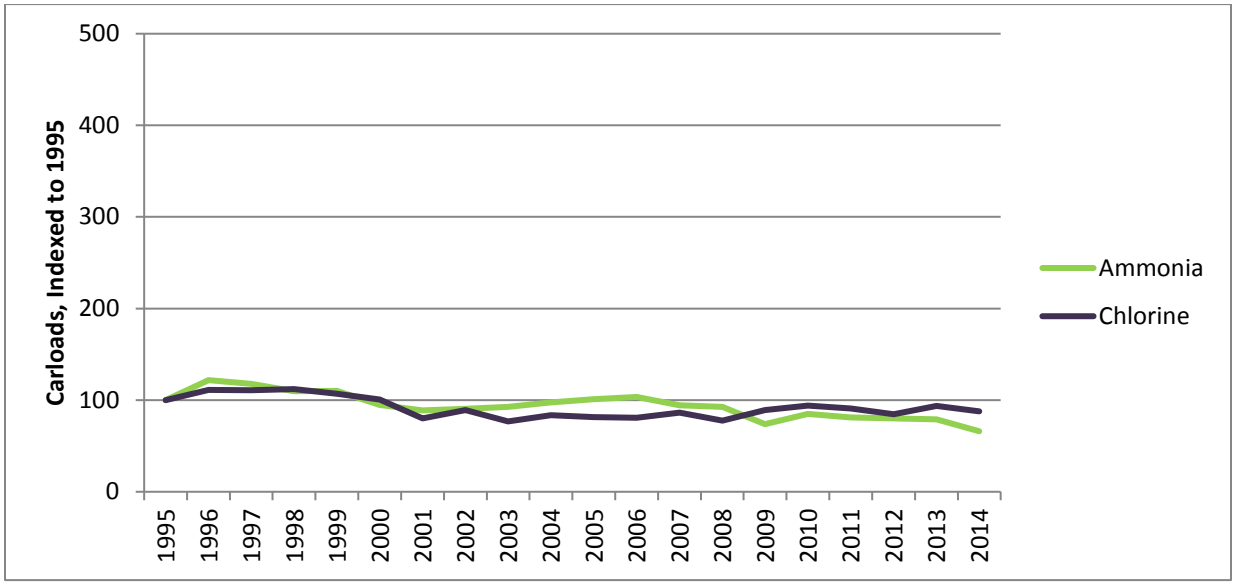


Figure 6. Number of Cars shipping Chlorine and Anhydrous Ammonia (indexed to 1995)[125]



For crude oil, the increase in ton-miles is also due to longer average trips, growing significantly as Bakken crude has been explored and shipped, as can be seen in Figure 7. Average miles per shipment for TIH commodities have remained comparatively flat, shown in Figure 8.

Class II and Class III traffic is included in the data shown in the figures, but cannot be broken out. As the STB Waybill is a sample survey, and because most short line shipments are done in coordination with a

[124] See STB, *Industry Data, Economic Data: Waybill.*
[125] See STB, *Industry Data, Economic Data: Waybill.*

Class I partner or are passed along to a Class I for the bulk of their journey, it is difficult to ascertain how much hazmat moves via Class II and Class III railroads.

Figure 7. Average Miles for Shipment for Crude Oil and Ethanol (indexed to 1995)[126]

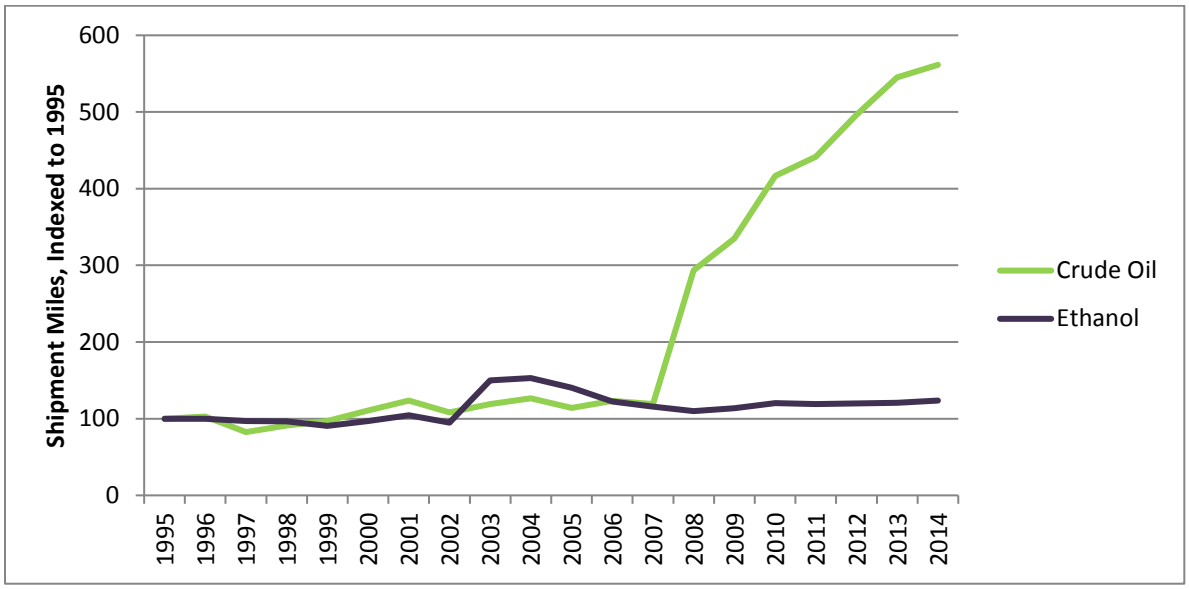
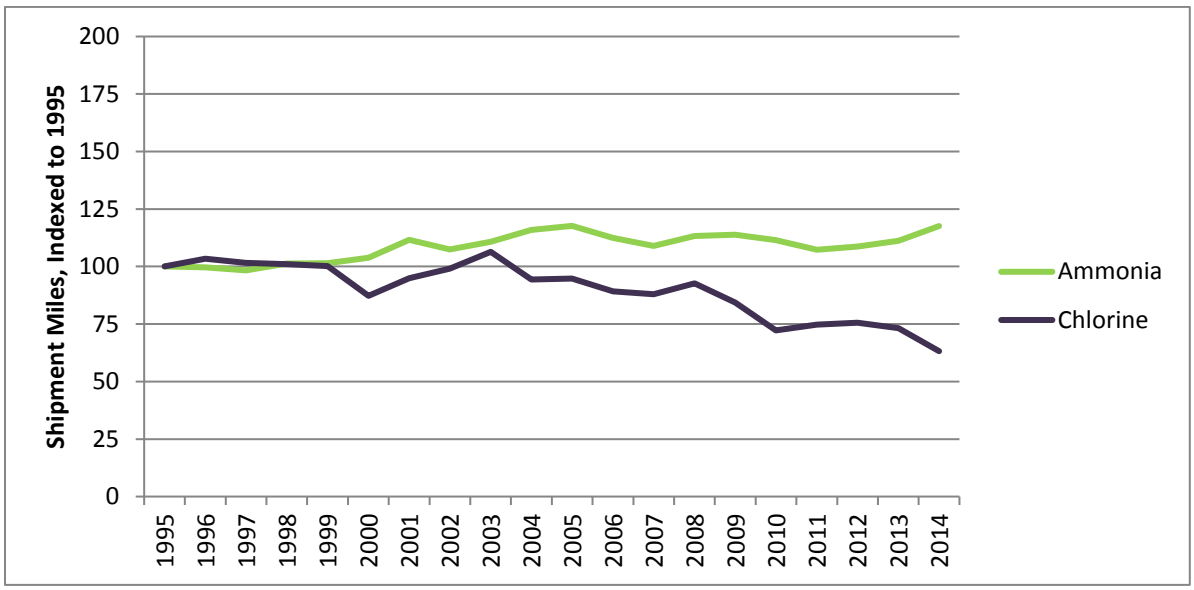


Figure 8. Average Miles for Shipment of Chlorine and Ammonia (indexed to 1995)[127]

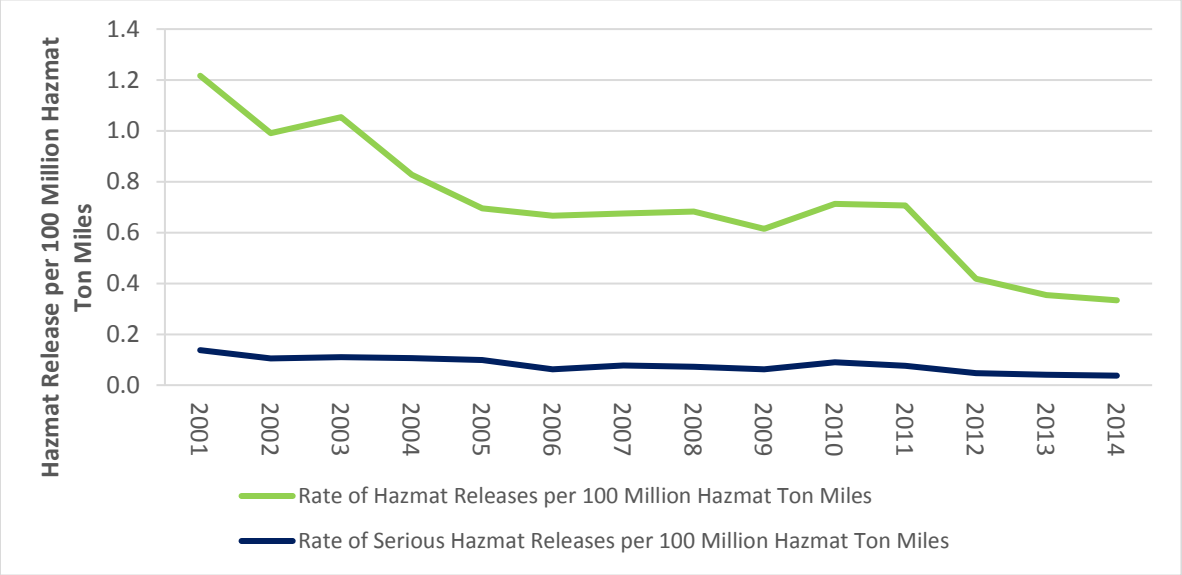


Over the past 15 years, the rate of hazmat releases on rail per hazmat ton mile has dropped, as shown in Figure 9. These data are derived from the PHMSA incident database, which includes all hazmat releases during loading, unloading, or transport. In general, rail incidents with a hazmat release are rare and appear

[126] See STB, *Industry Data, Economic Data: Waybill.*
[127] See STB, *Industry Data, Economic Data: Waybill.*

to be declining in frequency, an indication of improved rail safety performance over time. In 2014, for instance, a hazmat release occurred once every 300,000,000 hazmat rail ton-miles travelled.[128] A PHMSA-designated serious hazmat release occurred once per 2.7 billion ton-miles travelled.[129]

Figure 9. Rate of Hazmat Release Incidents per 100 Million Rail Hazmat Ton Miles[130]



Exposure is ultimately the core of hazmat risk. There is no possibility of damage from a hazmat incident if there is no hazmat exposure. Management of the TIH/PIH supply chain, including modifying production and end-use locations to minimize travel, is one possibility to reduce exposure. Another is substituting less hazmat for some of these uses, such as using ultraviolet light for drinking water purification as opposed to chlorine.[131]

Worst Case Scenarios

Incident consequences can take many forms, including property damage, environmental contamination and cleanup costs, evacuation costs, response costs, transportation system disruption, and personal injuries and fatalities. As noted above, the severity of these consequences will vary with the nature and location of the incident, the properties of the material released, environmental conditions, and incident response.

At present there do not appear to be any formal definitions of "worst case scenario" for hazmat rail, nor a consensus among stakeholders as to how such an estimate would be generated. Some related industries,

[128] See STB, *Industry Data, Economic Data: Waybill*; PHMSA, "Incident Statistics - Incident Reports Database," accessed Nov. 2016. Available for download at: http://www.phmsa.dot.gov/hazmat/library/data-stats/incidents.
[129] This statistic is derived from the PHMSA Incident Reports Database and the STB waybill sample. A PHMSA-designated serious incident includes one or more of the following: fatality or major injury, evacuation of more than 25 people, alteration of a major flight plan or operation, release of radioactive materials, release of more than 11.9 gallons or 88.2 pounds of a severe marine pollutant, or the release of a bulk quantity of hazardous materials (119 gallons or 882 pounds). All of the incidents described in Section 2.2.1 qualify as PHMSA serious incidents.
[130] See PHMSA Incident Reports Database; STB, *Industry Data, Economic Data: Waybill.*
[131] Branscomb et al., 2010.

such as pipeline transportation, employ standardized methodologies such as "worst case discharge" formula, which are used in contingency planning for oil spills.[132] In addition, in a July 2016 Notice of Proposed Rulemaking (NPRM), PHMSA proposed to revise the existing definition of a "worst case discharge" applicable to rail transportation.[133] The existing definition is based on the capacity of an individual rail tank car, whereas the proposed definition sets amounts (measured in gallons or as a percentage of the total lading) for the quantity of liquid petroleum oil carried within the entirety of the train consist.[134] "Worst case discharge" is also defined statutorily in the Oil Pollution Act of 1990 as "the largest foreseeable discharge in adverse weather conditions."[135]

Thus, the terms, "worst case discharge" and "worst case scenario," are different, as worst case discharge is oriented toward calculating physical quantities of product that may be involved in the event of a spill and these terms are not readily applicable to the question of calculating the broader consequences in terms of injuries and property damage. Some worst case terminology used in the insurance industry includes "maximum foreseeable loss" and "probable maximum loss," but the study team did not receive detailed information about how these concepts are specifically defined within the industry or applied to hazmat rail incidents.

Some academic studies have attempted to simulate worst case scenarios by combining assumed hazmat incident scenarios with computer modeling of factors such as toxicity, dispersion, population density, and evacuation rates. This research has tended to focus on the release of TIH/PIH material, such as chlorine, in an urban center. One study estimated the rupture of a 17-ton chlorine tank truck in a downtown area could cause up to 30,000 fatalities. The casualty estimates were strongly influenced by modeling assumptions, particularly evacuation capabilities and wind conditions.[136] Fatalities from the rupture of a rail tank car would, all other things being equal, be higher due to its larger capacity relative to a tank truck. Another simulation of a rail crash in Chicago with a 90-ton chlorine release estimated there would be 10,000 fatalities, 32,600 non-fatal injuries, and total insurance losses of over $7 billion.[137] A simulation involving two ruptured chlorine tank cars in a Houston rail yard fire was estimated to have fewer fatalities (600) but a higher overall total of direct costs, at $17-22 billion.[138]

An even more catastrophic event involving a deliberate terrorist attack on a large public gathering using

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[132] See 49 CFR § 194.105 (2005).
[133] See 49 CFR § 130.5 (2004); PHMSA, "Hazardous Materials: Oil Spill Response Plans and Information Sharing for High-Hazard Flammable Trains," Notice of proposed rulemaking (NPRM), *81 FR 50068*, 2016. Available at: https://www.gpo.gov/fdsys/pkg/FR-2016-07-29/pdf/FR-2016-07-29.pdf.
[134] See PHMSA, NPRM, *81 FR 50068*, 2016; PHMSA *Docket ID PHMSA-2014-0105-0240*, 2016. Available at: https://www.federalregister.gov/documents/2016/07/29/2016-16938/hazardous-materials-oil-spill-response-plans-and-information-sharing-for-high-hazard-flammable.
[135] See 33 U.S.C. § 1321(a)(24) (2010).
[136] Anthony Michael Barrett, *Mathematical Modeling and Decision Analysis for Terrorism Defense* (Carnegie Mellon University), 2009, as cited and discussed in Lewis M. Branscomb et al., *Rail Transportation of Toxic Inhalation Hazards: Policy Responses to the Safety and Security Externality* (Harvard University Kennedy School of Government), 2010.
[137] Andrew Coburn and Alexandra Cohen, *Catastrophe, Injury, and Insurance: the impacts of catastrophes on workers compensation, life, and health insurance* (Newark, CA: Risk Management Solutions, Inc.), 2004, cited in Norfolk Southern (NS) response to PHMSA *Docket ID: PHMSA-2016-0074-0006.*
[138] Coburn and Cohen, 2004, cited in NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006.*

TIH/PIH materials could cause up to 100,000 deaths, as modeled by the Naval Research Laboratory.[139] It is important to note that although they provide useful context, simulations of incident scenarios involving terrorist attacks or other deliberate hostile actions may have less relevance to discussions of adequate insurance coverage, since (a) they may not create legal liability for damages on the part of the shipper or carrier, and (b) they are based on specific scenarios where impacts would be at their absolute maximum, rather than on actual circumstances on the rail network.

Fewer studies are available with information on risks from non-TIH/PIH commodities. This could reflect a consensus that TIH/PIH materials present the greatest risks, or simply reflect that most of the research was conducted prior to the advent of large-scale shipments of crude oil by rail in the United States. Comments received from the city of Vancouver, Washington, addressed the prospect of a worst case scenario with a crude oil derailment in that city. According to the expert report commissioned by the city, damages from a crude-by-rail rail accident in Vancouver could be in the range of $5-6 billion.[140]

Translating incident consequences into an overall monetary figure or a required insurance coverage level is complicated by the fact that compensation for injuries and fatalities can vary significantly according to the circumstances, the nature of the incident, and the inherent variations in outcomes from the legal system and settlement negotiations. For example, a Louisiana jury awarded $3.4 billion in punitive damages (later reduced to $850 million) in a case arising from butadiene leaking from a rail car, even though there were no fatalities,[141] while other incidents with higher casualty levels, such as Graniteville, had lower reported financial totals.

As a point of reference, U.S. DOT's benefit-cost analyses use a value of statistical life of $9.6 million, based on empirical work on market valuations of risk reduction.[142] These analyses typically also include non-market costs such as environmental damage that may not figure into insurance claims. This approach is therefore more suited to analyzing whether a particular regulation or policy change has net societal benefits rather than assessing the adequacy of insurance coverage.

These high-cost catastrophic incidents are rare, which makes modeling and understanding the true risk caused by the transportation of hazmat by rail difficult to understand. It is extremely difficult—likely impossible—to know the full extent of risk of high-cost, low-probability disasters. This can be challenging for railroads, insurance companies, and emergency planners.

3.3 Efficiency of Risk Allocation in Hazmat Freight Rail Market

The FAST Act requires an assessment of the structure and level of insurance necessary to efficiently allocate the risk associated with hazmat incidents by rail.[143] As discussed in Section 3.2, an efficient allocation of risk is one in which all parties must pay for any costs imposed on others, and are thus

[139] Jay Boris, *The Threat of Chemical and Biological Terrorism* (Computing in Science & Engineering) 2002, presentation to D.C. City Council (2003), cited in Branscomb et al., 2010.
[140] City of Vancouver, Washington, response to PHMSA *Docket ID: PHMSA-2016-0074-0018*.
[141] Branscomb et al., 2010.
[142] U.S. DOT, "Guidance on Treatment of the Economic Value of a Statistical Life (VSL) in U.S. Department of Transportation Analysis – 2016 Adjustment," *Memorandum to Secretarial Officers and Modal Administrators,* Aug. 8, 2016: 1. Available at: https://www.transportation.gov/sites/dot.gov/files/docs/VSL%20Guidance%202016.pdf
[143] See section 7310 of the FAST Act. Available online at: https://www.gpo.gov/fdsys/pkg/BILLS-114hr22enr/pdf/BILLS-114hr22enr.pdf

incentivized to take precautions to minimize the preventable risk and mitigate the damages associated with any incident. In an efficient market, this occurs naturally, as risk is a part of the cost associated with the production of a good, and this cost is passed on to the consumer as part of the price paid.

Many markets, however, experience inefficiencies in pricing. Market failures lead to distorted prices, which, in turn, mean that either too much or too little of the good or service in question is provided from a societal standpoint. Market failures can include, for example, conditions that lead to market power for either the supplier or purchaser of goods, distorting prices, or costs associated with the production of that good or service that are not borne by the producer or consumer (i.e., externalities), such as pollution. Market failures can, in some cases, be remedied by regulation.

The market for the transportation of hazmat by rail has many inherent qualities that can be considered market failures. These market failures affect the extent to which risk is internalized into the price of transporting hazmat by rail. In an efficient market, the cost of risk associated with an incident would be internalized in the rate paid by shippers and perhaps borne (to some extent) by their consumers. This would mean shippers would be incentivized to reduce their contribution to risk, through safe packaging and necessary steps to improve the safe transportation of their goods. As discussed in Section 3.2.1, rail carriers have significant control over their safety practices, and—because they would be held liable in the event of an incident for which they were at fault—they too would be incentivized to take measures to reduce the risk of an incident.

This section discusses the market failures that appear to affect hazmat rail transportation and their impact on the efficient allocation of risk. These include externalities of social cost from catastrophic rail incidents, inefficiencies in the pricing of hazmat rail transportation, and possible limitations in the market for railroad liability insurance.

3.3.1 Externalities and the Societal Costs of an Incident

As discussed in Section 3.2.2, catastrophic rail incidents have been (and have the potential to be) extremely costly. These costs are primarily borne by those not party to the shipper-carrier transaction. This is known as an externality. In a less developed economy, these costs would be imposed upon the community at large. In the United States, tort law allows victims of incidents to recover monetary compensation for damages they suffer from those deemed responsible, and in that sense, liability functions to internalize much of the cost that would otherwise be external to the transaction. In many cases, as discussed in Section 3.2.1, the liable party is the railroad.

When considering risk, the consequences can be thought of in dollar terms, but it is important to note that this is an abstraction. The consequences of a hazardous material rail incident can be extremely dire. An incident like the one in Lac-Megantic took many lives and injured many more, some to a debilitating extent. In the case of the Graniteville, SC incident involving chlorine release, property damage was dire enough to force the closure of a nearby factory. A release of hazardous materials can cause significant and lasting environmental damage. Through our legal system, victims of an incident can be compensated financially for their loss, and through potential financial liability for damages associated with incidents, the external costs of an incident can be passed back to those responsible. It is important to note, however, that this system is imperfect. No amount of money can compensate for a death, nor a debilitating disease or psychological trauma resulting from an incident. While liability is spoken of in financial terms, this

cannot capture the true magnitude of external risk from these types of incidents. Thus, the tort law system is inherently limited in the extent it can internalize the external costs from hazmat transportation by rail.

The legal system is also limited in that an entity (like a railroad) could cause damages that exceed its ability to pay. If a liable party lacks the insurance or assets to compensate victims of an incident, then those costs have not been properly internalized and may affect decisions made regarding safety practices and mitigation.

Class I railroads carry insurance up to $1.5 billion, and have market valuations significantly higher than that. This suggests that if there were an incident with exceedingly high damages (above $2 billion), even if insurance was exhausted, the railroads (possibly through liquidating assets) would be able to pay victims for damages.

Class II and Class III railroads carry significantly less insurance, at most $25 to $50 million. This is, in part, because companies are not always incentivized to carry insurance beyond their asset value. If a company's debts exceed its valuation, it can declare bankruptcy and restructure or liquidate its assets. This could result in uncompensated victims in the event of a large rail incident. A recent sale of a Class II railroad put its market value at $126 million.[144] This figure gives a sense of the amount available if a small railroad needed to liquidate its assets to pay victims' damages. If a $2 billion incident occurred on that rail line, it may only cover $176 million ($50 million in insurance and $126 million in value) of those damages, leaving many victims without compensation for their losses.

This is the scenario that occurred in the Lac-Megantic incident. A Class II railroad was responsible for the incident, yet its assets and insurance coverage only provided a small fraction ($44.25 million) of the total damages (roughly $1.5 billion) the incident caused.[145]

For Class II and Class III railroads, this constitutes a market failure in the form of a negative cost externality. The railroads' costs include insurance up to a portion of their total valuation, not the full cost of a possible incident, which means that the risk of damages exceeding the valuation of a Class II or III railroad is not internalized. A portion of the damages are passed to other parties, those harmed by the incident, who have little to no control over whether this activity takes place.

3.3.2 Pricing of Hazardous Material Rail Transportation

There are a number of countervailing forces that affect the pricing of hazmat by rail, specifically the common carrier obligation that requires railroads to transport hazmat, the natural monopoly power of railroads and STB rate regulation that can prevent railroads from charging full monopoly rates.

As discussed in Section 1.2.4, rail can be a natural monopoly due to the high cost and impracticality of building a new railroad and the requirement of network access for competitive service. With no

[144] Lisa Eckelbecker, "Providence and Worcester Railroad to be sold in $126 million deal," *Telegram & Gazette*, last modified Aug. 16, 2016. Available at: http://www.telegram.com/news/20160815/providence-and-worcester-railroad-to-be-sold-in-126-million-deal.

[145] Tom Bell, "What does buyer see in small, bankrupt Maine railway?" *Portland Press Herald*, Jan. 30, 2014. Available at: http://www.pressherald.com/2014/01/30/what_does_buyer_see_in_small__bankrupt_maine_railway__/. The sums included $25 million in insurance and $14.25 million in proceeds from sale

competition from substitute modes (such as pipelines or trucking), rail carriers can use market power to charge higher prices for their goods than would occur in an efficient market.

Some goods are more vulnerable to monopolistic pricing than others; for instance, when rail service links directly with a production facility or end-use facilities, specific routing is necessary. This is, as with any good, exacerbated in a situation where there is inelastic demand for the shipped good. In many cases, chlorine and anhydrous ammonia would fit this description (as substitute modes are limited).

The regulation of rates by the STB and the common carrier obligation to serve all reasonable requests blunt the effect of monopolistic behavior and pricing. Upon complaint, the STB can regulate shipping rates along routes where rail carriers are determined to have market dominance. As discussed in Section 2.4, the URCS model is used to determine a railroad's variable cost, and rates determined to be more than 180% of that cost figure are subject to challenge. The URCS-derived variable costs, therefore, become a reference point for price negotiation between shippers and carriers. This limits the ability of railroads to use market power to increase prices at the expense of shippers, and puts some downward pressure on rates charged by rail carriers. This downward pressure may not affect every negotiation or rate.

As discussed in Section 2.4, the URCS model includes the costs of insurance coverage, but these are not broken out to reflect the increased cost associated with carrying dangerous commodities like TIH/PIH materials. Railroads have stated they purchase coverage in excess of what they would normally carry because they carry specific hazardous commodities.[146] Additionally, as the insurance market is limited for rail carriers, this insurance level may not reflect the full level railroads would like to carry. From a market efficiency standpoint, if railroads are not passing the cost associated with carrying specific commodities on to the shippers, this means shippers are being undercharged relative to the true cost of the service they are purchasing, and thus may not be properly incentivized to reduce the risk associated with transportation of their goods.

As interpreted by STB, the common carrier obligation prevents railroads from imposing any conditions on service that would unreasonably deny service. This has meant rail carriers may have difficulty demonstrating tariff conditions that indemnify shippers or impose safety conditions on shippers' traffic are reasonable. In 2011, Union Pacific (UP) asked STB to affirmatively declare that UP's TIH/PIH tariff, which included an indemnification requirement by shippers, was reasonable. STB declined, although it also stated it was not declaring the tariff unreasonable.[147] In another situation, in 2012 a complaint to STB challenged blanket speed limits for TIH/PIH trains that a carrier had imposed on a shipper as part of the carrier's tariff. After the carrier modified its tariff to eliminate the blanket speed limits, STB directed the carrier to comply with its modified tariff in response to assertions the carrier was continuing to apply the prior limits to some traffic. The carrier dropped other safety requirements following the shippers' complaints, including dedicated service and limits on the number of TIH/PIH rail cars per trains.[148]

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[146] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006.*

[147] See STB Decision, *STB Finance Docket No. 35504*, 2014. Available at: https://www.stb.gov/home.nsf/case?openform&caseID=29809&caseDocket=FD_35504_0.

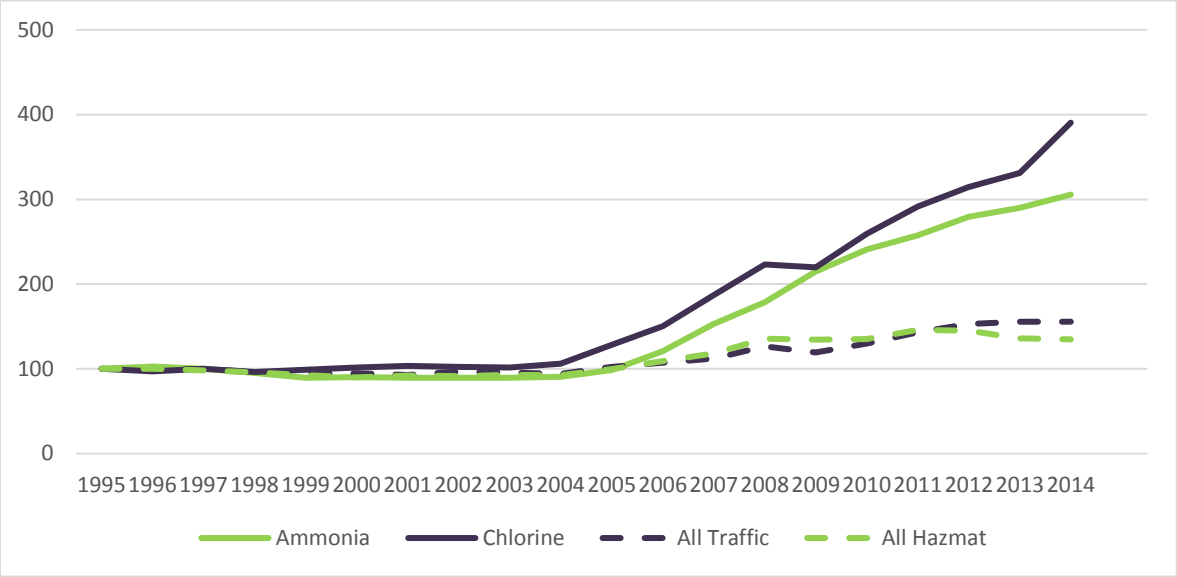
[148] The Board dismissed other complaints as the carrier had changed the tariff by the time the Board came to a decision. See STB Decision, *STB Finance Docket No. 35517*, 2013. Available at: https://www.stb.gov/home.nsf/case?openform&caseID=29809&caseDocket=FD_35517_0.

Shippers do incur costs to mitigate the risk from their shipments. Hazmat shippers must package their goods in accordance with the HMR, and their shipments (depending on commodity) must travel in accordance with the HMR, which can require speed limits and other requirements for safe travel.

In practice, most railroad shipments of hazmat occur under negotiated contract between carriers and shippers. Multiple commenters noted the costs associated with TIH/PIH transportation have risen substantially beyond the average cost of rail transportation in recent years.[149] CF Industries included in its docket comments a study showing a premium of 132.4% for anhydrous ammonia over non-TIH, non-hazardous transport, and found premiums associated with other TIH/PIH commodities as well.

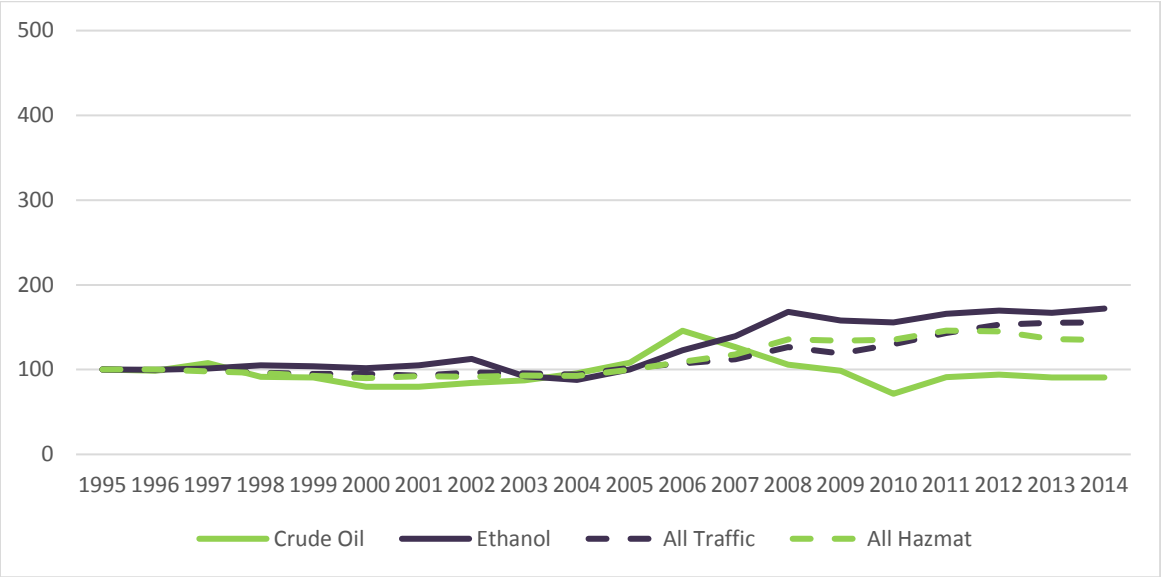
An analysis of revenue from the STB waybill sample shown in Figure 10 demonstrates the revenue earned per ton mile for shipments of anhydrous ammonia and chlorine has far outpaced growth for all hazmat traffic as well as rail traffic as a whole. A similar chart of crude oil and ethanol (Figure 11) shows they have not experienced the same behavior, and in the case of crude oil, revenue per ton mile has dropped (likely as a result of the increased volume and use of cost-efficient unit trains).

Figure 10. Revenue per Ton Mile for Anhydrous Ammonia, Chlorine, All Hazmat and All Traffic (indexed to 1995)[150]



[149] TFI response to PHMSA *Docket ID: PHMSA-2016-0074-0011*; CF response to PHMSA *Docket ID: PHMSA-2016-0074-0011.*
[150] See STB, *Industry Data, Economic Data: Waybill.*

Figure 11. Revenue per Ton Mile for Crude Oil, Ethanol, All Hazmat and All Traffic (indexed to 1995)[151]



If these high prices were the result of monopolistic pricing by shippers, they could be challenged under STB's complaint process. Shippers noted in their comments the high cost in money and time of challenging rates they would consider unreasonable before the STB, which may partially explain the presence of a premium for TIH/PIH traffic. The process has been described as "onerous" by rail customers, and in a listening session with PHMSA, CF Industries noted high legal costs, a lengthy review process, and a low success rate discourage shippers from challenging railroad rates before the STB.[152] Thus, any monopolistic premium in a rate would have to exceed the expected cost of a rate challenge in order to be challenged.

Commenters stated this price increase reflects a risk premium.[153] It appears railroads have been able to charge higher prices to shippers, reflecting the risk associated with these commodities. These commenters expressed concern, however, that rail carriers were not using this premium to transparently mitigate the risk associated with these shipments.[154] If this reflects an equilibrium price, the use of the funds associated with this premium is not a societal concern. What matters is that this price signals to shippers the true cost of transporting their goods. That being said, if this price increase is not explicitly attached to the increased risk associated with TIH/PIH chemicals, shippers may not have confidence that behaviors they take to reduce preventable risk will result in a reduced price to them (such as shorter shipment length or reinforced tank cars) due to the noncompetitive nature of the market.

Assessing whether or not the prices paid for hazmat shipments by rail reflect equilibrium prices is very difficult (and may differ between commodity markets, shippers, and carriers) due to the many ways the

[151] See STB, *Industry Data, Economic Data: Waybill.*
[152] See The Fertilizer Institute (TFI) and CF Industries, (PHMSA Listening Session, 2016); Chris Jahn, President of TFI, "Putting the STB's Rate Review Process Back on Track," *Freight Rail Reform (blog)*, May 6, 2015. Available at: https://www.freightrailreform.com/putting-the-stbs-rate-review-process-back-on-track/.
[153] CF Industries response to PHMSA *Docket ID: PHMSA-2016-0074-0013.*
[154] Chlorine Institute response to PHMSA *Docket ID: PHMSA-2016-0074-0004.*

market deviates from perfect competition. The presence of a premium for TIH/PIH commodities could mean the railroads are able to charge for some portion of the risk associated with hazmat shipments, or it could mean the railroads are exploiting market power to charge monopolistic rates. It is not possible to tell whether these rates represent a proper equilibrium price, a price below the equilibrium due to STB rate regulation and common carrier regulation, or a monopolistic price set above the true cost of risk.

3.3.3 Limitations of Insurance Market

As noted in Section 2, it is difficult to assess the state of the rail insurance market due to limitations in data available for use in this study. The availability of rail insurance plays a role in the overall functioning of the hazmat rail market.

Class I railroads currently purchase between $1 and $1.5 billion in liability coverage, and describe this level of coverage as possibly inadequate to cover damages of a catastrophic incident associated with hazmat. Additional insurance products have been described as uneconomical or unavailable for the Class I railroads at this time. This could reflect the difficulty of assigning actuarial value to what are extremely rare, high-cost incidents. In a situation like this, adverse selection may be making high-value insurance uneconomical or unavailable. Without more information from insurers, this is difficult to assess.

Rail carriers expressed concern that the insurance they carry could be revoked or increase significantly in cost if there were an incident.[155] Following the Lac-Megantic incident (Section 2.2.1), it appears railroads were able to purchase more insurance in the event of an incident, not less, but it is not known whether this will continue to be the case.

3.4 Summary

3.4.1 Adequacy of Current Insurance Scheme for Social Costs

An adequate insurance structure would ensure victims of a hazmat incident are sufficiently and promptly compensated for their losses, and rail operators have sufficient financial protection to cover very large expenses associated with a significant hazmat incident. Under this definition, Class II and Class III railroads do not have adequate insurance coverage for the possibility of a large-scale hazmat incident. Class I railroads likely have sufficient combined insurance and assets to compensate victims in the event of a serious incident, but not without significant impact to the Class I railroad.

When considering the adequacy of the current scheme for insurance, it must be acknowledged that, because of market failures and insufficient information, the pool of risk may be larger than necessary. If shippers underpay for hazmat by rail transportation, then there is likely more than a socially optimal level of hazmat transportation by rail. Additionally, the significant information issues and uncertainties around insurers mean they simply may not be able to provide sufficient coverage.

As discussed in Sections 2.3.2 and 2.3.3, different classes of rail carriers are likely to carry different levels

[155] Twin Cities & Western Railroad (TCWR), (PHMSA Listening Session, 2016); TCWR response to PHMSA *Docket ID: PHMSA-2016-0074-0024*; Mark Wegner response to PHMSA *Docket ID: PHMSA-2016-0074-0017*; STB Decision, *STB Finance Docket No. 35504*, 2014. Available at: https://www.stb.gov/home.nsf/case?openform&caseID=29809&caseDocket=FD_35504_0.

of insurance. Class I railroads carry up to $1.5 billion in insurance, while Class IIs and IIIs carry up to $25 million or $50 million. Yet, an incident involving hazmat has the potential to have equal consequences, regardless of the size of the railroad carrying it.

In a scenario with a railroad-liable incident that costs over $2 billion in damages, a Class I railroad would run through its insurance and self-insurance retention, likely up to $1.5 billion. Any excess costs would need to be compensated through financing or selling of assets. While this might be damaging for a Class I railroad, victims would likely still be compensated adequately. There is some concern among Class I railroads about continuity of insurance coverage following an incident, reflecting further uncertainty about the insurance market.[156]

In the same scenario for a Class II or III railroad, insurance would quickly be exhausted, and the assets of the railroad may only cover a small portion of the damages, potentially leaving many victims without adequate compensation (absent lengthy litigation), and the rail operator without insufficient insurance protection against those liabilities. This was the scenario at Lac-Megantic.

The majority of Class II and Class III railroads are not independent, potentially providing access to a larger pool of funds or insurance coverage from a holding company.[157] Still, for independent railroads, a catastrophic hazmat incident could result in a lack of adequate compensation for social damages, such as the costs associated with injuries, deaths, environmental damage, etc. It could also lead to financial insolvency and bankruptcy of the railroad.

3.4.2 Efficiency of Pricing & the State of Preventable Risk

It is difficult to assess whether hazmat by rail transportation is priced efficiently due to the noncompetitive nature of the market. If shippers are paying above a market equilibrium rate, likely due to railroad monopoly power, then there is likely too little hazmat transportation occurring. If shippers are paying below the equilibrium rate, likely due to common carrier obligations and regulations that limit the ability of railroads to charge prices that include the cost of the risk they bear, there is too much hazmat transportation occurring, increasing societal risk of an incident.

Shipper comments indicate discomfort among shippers for paying higher rates for TIH/PIH transportation, citing the lack of pricing 'transparency.'[158] Ultimately, it is not possible to tell whether current prices charged for hazmat transport by rail represent a social equilibrium where shippers are paying for the risk generated by their shipments as part of their shipping costs, or whether current levels in pricing will be able to continue.

Preventable risk is not just determined by shipper and carrier behavior, but it is also influenced by regulation. Judiciously crafted, cost-beneficial safety regulation is one option that can be used to reduce some of the societal cost associated with risk of hazmat transportation incidents. Regulation takes time to develop, however, and regulators may have limited access to information regarding industry practices.

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[156] AAR response to PHMSA *Docket ID: PHMSA-2016-0074-0008.*
[157] FRA, *Summary of Class II and Class III Railroad Capital Needs and Funding Sources*, 2014: 3. Available at: https://www.fra.dot.gov/eLib/Details/L16020.
[158] American Chemistry Council (ACC), (PHMSA Listening Session), 2016; ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0024*.

While determining whether or not there were cost-beneficial regulations for hazmat transportation was outside the scope of this study, there is a possibility that rules not presently in place would reduce the societal pool of risk.

3.4.3 Ability of Railroads to Continue Operations in the Event of a Hazmat Incident

Railroad-related bankruptcy law is unique in that it contains an explicit requirement for the bankruptcy court to consider the public interest and for railroad lines to be abandoned only where this is consistent with the public interest.[159] If a railroad were forced into bankruptcy by the costs associated with a catastrophic hazmat incident, but had been profitable beforehand, it is reasonable to assume the courts would find a buyer to continue service on that line. While this can be disruptive to the rail network, the disruption would ultimately be temporary. This may have the effect of consolidation in the industry.

If a railroad were not profitable before the incident, a catastrophic incident with significant liability might be the end of operations for part or all of that rail line. Another possibility is that a catastrophic rail incident would alert investors to a higher level of hazmat risk than previously perceived, which may change railroads' cost structures such as increasing the costs of borrowing or increasing insurance premiums.

As discussed above, different classes of railroads would have different capacities to respond to a large-scale hazmat incident, which means the risk of a hazmat incident affects their ability to continue operations in different ways. Class I railroads would survive even a very large incident through the sale of assets, though the impact to their business would be significant.

Class II and Class III railroads are unlikely to survive a catastrophic rail incident, absent support from a holding company or business partner. Class II and Class III railroads have trended toward consolidation in recent years, and increased insurance costs following a major incident might accelerate this pressure.[160] Class II and Class III railroads do not always have a diversified base of clients and, while they are also able to recover their insurance costs, a large change in cost structure might impact their client base in a way that would impact the viability of the railroad. If Class II and Class III railroads were required to retain additional insurance to better compensate victims, the resulting change in their cost structures may threaten their ability to remain independent or operational.

[159] See 11 U.S.C. §§ 1165 and 1170 (*1997*).)..
[160] FRA, 2014: 3. FRA, *Summary of Class II and Class III Railroad Capital Needs and Funding Sources*, 2014: 3. Available at: https://www.fra.dot.gov/eLib/Details/L16020. FRA, 2014: 3.

4 Alternative Insurance Models

4.1 Overview

This section addresses the third requirement of Section 7310 (b)(3) of the FAST Act; namely "The potential applicability, for a train transporting hazardous materials, of an alternative insurance model, including: 1) a secondary liability coverage pool or pools to supplement commercial insurance; and 2) other models administered by the federal government." The study team reviewed information on the various types of federal insurance programs, and focused on those insurance programs that related to corporations as opposed to individuals or households and that dealt with the risk of low-probability, high-consequence events. As a result of that review, the following types of insurance models were selected for analysis:

- Requirements for minimum levels of financial responsibility
- Insurance pooling among railroads
- Secondary liability pools funded by shippers
- Federal government providing direct insurance.

In addition, other concepts related to treatment of liability and insurance are briefly discussed in Section 4.6.

For each alternative insurance model, the analysis provides:

- Description of the insurance model;
- Examples of the insurance model in practice;
- Discussion of how the model would address the findings related to the necessary and appropriate level and structure of insurance described in Section 3.4;
- Discussion of what specific issues would need to be addressed in order to apply the model to the transport of hazmat by rail, including any challenges to implementing the insurance model and compatibility with other laws or regulations; and
- Summary of the expected impacts including costs and risks borne by each stakeholder group, competitive impacts, and potential impacts on safety behavior.

Information from this section is drawn from responses to the RFC, as well as from research of other insurance models and interviews with staff at government agencies responsible for administering two of the government insurance programs described below.

The analysis of alternative insurance models is limited in a few important ways. First, the analysis focuses on the *structure* of the various insurance models; further analysis and investigation would be required to fully flesh out an alternative insurance model in regards to exact dollar amounts of coverage provided, taxes or premiums collected, circumstances excluded or included, potential differential treatment of various hazmat commodities, and potential differential involvement by size of rail carrier or shipper. As a result, the impacts of various alternative insurance models are described only in directional terms. More data would be needed—such as information on insurance costs, risks, insurance levels, shipper costs, railroad costs, etc., especially for the Class II and Class III railroads—before the magnitudes of the impacts could reasonably be estimated. Even with more data available, the full impact of an alternative

insurance model cannot be fully known until it is implemented. Further, no representatives from the insurance industry responded to the RFC. As a result, the following discussion does not comment on potential impacts to the insurance sector. Finally, only one short line railroad provided comments. Thus, while the possible impacts on short lines are discussed, there may be gaps in that discussion.

4.2 Requirements for Minimum Levels of Financial Responsibility

4.2.1 Description

Currently, there are no federal requirements in the United States establishing minimum levels of financial responsibility for freight railroads. Financial responsibility refers to the demonstrated ability of an entity to pay damages up to a certain level for an accident it causes. Financial responsibility can be proved by showing valid insurance policies, surety bonds, or certifications that an entity has sufficient cash reserves to cover a set liability amount.

Although there are no federal requirements, at least two states have laws requiring railroads carrying oil to demonstrate financial responsibility. Through its Public Act 274 of 2015, the State of Washington requires railroads carrying oil in the state to show financial responsibility to cover the cost of cleaning up a "reasonable worst case spill" of oil from a train.[161] The methodology to estimate the cleanup costs relies on several factors including maximum train speed, number of oil tank cars in the train and estimated cleanup cost of $400 per gallon of oil. The resulting estimate for a 110-car train travelling at 45 mph would be $632.3 million, or $781 million if the train was travelling at 50 mph.[162] The $400 per gallon cost is for cleanup costs only and does not cover potential compensation for property damage, injuries, or fatalities. The State of California requires railroads transporting oil to show financial responsibility to cover the cleanup costs of a reasonable worst case spill with costs of $10,000 per barrel (or $238 per gallon).[163]

Although not applicable to freight rail carriers, two federal modal transportation agencies have minimum financial requirements. The Federal Motor Carrier Safety Administration (FMCSA) currently requires minimum financial responsibility for commercial motor carriers. The required amounts are $750,000 for carriers of non-hazardous materials, $5 million for carriers of bulk hazmat and explosives, and $1 million for carriers of other types of hazmat.[164] The Federal Aviation Administration (FAA) requires air carriers (other than air taxi carriers) to have financial responsibility of $300,000 per passenger and $20 million per aircraft with 60 or more passengers or $2 million per aircraft with less than 60 passengers.[165]

4.2.2 Applicability

Introducing requirements for minimum amounts of financial responsibility for railroads would address the

[161] See State of Washington, *Concerning oil transportation safety*, 2015 House Bill 1449, effective Jul. 1, 2015. Available at: http://app.leg.wa.gov/billsummary?BillNumber=1449&Year=2015.
[162] Samantha Wohlfeil, "Washington asks if railroads could afford $700M oil train spill," *The Bellingham Herald*, Feb. 13, 2016. Available at: http://www.bellinghamherald.com/news/local/article60156446.html.
[163] See State of California Department of Fish and Wildlife, *Application for Certificate of Financial Responsibility for Railroad*, last modified Aug. 20, 2015. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=106058&inline.
[164] See 49 CFR Part 387 (2008).
[165] See 14 CFR Part 205 (1992).

finding that small railroads have low levels of insurance and would act to correct the market failure identified in Section 3.3.1. As explained in that section, the liability and tort system provides relief to injured parties for harms caused by others and thus causes entities to internalize the external risks their actions impose on others. However, it is possible small entities, such as Class II and Class III railroads, if involved in an incident, may cause damages higher than they are able to pay. Thus, a market failure results because railroads and shippers do not completely internalize the externality of the increased risk to the public that results from a hazmat shipment. In the absence of a regulatory requirement, railroads choose for themselves the amount of insurance they wish to carry. The railroads make the decision based on the their own tradeoffs between the cost of additional insurance coverage, their perception of the likelihood of an incident, and what they have at risk in the case of an incident, which is the lower of the damages stemming from an incident and the value of their assets.

By requiring higher levels of financial responsibility, shippers and railroads would face stronger and potentially more accurate price signals related to risk born by the community and it would act to provide more insurance-provided compensation to potential victims of railroad incidents.

Issues to Address

To enact the requirement, the appropriate amounts of financial responsibility would need to be determined. The amount chosen would need to be higher than what railroads currently choose for themselves in the absence of a requirement for there to be any impact. Smaller railroads choose smaller amounts of insurance, as discussed in Section 2.3. Class I railroads tend to have around $1 to $1.5 billion in insurance. Typical coverage limits for Class II railroads are in the range of $25 to $100 million, with retentions of $250,000 to $500,000, while Class III railroads have coverage of around $5 million and retentions around $50,000.[166]

The financial responsibility required of a railroad would ideally relate to the expected magnitude of the potential damages an incident on a railroad may cause. Therefore the amount of insurance required should reflect the types and volumes of commodities carried, including hazardous materials. One could further tailor the financial responsibility requirements to the circumstances of the railroad. In its comments, Riverkeeper, Inc. urged PHMSA to consider diversity of liability and insurance needs related to local conditions.[167] As an example of tailoring insurance requirements to circumstances, the Washington and California financial responsibility requirements for crude oil relate to a “reasonable worst case scenario” that is assessed based on speed of the trains and the number of carloads in the shipment. The amount of insurance for TIH/PIH incidents might be dependent on the size of the population centers on its route or its proximity to important natural resources such as drinking water supplies. As a potential consequence, a railroad that runs through a densely populated area might be required to hold more insurance than a railroad that has a large separation between the track and nearby populations.

In the context of a secondary liability pool (discussed below), some commenters suggested the level of financial responsibility required for smaller railroads should be lower than the amount required for Class I railroads. While such a formulation may support other policy goals relating to support for small businesses, requiring a lower amount for smaller entities is harder to justify on the basis of risk. A

[166] Insurance Information Institute, Inc., “Railway Liability Insurance,” accessed 2016. Available at: http://www.iii.org/article/railway-liability-insurance.
[167] Riverkeeper, Inc. response to PHMSA *Docket ID: PHMSA-2016-007-0005.*

shipment of a tankload of chlorine poses the same risk to the public if it is on Class I, Class II, or Class III railroad track, assuming everything else is the same. However, this does not mean small railroads would have to pay the same premiums as Class Is to obtain that level of insurance coverage. It could be expected that the total premium or cost of insurance for certain level of coverage would be higher for a railroad that carries larger volumes (measured in, say, ton-miles) of hazmat because the larger railroad has more exposure to risk due to higher amount of ton-miles of hazmat it transports. Additionally, when considering whether to permit lower minimum levels financial responsibility due to financial hardship, one should recognize many Class II and Class III railroads are owned by holding companies. Those holding companies may face less financial hardship from a higher level of insurance coverage than an independent Class II or Class III railroad.

In selecting the amount of financial responsibility required, the current levels required for truck transport should be considered, given the competition between truck and rail for freight transport.[168] Currently, FMCSA requires trucks carrying hazmat in bulk to demonstrate financial responsibility of $5 million. The current minimum financial responsibility levels for motor carriers of property took effect on January 1, 1985.[169] As FMCSA noted in its 2014 Report to Congress, if the $5 million amount were adjusted using a general measure of inflation, it would be roughly $11 million in 2013 dollars.[170]

The amount of the financial responsibility does not necessarily need to cover the amount of the absolute worst case scenario. First, realistically there cannot be a requirement for railroads to hold more insurance than is currently available in the private market unless the system is government operated. Second, there is a judgment call to be made to find a balance between potential costs to victims and the public, and the actual realized costs of the insurance to the railroads. The uncertainty involved in estimating the risk present from low-probability, high-consequence events, such as a TIH/PIH release in a dense population center, is very great. This presents a difficult situation for policymakers wishing to base their policies and regulation on objective data and information.

Under the current tort law framework within which insurance coverage applies, victims still need to prove fault or negligence on the part of the railroad to be compensated by the insurance policy held by the railroad. If a regulation is put in place, it should specify how the minimum financial responsibility should change in the future. The methods for changing minimums might account for inflation, developments in the insurance industry, or changes in the efficacy of available preventative safety measures. Public comments indicated the amount of insurance available fluctuates over time in response to incidents.[171]

If an incident occurs that results in damages over the insured amount, victims can continue to sue and claim damages from the railroad or any other responsible parties. If found negligent, a large railroad may

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[168] A chlorine rail tank car holds 90 tons, while a truck carries 22 tons. The Federal Motor Carrier Safety Administration (FMCSA) requires $5 million in insurance for a bulk hazmat truck carrier. Available at: https://cms.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/MCS-90%201-5-17%20508.pdf

[169] 49 FR 27288.

[170] FMCSA, *Examining the Appropriateness of the Current Financial Responsibility Requirements for Motor Carriers, Brokers, and Freight Forwarders*, Report to Congress, Apr. 2014. Available at: https://www.fmcsa.dot.gov/mission/policy/report-congress-examining-appropriateness-current-financial-responsibility-and.

[171] AAR response to PHMSA *Docket ID: PHMSA-2016-007-0008:* 8.

need to liquidate assets to pay out the required compensation. Smaller railroads may have to liquidate entirely and face bankruptcy in order to pay the damages.

In cases where the damages are significantly higher than the amount the railroad can provide either through insurance or bankruptcy liquidation, the federal government is enabled to provide federal assistance to disaster-affected communities through the Stafford Act.[172] The Stafford Act authorizes the President to issue major disaster or emergency declarations in response to catastrophes in the United States that overwhelm state and local governments. Such declarations result in the distribution of federal aid to individuals and families, certain nonprofit organizations, and public agencies. The program is administered primarily by the Federal Emergency Management Agency (FEMA). The Stafford Act, for example, authorized aid to communities affected by Hurricane Katrina in 2005. However, the goal of Stafford Act programs is to alleviate suffering and allow people and communities to get back on their feet; it is not intended to compensate for all losses or return victims to their pre-disaster position.[173]

Implementation

The agency tasked with implementing a requirement for financial responsibility would need to set up a system for railroads to prove they have a sufficient level of financial responsibility. Such systems already exist for FAA, FMCSA, the State of Washington, and the State of California. In addition, any new requirements related to financial responsibility would likely need to be phased in over time. Given that similar requirements are in place at the federal level for other modes, there should be no issue of compatibility with other laws or regulations.

4.2.3 Impacts

Potential Stakeholder Impacts

Potential Victims. Increasing the amount of insurance held by small railroads would provide more insurance-provided compensation to victims of incidents involving small railroads compared to the current situation. Compensation to victims of incidents on larger railroads would likely remain unchanged because the Class I railroads already hold large amounts of insurance. In order to be compensated through the railroad's insurance, potential victims would still need to prove negligence on the part of the railroad. Thus, in incidents where no party is found to be legally liable, victims might not receive compensation. Additionally, the victims would need to pursue claims in court which requires victims to bear upfront legal expenses. This represents no change from the current situation.

Class II and Class III Railroads. Small railroads would need to pay higher premiums for the higher levels of insurance coverage, which would raise their costs compared to the current situation. In return, the insurance would provide more financial and bankruptcy protection to smaller railroads. However, given that these smaller railroads are not voluntarily choosing larger amounts, this indicates that the small railroads themselves do not find the value of the benefit to be high enough to justify the cost. Those higher costs would likely be passed onto their customers (the shippers) in the form of higher transportation rates. Additionally, the required amount of insurance may simply not be available to small railroads, which would be a challenge for the agency tasked with implementing the requirements. A

[172] 44 CFR Part 206 (2011).
[173] Keith Bea, "Federal Stafford Act Disaster Assistance: Presidential Declarations, Eligible Activities, and Funding," *Congressional Research Service Report to Congress*, updated 2008: CRS-15, CRS-18.

secondary risk pool for railroads (discussed below) may be able to mitigate some of those issues.

Class I Railroads. Generally speaking, the situation of larger railroads would remain unchanged from the current situation. As discussed in Section 2.3.2, Class I railroads already carry close to the maximum insurance coverage available in the market. Thus, assuming the level of insurance required is set at or below the amount currently held by Class I railroads, their costs should remain the same.

Shippers. Smaller railroads would experience higher costs from higher insurance requirements and would attempt to pass along those higher costs to their customers (i.e., shippers). As a consequence, shippers that currently use smaller railroads may see their transportation costs increase.

Tariff Setting and Rail Rate Negotiations

As discussed in Sections 3.3.2 and 3.4.2, shippers noted in their public comments they already pay higher rates for TIH/PIH shipments, but they do not know whether those supplemental fees are actually used to obtain more insurance or are made available to compensate potential victims.[174] As a standalone proposal, a requirement for a minimum level of responsibility would likely not alleviate that concern as it relates to Class I railroads, because Class I railroads already purchase close to the maximum amount of insurance available in the marketplace. However, requiring smaller railroads to purchase higher amounts of insurance than they currently do would likely assure shippers the railroads are insured.

Competitive Impacts

Some of the shippers that face higher rail rates due to higher costs from increased insurance requirements may switch from rail to truck for the entire movement or may replace a short line movement to connect to a larger railroad. It is also possible a hazmat shipper could be priced out of market. The production of the hazardous commodities facing higher rail rates may shift to producers who still remain in the market or it may be discontinued entirely.

Railroads experience economies of scale, so it is possible losing some customer base (in this case, shippers of hazmat) would require those costs to be spread out over the remaining smaller customer base. As a result, those same impacts from higher rail transportation costs might be experienced by a second tier of customers. [175]

Safety

As explained in Section 2.3.1, having insurance may cause entities to engage in more risky behavior (this concept is referred to as “moral hazard”). Economic theory suggests with more insurance, there is some possibility for smaller railroads to relax safety precautions. However, any such potential behavior is mitigated by the HMR and FRA regulations. Further, insurance companies are aware of the issue and often mitigate that potential response by providing incentives for better safety behavior in the form of premium discounts for entities that have good safety practices. Finally, the railroad pays the first level of compensation after an incident via the retention or deductible specified in its insurance policy. This

[174] ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019:* 3-4; Chlorine Institute response to PHMSA *Docket ID: PHMSA-2016-0074-0004:* 2.
[175] Twin Cities & Western Railroad (TCWR), (PHMSA Listening Session, 2016); TCWR response to PHMSA *Docket ID: PHMSA-2016-0074-0024*; Mark Wegner response to PHMSA *Docket ID: PHMSA-2016-0074-0017*

provision provides further incentives for safe behavior.

As explained above, increased costs for transportation may shift some traffic to truck. Truck is generally considered a less safe mode than rail, therefore the financial responsibility requirement that raises costs of rail, may increase the likelihood of an incident overall. The magnitude of that increase in risk is not known.

4.3 Insurance Pooling Among Railroads

As discussed in Section 2.3.3, it appears one of the reasons smaller railroads currently purchase relatively small amounts of insurance is that the insurance made available to them in the marketplace is too expensive. That is, the railroads may not perceive the value of additional insurance to exceed the cost of additional insurance. Since there are currently no requirements related to minimum levels of financial responsibility, railroads opt not to purchase higher levels. This section discusses two possibilities for reducing the costs of insurance for railroads through pooling arrangements. Operationally, each individual railroad would likely need to purchase some amount of private single entity insurance along with a specified retention or deductible. The pooled coverage would only apply over some higher amount of damages.

4.3.1 Description

Variation 1: Short Line Pools with Class I Railroad

It might be possible for a small railroad to contract with its Class I partner to obtain insurance coverage at a lower cost than attempting to purchase an individual policy. Very few (if any) shipments are made by a single short line railroad alone. The short line may provide "first mile" or "last mile" service and interchange the shipment with a larger railroad to complete the movement.[176] In addition, some short lines may be "tenants" running operations on Class I "host" railroad. In some instances, short lines are partners with a Class I railroad and in other instances short lines may use trackage rights to provide a service that competes with a Class I railroad.[177]

Class I railroads have access to large amounts of insurance coverage. It may be possible for Class I railroads to provide umbrella coverage for their short line partners under their insurance policy. Any increased premium cost could be shared by the short line. The Class I may need to review the safety policies and procedures of the short line, but the Class I is possibly well positioned to understand what types of safety practices are appropriate and might be in a good position to monitor the safety behavior of the short line. It may be a more efficient structure than expecting each short line to separately negotiate with an insurance company and some efficiencies may be gained by having the Class I act as a broker and negotiate on behalf of a large number of short lines. In addition, in the event of an incident on a short line, the Class I interchange partner railroad may have some potential liability exposure. A court or jury could conclude the accident was at least partially related to something the Class I did (or failed to do) before handoff to the short line, or because the Class I has a general responsibility for the safety of the shipment, especially in cases where the shipper contracted with the Class I for the entire movement. However, the

[176] American Short Line and Regional Railroad Association (ASLRRA) response to PHMSA *Docket No. PHMSA-2014-0105 (HM-251B):* 6.
[177] ASLRRA response to PHMSA *Docket No. PHMSA-2014-0105 (HM-251B):* 6.

autonomy of the short line as a separate business concern must also be observed, especially with respect to instances where the short line competes with the interchanging Class I railroad.

In its comments, the Chlorine Institute asserted Class I railroads should be held responsible for ensuring their short line partners have acceptable safety practices and sufficient insurance coverage because shippers do not have control over which short lines will be used (shippers generally only deal with the Class I railroads, who then deal separately with the short lines). However, in many cases, the Class I railroad also does not have a choice on which short line to use because often a shipment point is served by only one railroad.

Variation 2: Short Lines Pool Together to Obtain Insurance Coverage

During a listening session related to this research, representatives from the Twin Cities & Western Railroad Company mentioned a situation where a Class I partner railroad was requiring them to obtain insurance coverage of $100 million. The cost of obtaining an individual policy was cost prohibitive, but joining a pool of other railroads to purchase joint coverage lowered the cost of the coverage.[178] They did not explain why the pooling arrangement resulted in lower costs. The American Chemistry Council also mentioned a short line insurance pool as a way of obtaining insurance coverage for smaller railroads.[179] In its comments, Dow Chemical stated "with Dow's experience in the insurance market, we strongly believe that an insurance pooling arrangement for the short line industry can be created that would allow short lines to reasonably obtain the level of coverage available to Class I railroads."

The cost of insurance may be high for individual short lines simply due to the administrative costs borne by the insurance company from individually negotiating with each short line. A pooled policy that imposes the same terms on all short lines, e.g., safety policies and procedures required for coverage, could reduce these costs.

4.3.2 Applicability

The insurance pooling arrangements for railroads described above are relevant in combination with a requirement for a minimum level of financial responsibility. They are presented here as voluntary options that have the potential to reduce the cost of such a proposal.

Issues to Address

The members of a railroad risk pool would need to decide how to allocate the costs among the members, perhaps based on some measure of risk introduced by each member. The lower tiers of coverage may mostly relate to worker injury risk and so might be based on the number of employees, while higher tiers of coverage might be most impacted by hazmat shipments and thus might be based on the ton miles of different hazmat transported by each railroad.

Implementation

The agency tasked with implementing a minimum level of financial responsibility would need procedures to accommodate these type of pooling arrangements. It is not clear that the federal government could

[178] Notes from Rail Liability Listening Session with Twin Cities & Western Railroad Company, October 5, 2016. Docket ID: PHMSA-2016-0074.
[179] ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019:* 3, 5, 8.

require any of these pooling arrangements; they are presented here as voluntary options for railroads to explore in order to fulfill a potential new requirement for a minimum level of financial responsibility.

Concerning the first variation relating to short lines pooling with Class I railroads, there is a question as to whether a Class I would be willing to provide insurance for its short line partners. Both variants of pooling arrangements among railroads present the opportunity for disputes to arise. It is not clear whether STB would have a role in settling those disputes.

4.3.3 Impacts

Generally speaking, the intended impact of these pooling schemes would be to lessen increased costs for small railroads resulting from a new requirement for minimum levels of financial responsibility. If the pooling arrangements do not actually offer any cost savings, then they provide no benefit.

Potential Stakeholder Impacts

Potential Victims. By reducing the cost of insurance, it may be more politically feasible to require a higher level for the minimum amount of financial responsibility required by a railroad. As a result, these pooling arrangements may facilitate providing more coverage for potential victims of a hazmat incident on a smaller railroad. Since large railroads already carry high levels of insurance, the compensation to victims of incidents on large railroads would remain unchanged from the current situation. Liability would still be decided by a court and victims would still incur legal expenses to bring a suit. If no party is found legally liable for a particular incident, the victims in that incident might not receive any compensation, which represents no change from the current situation.

Class II and Class III Railroads. The pooling arrangements are presented as options for reducing the cost of requiring smaller railroads to hold more insurance than they currently do. However, these potential cost savings are mostly theoretical, as there is very little information publically available on the cost of insurance coverage for small railroads, either for individual policies or for pooled policies.

Class I Railroads. If Class I railroads were responsible for obtaining insurance coverage for their short line partners (pooling variation #1), the costs of insurance would be expected to rise compared to an insurance policy that applies only to the Class I railroad. However, one could also expect the Class I railroad to pass along those additional costs to the short line.

Shippers. Under any of the pooling schemes, shippers using smaller railroads might find their rates are lower than compared to a situation with a new minimum financial responsibility requirement and no pooling.

Tariff Setting and Rail Rate Negotiations

Both of the alternatives discussed above relate to smaller railroads pooling with other railroads in order to purchase commercial insurance at less expense compared to a situation with requirements for minimum level of financial responsibility and no pooling. While the cost of insurance may go down, that cost saving is not expected to change the structure of the tariff-setting process or rate negotiations.

Competitive Impacts

To the extent the pooling arrangements can lower costs to short line railroads, the negative competitive

impacts for smaller railroads from a requirement related to a minimum level of financial responsibility are mitigated compared to a situation with requirements for minimum level of financial responsibility and no pooling.

Safety

While there are many federal safety regulations in place to ensure the safe transport of hazmat by rail, the pooling arrangements to purchase commercial insurance may allow railroads to exert pressure on each other to enact best practices related to safety procedures since an incident on one railroad can have negative impacts on other railroads.

4.4 Secondary Liability Pool Funded by Shippers

4.4.1 Description

The idea for a secondary liability pool for railroads funded by shippers was addressed by several public comments. Although there is variation among the proposals, the following is a general description of how the secondary liability pool concept could be applied to rail transportation of hazmat.

Railroads would be required to demonstrate a certain level of financial responsibility, which would also be a cap on liability for the railroads. If damages from a hazmat on rail incident exceeded the amount of the individual railroad's liability, the residual damages would be paid from a newly created fund to which shippers would contribute. The fund would receive revenues in the form of taxes or fees paid by hazmat shippers based on how much hazmat they ship.

In other industries where a liability pooled fund has been created, such as for contaminated sites in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the Superfund Law, a strict liability regime exists. With respect to CERCLA, the government does not need to prove fault on the part of the potentially responsible party (PRP) to collect damages needed to clean up the site. This "strict liability" framework speeds up compensation to people or places harmed. After damages have been collected from the PRP, the PRP is able to pursue contribution claims against other PRPs based on fault or causation. This way, clean up or remediation is not delayed by proceedings to determine fault or causation, but PRPs have an avenue to seek that their financial responsibility matches degree of causation or fault. In the event no PRP exists, the government is able to fund remediation through the Superfund.

However, a counter argument to strict liability is that it is not appropriate to hold railroads strictly liable because they do not have discretion over making the shipment; that is, in some cases they are compelled to make the shipment because of common carrier obligations. While a law similar to CERCLA would allow for railroads to seek payment from responsible parties, the process could be expensive and burdensome.

Additional examples of secondary liability funds used in other industries are described below.

Oil Spills on Navigable Waterways in the United States

The Oil Spill Liability Trust Fund (OSLTF) was created in 1986 but funding was not authorized until the signing of the Oil Pollution Act (OPA) of 1990 in the aftermath of the Exxon Valdez oil spill in Prince

William Sound, Alaska. The OSLTF is used to pay for removal costs and damages resulting from oil spills in U.S. waters. Marine vessels are required to demonstrate financial responsibility of a certain amount depending on the size of the vessel, based on a "worst case discharge" estimate. There are different provisions for drilling operations. Depending on the type of facility, there are limits on the amount a responsible party might pay for removal or damages. Any removal costs or damages that exceed that amount are reimbursed by the fund, which is funded by an $0.08 per barrel tax on all oil imported into or produced in the United States. In addition to the tax, the fund receives revenues from interest on trust fund, cost recovery from responsible parties, and penalties imposed on responsible parties.[180]

The liability cap on damages or removal costs does not hold if an entity is found to have violated a federal or state regulation, acted negligently, or engaged in willful misconduct. The funds are not used for victim compensation for death or injury. Rather the fund only compensates for business losses, property damage, natural resource damage assessments, cleanup, agency operating costs, and research. In some cases, no responsible party for an oil spill can be identified. In those cases, the fund pays for all of the removal and damages. Total payouts from the fund are capped at $1 billion or the balance of the trust fund, whichever is less. The responsible party is responsible for handling claims for damages from the spill, including advertising, adjudication, and payment. If the responsible party does not perform those activities, the National Pollution Funds Center (NPFC) performs those duties and bills the responsible party.[181]

The issue of liability caps was questioned in the aftermath of the *Deepwater Horizon* explosion and oil spill in April 2010. The liability cap for an off-shore drilling operation is $75 million, orders of magnitude smaller than the expected damages from the Deepwater Horizon. In spite of that liability cap, British Petroleum (BP), one of the responsible parties, voluntarily waived the $75 million liability cap and put $20 billion in an escrow account to compensate individuals and businesses. As summarized by the National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling ("the Commission"), Congress began to consider raising the limit or eliminating it altogether.[182] On the one hand, increasing the liability limit would serve as a powerful incentive for companies to pay closer attention to safety. On the other hand, members of Congress became aware many drilling operators were small independent contractors without the financial ability to pay insurance premiums for higher levels of liability. There was concern that lifting the liability cap would have anticompetitive impacts, especially since the smaller independent producers develop smaller and end-of-life fields that larger firms find uneconomic.

The Commission found the liability cap for oil spills in OPA distorts incentives to adopt cost-effective safety precautions and does not provide adequate compensation. The Commission noted if the spill had been caused by a company with less financial resources, it would have declared bankruptcy long before paying the full damages incurred. The OSLTF, with a cap of $1 billion, does not provide sufficient backup. Thus, a significant portion of injuries would have gone uncompensated. The Commission made a series of recommendations aimed at achieving the goals of creating proper safety incentives, fully compensating potential victims, and not driving competent independent oil companies from the market.

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[180] United States Coast Guard (USCG), "The Oil Spill Liability Trust Fund," *National Pollution Funds Center*, accessed Nov. 2016. Available at: https://www.uscg.mil/npfc/About_NPFC/osltf.asp.
[181] USCG, 2016.
[182] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deep Water: The Gulf Oil Disaster and the Future of Offshore Drilling*, Report to the President, Jan. 2011: 245-6. Available at: https://www.gpo.gov/fdsys/pkg/GPO-OILCOMMISSION.

The recommendations include increasing the liability cap, allowing smaller independent companies to create a mutual insurance pool, phasing in changes to insurance requirements over time, and encouraging smaller companies to partner with firms with greater financial resources (noting these "joint ventures" already exist and no further policy change is needed). The Commission also recommends raising the per-incident cap on payouts from the OSLTF from its current $1 billion level.

Rail Transport of Crude Oil in Canada

In the aftermath of the disaster at Lac-Mégantic, Quebec, the Canadian government adopted the Safe and Accountable Rail Act.[183] The Act requires railroads to hold minimum amounts of liability insurance, with the amount depending on the amount of oil or hazmat shipped, as shown in Table 8 below.[184] The amount of liability insurance requirement is also the liability cap for the railroads.

Table 8. Table of Minimum Liability Insurance Coverage (volumes in tonnes per year)[185]

Minimum Required Insurance (Canadian dollars)	Crude Oil	Toxic inhalation hazard	All other types of dangerous goods
CAD$ 25M	0	0	< 40,000
CAD$ 100M	0 > to <100,000	> 0 to < 4,000	>=40,000
CAD$ 250M	100,000 > to < 1.5 million	4,000 > to < 50,000	--
CAD$ 1B	>= 1.5 million	>=50,000	--

The Act requires shippers to pay a tax of CAD$ 1.65 on each ton of crude oil shipped by rail into a secondary liability fund that would be used to compensate victims of rail incidents for damages beyond the private insurance amount. If an accident exhausts the fund, the Canadian government would be responsible for paying additional claims. The tax is currently only imposed on crude oil, but it could be extended to other types of dangerous goods in the future. Because the Act is relatively new and the requirements were phased in over time, there is not yet much information on the impacts of the new program on availability of coverage, insurance costs, or rail rates.

U.S. Nuclear Power Industry

The Price-Anderson Act of 1957 governs liability-related issues for the nuclear power industry in the United States.[186] The U.S. government had a goal to allow private companies to build and operate nuclear power plants to supply civilian energy needs. However, private companies were unwilling to enter the market because of the potentially large amount of liability and risk associated with a new nuclear power industry. To alleviate that concern and foster private participation, Congress passed the Price-Anderson Act. The Act requires commercial nuclear power plants to hold the maximum amount of insurance that is available in the market (as of 2014, this was $375 million per reactor).

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[183] A discussion of the liability requirements of this Act are available online at https://www.tc.gc.ca/eng/mediaroom/infosheets-railway-safety-7683.html

[184] Transport Canada, "Liability and compensation regime under the Safe and Accountable Rail Act," Feb. 2015, last modified Jan. 6, 2016. Available at: https://www.tc.gc.ca/eng/mediaroom/infosheets-railway-safety-7683.html.

[185] One tonne (or metric ton) equals 1,000 kilograms or approximately 2,204.6 pounds.

[186] 42 USC § 2210

If an incident results in damages greater than the amount of private insurance required, the owners of each of the current 104 nuclear reactors must pay those additional damages, up to $121,255,000 per reactor or $12.61 billion in total. Above that amount, Congress would determine if additional disaster relief is required. Each reactor owner must hold that maximum amount of $121,255,000 per reactor in cash reserves. The reactor owners only make a payout if an incident occurs.[187]

The Act imposes a strict liability framework, meaning owners of nuclear reactors waive certain defenses to claims. The strict liability regime is believed to streamline the claims process by reducing legal costs and the time needed for legal proceedings.[188]

In the after-math of the Three-Mile Island nuclear incident in 1979, the nuclear power industry created the Institute of Nuclear Power Operations (INPO), a non-profit safety "watch-dog" organization that conducts thorough inspections of each nuclear site every two years and provides a rating. Also created after the Three-Mile Island incident was the Nuclear Electric Insurance Limited (NEIL), a mutual insurance company that insures all nuclear power plants in the United States as well as some facilities internationally. Representatives from NEIL are allowed access to the INPO ratings of each reactor and use that information to develop insurance premiums for each nuclear site with better rated sites enjoying lower premiums.[189]

Vaccines

The National Childhood Vaccine Injury Act of 1986 created the National Vaccine Injury Compensation Program (VICP). It provides compensation to people injured by certain vaccines through a no-fault alternative to the traditional tort system. The VICP was established after lawsuits against vaccine manufacturers threatened to cause vaccine shortages and reduce vaccination rates. The objectives of the program are to: 1) ensure an adequate supply of vaccines; 2) stabilize vaccine costs; and 3) establish and maintain an accessible and efficient forum for individuals injured by certain vaccines. The Vaccine Injury Compensation Trust Fund is financed through a $0.75 excise tax on certain vaccines. The program is administered by the Department of Health and Human Services (HHS). The U.S. Court of Federal Claims makes the final decision as to whether a petitioner is compensated and the amount of the compensation.[190] The individual vaccine manufacturers are shielded from individual lawsuits by injured parties.

4.4.2 Applicability

The secondary liability pool funded by shippers would be used to supplement the insurance coverage held by railroads. Recall that $1 to $1.5 billion of insurance is currently held by Class I railroads. Smaller railroads hold much less. As discussed in Section 3.3.2, there is some concern expressed in the RFC responses that a hazmat incident could result in damages much higher than the amount of insurance coverage held by the railroads. If the incident occurs on a Class I railroad, the Class I railroads all have large amounts of assets that could potentially be liquidated to compensate victims. However, such

[187] "Nuclear Insurance and Disaster Relief," *United States Nuclear Regulatory Commission*, 2014: 1. Available at: https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/nuclear-insurance.pdf.
[188] U.S. Department of Energy, *Report to Congress on the Price-Anderson Act*, Mar. 1999: 11-12. Available at: https://energy.gov/sites/prod/files/gcprod/documents/paa-rep.pdf.
[189] National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011.
[190] Health Resources and Services Administration (HRSA), "About the National Vaccine Injury Compensation Program,", Feb. 2016. Available at: http://www.hrsa.gov/vaccinecompensation/about/index.html.

liquidations might cause service disruptions that could negatively impact the general U.S. economy. Further, the process would require lengthy legal proceedings. If a large scale hazmat incident occurred on a smaller railroad, the amount of compensation available to victims might be limited by the amount of insurance held by the railroad and the much lower value of the assets of the railroad. The secondary liability fund would provide an additional source of funds to compensate potential victims.

The secondary liability fund would also protect railroad assets in the event of an incident that causes damages in excess of the railroad's insurance coverage. Most Class I railroads' annual reports already identify the prospect of a hazmat incident that exceeds their insurance coverage level as a key risk to their business operations. Such an incident could necessitate asset sales or financial restructuring in order to pay damages; this is relevant to this study to the extent that those actions could create disruptions to railroad service. Over the longer term, one or more high-cost hazmat rail incidents (and/or reduced availability of liability insurance) would likely cause investors to demand a higher risk premium on railroads' debt and equity instruments, affecting their ability to raise needed capital for continued operations.The American Chemistry Council (ACC) stated the taxes used to finance the secondary liability fund should only be levied on shipments of commodities that have liability risks that might reasonably be expected to exceed the amount of commercially available insurance.[191] The Canadian secondary rail liability pool applies only to crude oil shipments, but leaves open the possibility of expanding the fund to TIH/PIH shipments. The public comments related to this research similarly focused on TIH/PIH and crude oil.[192] To set up such a secondary liability pool in the U.S., decisions would need to be made regarding which commodities to include.

Some shippers oppose making additional payments for a secondary liability fund because they already pay higher rates for TIH/PIH shipments and believe they are already compensating railroads for the financial risks of TIH/PIH shipments.[193] Notably, the Canadian Fertilizer Institute provided comments to Canadian authorities urging them to exclude TIH/PIH from the secondary liability pool eventually instituted under the Safe and Accountable Rail Act.

Other shippers seem interested in the secondary liability pool concept even though they would be required to pay taxes to support the fund. By capping the liability of a railroad to a level that can be covered by commercial insurance, the railroads experience less uncertainty about the financial risk they face from hazmat shipments. Currently railroads are likely charging a risk premium that is inflated due to uncertainty about the true level of risk. Under the secondary liability pool, shippers pay a consistent known amount on all their shipments, adding a degree of certainty to their business operations as well. Those shippers who support the idea of a secondary liability pool stress that they do not want to pay for the same liability twice. They appear to expect their rail rates would be lowered following the implementation of a tax on shippers to fund the secondary liability pool.[194]

ACC stated, "[t]aken as a whole, the core elements [of a shipper funded secondary liability pool] would provide greater certainty of liability coverage in the event of an incident, protect railroads from liabilities

[191] ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019*.
[192] See for example, ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019* and Dow Chemical response to PHMSA *Docket ID: PHMSA-2016-0074-0015*.
[193] TFI response to PHMSA *Docket ID: PHMSA-2016-0074-0011*.
[194] ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019*.

that threaten their ability to continue operating, and reduce or eliminate rate premiums paid by hazmat shippers."[195]

CSXT stated a shipper funded secondary liability fund (formulated in accordance with CSXT's suggestions) is "not only a feasible alternative but a necessary and overdue legislative solution to the railroads' common carrier dilemma. Where the railroad is unable to refuse to transport hazardous materials and other stakeholders (i) control aspects of such transportation (including whether to ship the materials in the first instance) and (ii) benefit economically from such transportation, those stakeholders should necessarily be involved in a liability sharing regime. Capping liability and sharing liability more broadly (i) protects railroads from potentially ruinous liability; (ii) protects taxpayers from shouldering any excess liability beyond a railroad's insurance capacity; and (iii) is in the public interest as it both recognizes the continued need for common carrier service and ensures the continued viability of the North American rail network."[196]

NS stated a secondary liability pool modeled after the Price-Anderson Act "would provide a greater degree of certainty as to the rights and obligations of the carriers and shippers. It would recognize that there should be limitations of liability. It would also provide for the sharing of risk and exposure relating to hazardous materials transportation over a broader group to include the public at large, because such type of legislation would be premised on the public need for the use - and, accordingly, the transport."[197]

Issues to address

To operationalize a secondary liability fund paid for by shippers, several issues would need be decided.

Level of Railroad Financial Responsibility, Railroad Liability Cap, and Amount of Shipper Tax. All of the existing secondary liability funds referenced for this research and all of the public comments about such an insurance model indicate that the liability cap for the railroad should equal the required level of financial responsibility for the railroad. In addition, many comments suggested that from a practical standpoint, the level of insurance required of smaller railroads would likely need to be lower than the amount required of Class I railroads because smaller railroads have less financial resources to pay premiums for higher levels of coverage.

However, from a risk assessment standpoint, the level of insurance required of a railroad should relate to the amount of damage that might result from an incident on a particular railroad, not its ability to pay the premium. There exists a logical connection between the cost of insurance coverage and a railroad's financial resources. Larger railroads are charged higher premiums for a set level of coverage because they handle larger amounts of hazmat and thus have greater exposure to risk of a hazmat incident. That is, the likelihood of a hazmat incident occurring on a particular railroad is generally expected to increase with the amount of hazmat traffic handled by the railroad. Theoretically, the reverse should also be true. Premiums for a set level of insurance may be much lower for short line railroads because an individual short line railroad handles less hazmat traffic than a Class I. However, the relationship between insurance premiums and hazmat volume may not scale proportionally since insurance adjusters include other factors

[195] ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019.*
[196] CSXT response to PHMSA *Docket ID: PHMSA-2016-0074-0016.*
[197] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006.*

in determining premium levels, such as safety practices, safety history, administrative costs, etc.

CSXT proposed a structure whereby Class I railroads would be liable for the first $500 million in losses on an "at fault" basis. Shippers would be required to purchase coverage for $500 million in excess of the Class I railroad's exposure and the liability would not be fault-based. A TIH/PIH trust fund would be created that would cover any damages beyond the first two tiers, up to a total of trust fund payout of $1 billion for a total of $2 billion in coverage. Although not discussed explicitly in CSXT's comments, the inference is that if the railroad is not at fault, the shipper's insurance would cover the first $500 million in damages and the trust fund would pay an additional $1 billion for a total of $1.5 billion in coverage.

CSXT proposes the trust fund would be financed by a tax of $1000 per carload of TIH/PIH, or the mileage-based equivalent. As rail moves approximately 100,000 carloads of TIH/PIH materials annually, the fund would receive $100 million in contributions per year. Over 10 years, the fund would accumulate $1 billion necessary for a maximum payout.

CSXT proposed lower liability caps for Class II and Class III railroads, perhaps ranging between $10 and $100 million, with the TIH/PIH trust fund filling the gap between the railroad liability and the shipper's liability amount of $500 million.

TCWR presented a white paper that suggested a liability cap of $25 million for railroads and a secondary liability pool funded by $50 per carload tax, of which $25 would be paid by the shipper and $25 would be paid by the railroad. Those tax rates are much lower than those proposed by CSXT, but the suggested amount of insurance coverage aligns with CSXT's recommendations for Class II and Class III railroads.

AAR acknowledged "while the risks associated with hazmat are no less for smaller railroads than they are for larger railroads, smaller railroads have more limited ability to obtain sufficient third party liability coverage" and suggested the secondary liability fund could be used to compensate victims of incidents on smaller railroads.[198]

In the Canadian system, the shipper tax is based on the volume of the shipments. The shipper tax could also be based on a measure of volume and mileage, such as ton miles of the relevant commodities. A volume-based tax sends price signals that incentivize reduced shipment amounts. A tax levied on the basis of ton miles would incentivize reduced shipment volumes and also incentivize reducing the length of the hauls, and could potentially influence hazmat consumers to switch to closer sources.

Fund Adequacy. Once the fund is initiated, it would build up over time. If a large incident occurred before there were adequate funds available, victims would be left uncompensated. A solution would be for the fund to be allowed to borrow from the U.S. Treasury and pay back the loan based on future payments. The tax rates could be increased in order to pay back the loan in a timely manner. As an example, the Federal Deposit Insurance Corporation (FDIC) insures bank deposits up to $250,000. Banks pay premiums to a fund managed by FDIC. FDIC also has the ability to borrow up to $100 billion from the U.S. Treasury.[199] During the 2008 financial crisis, which saw the bankruptcy of hundreds of banks, the fund ran perilously low. To keep the fund solvent, FDIC issued a temporary special assessment of fees to

[198] AAR response to PHMSA *Docket ID: PHMSA-2016-0074-0008.*
[199] Diane Ellis, "Deposit Insurance Funding: Assuring Confidence," *FDIC,* Staff Paper, Nov. 2013. Available at: https://www.fdic.gov/deposit/insurance/assuringconfidence.pdf.

replenish the funds. In its comments, CSXT suggested although borrowing from the U.S. Treasury is a possibility, an alternative that reduces dependence on the federal government would be for the fund to issue bonds that would be repaid with future shipment taxes.

Excess Funds. In the event no large incidents ever occur, it is possible the fund could grow indefinitely over time. If extremely large amounts of funds accumulate, Congress might call for a lapse in the taxes used to pay the fund or some of the funding might be used to conduct safety research related to hazmat issues.

Cap on Secondary Liability. Several of the public comments related to a shipper-funded secondary liability pool assumed there would be a per-incident cap on the amount of payments made by the secondary pool. The idea of developing a preset cap on the payments made by the secondary liability fund seems to stem from a desire to calculate the appropriate tax rate needed in order to meet the funding goal in a certain time frame (for instance, CSXT suggested 10 years to build up the fund).

Having a certain funding goal would aid in developing the pool; however, it is not clear that a strict cap would be necessary or advisable if the goal is to fully compensate any potential victims of a hazmat on rail incident. In its comments, Riverkeeper, Inc. stated any new policy or program considered by PHMSA should not create a shortfall between any potential liability cap and the potential damages from a worst case scenario.[200] To alleviate that concern, if the fund balance is inadequate to pay the full amount of damages, then (as discussed above) the fund could borrow from the U.S. Treasury and repay the loan with future revenues and perhaps issue a temporary special assessment to repay the loan in a timely manner.

Exceptions to the Liability Limit for Railroads. As mentioned above the liability cap for the OSLTF does not hold if an entity is found to have violated a federal or state regulation, acted negligently or engaged in willful misconduct. The Canadian liability scheme for crude oil by rail is more lenient in that it only voids the limit of liability if it is proved "the railway accident resulted from any act or omission of that company that was committed either with intent to cause the accident or recklessly and with the knowledge that the accident would probably result."[201] The criteria for voiding the liability limit for a hazmat on rail secondary liability pool are an open question. There may be a public outcry if a railroad that engages in truly egregious behavior is "let off the hook" for a large-scale disaster. On the other hand, railroads are operated by humans and human error can never be entirely prevented (although it is the goal). If the bar for being covered by the liability limit is too high, the program would provide little benefit because it would not materially change the railroad's perception of the risks they face and there would be no reason to change the rates they charge. The pool would, however, raise the shipper's cost of transport via the shipper-paid tax and the funds collected would sit unused.

If there are exceptions to the liability cap for the railroad, the fund could be structured as the funding source of last resort for cases where the liability cap for railroads does hold. That is, if an incident occurs as the result of railroad actions that nullify the liability cap for the railroad, the victims will be compensated through access to the full amount of the railroad's assets. If there are any remaining uncompensated damages, the fund could provide any additional compensation necessary.

[200] Riverkeeper, Inc. response to PHMSA *Docket ID: PHMSA-2016-0074-0005.*
[201] Canada Transportation Act, *2015,* S.C. 1996, c.10 s 152.7.

Retroactive Payments. When the idea of secondary liability pool was presented in the public comments, the commenters generally pointed to the Price Anderson Act for the nuclear power industry as an example of such a program. The secondary liability pool for nuclear power has an interesting characteristic, in that the members of the secondary risk pool (all the nuclear power reactors in the United States) only pay retroactively. The members hold the maximum amount of potential damages assessed to them in reserve, but only pay if there actually is an incident. The idea of retroactive payment made by shippers seems impractical from an implementation standpoint for two reasons. First, there are only 104 nuclear power reactors in the United States, while there are potentially thousands of hazmat shippers. As each shipper would need to present evidence of having the required amount of financial responsibility, there would a comparatively large administrative burden in tracking certifications and collecting funds in the event of an incident. Secondly, the Price Anderson system only works because the maximum amount required of a reactor owner is pre-specified. If damages exceed the maximum amount, Congress will "consider" whether to provide additional funds. The pay-as-you-go system, as opposed to a retroactive payment, seems more suited to a secondary liability pool for hazmat on rail from an administrative standpoint, and, if coupled with an ability to borrow from the U.S. Treasury, more suited to fully compensate victims in the event of a large scale disaster.

Fund run by Government or Private Insurance. Dow Chemical suggested the benefit of a secondary liability pool could be created without a government agency running the pool. Instead, a secondary level of compensation could be provided by having shippers pool together to purchase private insurance to cover amounts higher than the railroad liability cap. Dow Chemical stated such a structure would provide the most efficient and cost effective means of providing rapid compensation to victims of an incident.

Without further input from the insurance industry, it is not clear whether a private insurance company would be willing to provide such coverage. It is also not clear what such a policy would cost. Because only a few insurance companies provide very high coverage amounts, those in the market are able to charge higher rates due to lack of competitive pressure. Without this pricing information, it is not clear whether a private insurance policy for the shipper funded portion of the liability would be more cost effective. Further, a private insurance policy would necessarily be limited by the amount of the policy, whereas a government-run fund might be able to borrow to cover potentially higher damages.

A Layer of Shipper Purchased Private Insurance. In its comments, CSXT suggested a layer of shipper-purchased private insurance that would cover damages above the railroad liability cap but below the level where the secondary liability pool would make payments. For incidents involving Class I railroads, CSXT suggested the first $500 million be the responsibility of the railroad, the next $500 million the responsibility of the shipper, and anything above $1 billion and up to $2 billion be paid by the fund. Note this proposal would provide Class I railroads insurance cost savings since they currently purchase between $1 and $1.5 billion compared to the $500 million suggested by CSXT. It is not clear what advantage is gained by having a layer of individualized liability aimed at the specific shipper whose product is involved in the incident. If the incident is caused by shipper negligence in packaging and handling the commodity for transport then they should be held liable for the damages, with no payments required from the railroad. If there is no negligence on the part of the individual shipper, then their potential liability exposure for the incident relates only to requesting the movement in the first place. In that sense, all hazmat shippers contribute in some way to the risk of a hazmat-by-rail incident, and payment by the shared liability pool seems appropriate. Of course, it should be noted that society as a

whole, not just shippers, contributes to the risk of hazmat-by-rail incidents through its consumption of hazmat-involved products, such as gasoline, plastics, fertilizer, etc. Assigning the risk to shippers is an effective convenience in that shippers may pass along any additional costs from that risk onto the end users.

Other Parties. AAR extended the idea of minimum levels of financial liability and associated liability cap for railroads and stated all parties to a TIH/PIH shipment, including the railroad, the shipper, the tank car owner, lessors, and manufacturers, should be required to maintain insurance and be individually liable on an at-fault basis for a defined amount of damages arising from an incident. The secondary liability fund would pay any damages above the liability cap amount.

Implementation

Shippers stated they should not be required to pay for the same liability twice, referring to their current higher than average rates for TIH/PIH shipments and the possibility of paying an additional tax to fund the secondary risk pool.[202] As explained in Section 3.3.2, rail rates for hazmat shipments are generally negotiated in contracts; federal agencies, including the STB, do not have authority over negotiated contracts. Therefore, it appears that a mechanism by which the STB or some other federal agency could affect a corresponding reduction in hazmat rail rates consequent to the institution of a shipper tax on hazmat shipments does not currently exist. Nonetheless, a corresponding reduction in rail rates consequent to a shipper tax to fund a secondary liability pools seems crucial for gaining support from shippers for a secondary liability pool.

A mechanism would need to be developed to facilitate shipper payment of the taxes and fees for the secondary liability fund. Having the railroad collect the taxes via its existing invoicing arrangements is one possible mechanism. The funds would then be turned over to the fund administrator. Typically these funds are invested in U.S. Treasury bonds. However, the Chlorine Institute in its comments expressed concern that if the taxes are collected by the railroads, the funds might be mismanaged, and urged PHMSA to closely track and oversee the process.

A system for processing and validating claims made on the fund would need to be created. Having the validity of the claim assessed by the same agency responsible for making the payment might create an internal conflict. Thus, some insurance schemes have those responsibilities split up among different entities. For instance, the VICP is managed by the HHS, but the claims are reviewed by the U.S. Court of Federal Claims.

4.4.3 Impacts

Potential Stakeholder Impacts

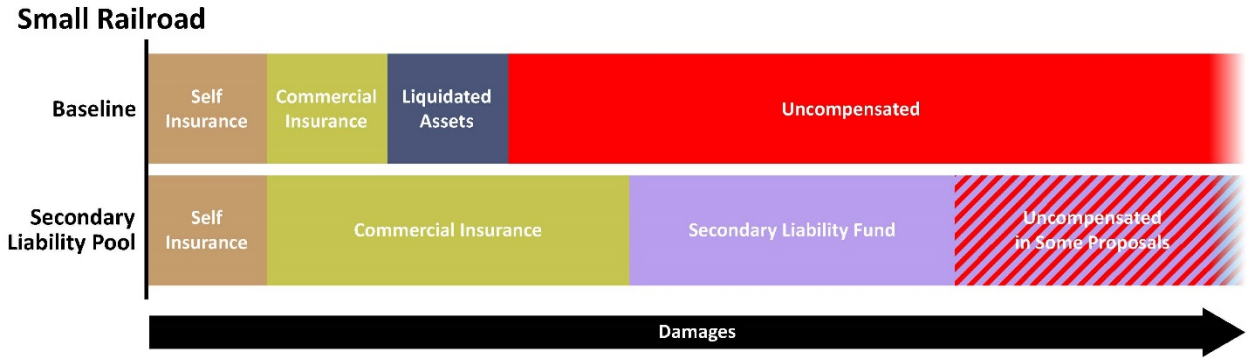
Potential Victims. A pooled secondary liability fund coupled with requirements for minimum levels of financial responsibility that exceed currently held insurance coverage could provide more insurance-provided compensation to potential victims of hazmat incidents on smaller railroads than is available currently and more than would be available with a standalone requirement related to minimum levels of financial responsibility. The compensation available to potential victims on Class I railroads would

[202] ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019;* TFI response to PHMSA *Docket ID: PHMSA-2016-0074-0011.*

probably not be impacted since the Class I railroads likely have sufficient assets to cover damages resulting from even catastrophic incidents. Further, the fund could be structured to provide compensation to victims of incidents where no party is found to be legally liable. A strict liability regime provides administrative streamlining to potential victims, since the claimants can avoid lengthy and costly legal proceedings to prove negligence.

Class II and Class III Railroads. Figure 12 provides a notional representation of the payment sources financial damages for a hazmat incident on a small railroad under current baseline conditions compared to a situation with a secondary liability pool. The figure shows that under current conditions, payments would first come from a railroad's cash reserves (or self-insurance), then from the commercial insurance held by the railroad, then from the proceeds from liquidation of assets. Any damages incurred beyond that amount would be left uncompensated. As part of a secondary liability pool program, small railroads may be required to hold more private insurance (or other means of proving financial responsibility) than they currently do. The liability for that railroad would be capped at the amount of private insurance it holds. Thus, the railroad would not be faced with the need to liquidate assets after an incident. The secondary liability pool would then make any additional payments needed to compensate the victim. Some proposals related to the secondary liability proposed a cap on the payments made by the fund, but such a ceiling is not strictly necessary. Thus, under a prototype secondary liability pool, a small railroad may need to purchase more insurance, resulting in higher costs to the railroad, but the threat of bankruptcy due to a low-probability, high-consequence event is removed. The costs of insurance may also rise if the liability cap is partnered with a strict liability regime for the railroads, since the railroads would not have access to certain defenses from being held liable, making the probability of an insurance payout higher than under current conditions. The consequences from higher costs to small railroads were discussed in Section 4.2.

Figure 12. Notional Representation of Sources for Damages Payments for a Small Railroad (baseline and with secondary liability pool) subject to a low probability, high consequence event

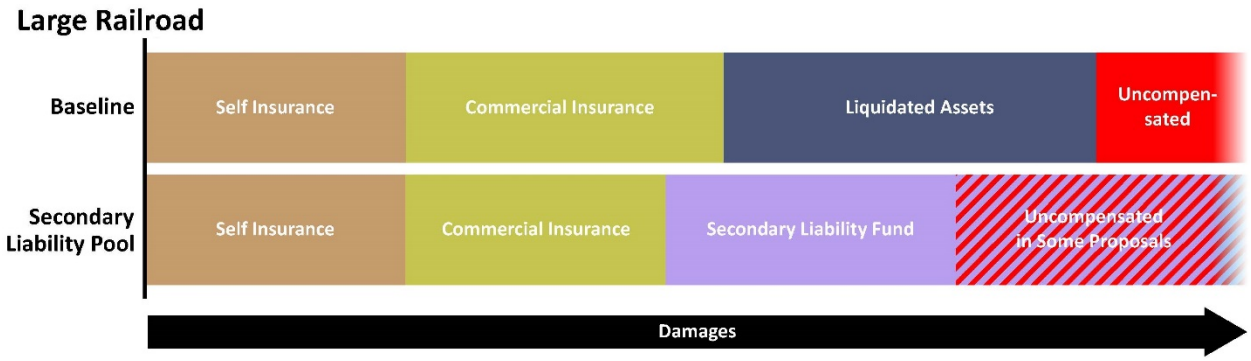


Class I Railroads. Figure 13 provides a notional representation of the sources for payment of damages for a hazmat incident on a large railroad under current baseline conditions, compared to a situation with a secondary liability pool.[203] The figure shows large railroads tend to hold significant cash reserves (self-insurance) to cover smaller incidents, and that is not expected to change with the introduction of a secondary liability pool program. Currently large railroads purchase the maximum amount of commercial

[203] Large railroads in this discussion is a relative categorization that may include not only Class Is, but also holding companies comprised of many short line railroads.

insurance available in order to shield their assets from bankruptcy liquidation in the event of a large incident. Depending on the level chosen for the liability cap, a large railroad might purchase less insurance than they currently do. The secondary liability fund would pay for damages beyond the amount of the railroad liability cap. Thus, under a secondary liability pool, large railroads could experience savings related to insurance costs, although the cost of a smaller amount of insurance may rise compared to the current situation if the liability cap is coupled with a strict liability regime, since the railroads lose the right to claim certain defenses. Perhaps more importantly, the liability cap protects the railroad from potentially ruinous liability from a catastrophic incident. Railroad liability beyond its insurance coverage would not only create financial losses to railroad shareholders, it could also result in potentially severe service disruptions that may negatively impact the general U.S. economy.

Figure 13. Notional Representation of Sources for Damages Payments for a Large Railroad (baseline and with a secondary liability pool) subject to a low probability, high consequence event



Shippers. Some small railroads would need to pay more insurance coverage, if the amount of the minimum financial responsibility is set above what they currently pay. Those costs may be passed on, either to only the hazmat shippers, or to all shippers using the small railroads. In addition, all hazmat shippers, regardless of the size of the railroad they use, would bear the incidence of the new tax used to fund the liability pool. In response to that tax, railroads may lower their rates in order to retain customers. In the public comments, some hazmat shippers have expressed their openness to a secondary liability pool, but only if they do not end up paying more than they currently do. In other words, shippers do not want to pay twice for the liability, that is, through new shipper taxes in addition to existing, and relatively high, hazmat rail rates. Railroads could lower their rates due to the introduction of a liability cap for railroads, but the majority of hazmat rail rates are negotiated and the results of negotiations cannot be predicted with certainty.

The tax on the shipment would also act as a price signal to the receivers of hazmat commodities to incentivize them to use alternative commodities. If the tax is levied on a mileage basis, it can incentivize receivers to source their chemical needs from closer facilities. Both of those impacts would lessen the risk of a hazmat on rail incident by reducing the risk exposure.

Further, the liability cap on railroads would shield railroads from potentially ruinous financial liability, which would also preserve the ability of a railroad to continue to provide service in the aftermath of a catastrophic incident. Preservation of the rail network is a benefit to all entities who rely on the rail network, not just hazmat shippers.

Tariff Setting and Rail Rate Negotiations

The secondary liability pool could significantly change the structure of tariff setting and rail rate negotiations. Currently, railroads face additional exposure to financial risk from hazmat shipments, not covered by the insurance coverage they hold. That additional risk exposure is one reason the rates charged for TIH/PIH are higher than average rates. However, the size of that uncovered risk is difficult to estimate and quantify. Uncertainty about the amount of residual risk creates pressure to further increase rates. Under a secondary liability pool described in this section, all financial risk to the railroad could be covered by commercially available insurance and thus the cost of the risk is observed and uncertainty is removed. Removing financial risk has benefit for all the parties involved. If coupled with a revision to how URCS estimates the variable cost of hazmat shipments (discussed in Section 4.6.6), there could be further changes to how tariffs are set and rates are negotiated.

Competitive Impacts

Similar to the impacts for the requirements of minimum financial responsibility as a standalone concept, the secondary liability pool may raise costs for small railroads and lower costs for large railroads. As a result, small railroads may lose some business to large railroads—or even trucking—resulting in a loss of revenue.

Safety

Under the current situation, railroads are highly exposed to financial risk from hazmat shipments. The threat of dire financial consequences is one force (among many) that incentivizes railroads to engage in high levels of safety precaution in transporting hazardous materials. The introduction of a liability cap would act to reduce a railroad's exposure to financial risk. Thus, economic theory based on moral hazard suggests there is some possibility railroads may reduce their safety efforts. In its comments, Citizens Acting for Rail Safety–Twin Cities expressed concern, stating "any [cap] on liability of rail carriers operating in the U.S. and/or spreading of liability to shippers, brokers or other parties must show evidence that reducing or removing the liability burden from the rails carriers will indeed lead to prevention measures to improve the safety of transport by rail of hazardous materials."

However, any potential for reducing safety behavior is mitigated by the requirements in the HMR and FRA regulations. Further, insurance companies are aware of the issue and often mitigate that potential response by providing incentives to better safety behavior in the form of premium discounts for entities that have good safety practices. Additionally, the first level of compensation after an incident is provided by the railroad, which provides further incentive for safety behavior (much like the deductible on an individual's automobile insurance). NS, in its comments, pointed out that accidents have reputational harm and affect a railroad's ability to transport other freight due to damages to rail lines.

Further, the tax on the shipment would act as a price signal to the receivers of hazmat commodities to incentivize them to use alternative, less hazardous commodities or to source them closer to the site where they will be used.

The higher level of financial responsibility required of smaller railroads as part of a secondary liability pool program may increase costs for smaller railroads. Increased costs for transportation may shift some traffic to truck. Truck crash rates are higher than rail incident rates, and the financial responsibility requirement may cause an increase in the overall likelihood of a hazmat incident while in transportation.

4.5 Government Provides Direct Insurance

4.5.1 Description

Under this insurance model, the federal government could provide additional insurance to railroads above the amount available in the private market. Ideally, the government would run it on a cost neutral basis, with only enough markup to cover its administrative expenses. If collected premiums to date were not sufficient to cover damages of an incident, funds could be borrowed from the U.S. Treasury and paid back with future premiums.

One example of the federal government providing direct insurance is the aviation war risk insurance program.

Aviation War Risk Insurance. This insurance provides coverage for hostile acts of violence against airlines, such as terrorism, hijackings, and sabotage, and covers third-party damages. It is mandated that U.S. airlines hold aviation war risk policies.

The federal government provided aviation war risk insurance to merchant fleets during World War I and World War II via the 1938 Civil Aeronautics Act, but there were not enough commercial flights to warrant commercial air products. Until 1951, commercial aviation war risk insurance was cancellable within a 48-hour period, and was therefore not usually taken. An amendment to the 1938 law gave the Secretary of Commerce the authority to provide war risk insurance when deemed in the interest of air commerce. The program was continued under the Federal Aviation Act of 1958 and retained within the Department of Commerce until 1966, when it was moved to the FAA under the newly-created U.S. DOT. However, until 2001, this insurance was typically only available to international and intercontinental flights.

After the events of September 11, 2001, private insurers worldwide stopped writing aviation war-risk insurance policies; they later offered the coverage, but with terms airlines found unfavorable. In response, Congress passed the Air Transportation Safety and Systems Stabilization Act of 2001,[204] extending federal aviation war risk insurance to domestic flights. The statute, which requires the FAA to offer war risk insurance to U.S. airlines with premiums based on the cost of such coverage prior to the 9/11 attacks, was passed in 2002 (as part of the bill that established the Department of Homeland Security). It had a fixed expiration date that Congress reauthorized on an annual basis; the most recent extension was the Consolidated Appropriations Act of 2014, which extended the program to September 30, 2014. It was not reauthorized by Congress after that date.[205]

Under the statute, aviation war risk insurance was offered by the FAA only after a determination by the Office of the Secretary of Transportation (OST) that insurance was not available on reasonable terms.[206]

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[204] Available online at https://www.gpo.gov/fdsys/pkg/PLAW-107publ42/pdf/PLAW-107publ42.pdf
[205] Bart Elias, Rachel Y. Tang, and Baird Webel, "Aviation War Risk Insurance: Background and Options for Congress," *Congressional Research Service*, Sept. 5, 2014: 1, 6.
[206] Eric Nelson and Helen Kish, "Federal Aviation Administration Aviation Insurance Program," *Federal Aviation Administration*. Slides are available at: http://www.aci-na.org/sites/default/files/ht_-_faa_war_risk_program_john_geisen.pdf.

U.S. air carriers paid premiums for coverage, which ranged from $100 million to $4 billion per carrier, with the average falling between $1.5 billion and $1.6 billion in 2014. Total maximum per occurrence coverage for all insured air carriers in force in January 2014 was $68 billion. The premiums, including $163 million collected in FY2013, were collected in the Aviation Insurance Revolving Fund, a dedicated fund at the U.S. Treasury that invested into U.S. Treasury securities. Premiums were typically invested from the time they were received to the time they are paid out into a claim. The FAA reports the fund had a balance of approximately $2.2 billion in July 2014.[207]

Between April 2014 and August 2014, U.S. air carriers cancelled their FAA war risk insurance policies in favor of commercial coverage. Private markets began to open up after a period of historically low aviation losses. As a result, only 4% of revenue passenger miles (RPMs) were covered under the program. In essence, the program successfully provided coverage after 9/11 until commercial rates were once again competitive.

The program was widely considered too costly for the federal government to provide permanently. The OST sent letters to the Speaker of the House and President of the Senate, arguing the current program "is not prudent in these austere fiscal times."[208]

4.5.2 Applicability

There is concern in the public comments that in the aftermath of large scale incident, the private market for rail insurance may disappear or charge very high rates for coverage.[209] In such an instance, government provided insurance might be appropriate, especially when coupled with a regulatory requirement to maintain a certain level of financial responsibility.

Issues to Address

The aviation war risk insurance program was in place for a limited amount of time until the private sector insurance companies re-entered the market. If the federal government were to supply rail insurance after a low-probability, high-consequence incident, the question is if railroads would be allowed, or even interested in, switching to private insurance if private insurers reentered the market. This question is particularly salient if the government insurance program had made payouts above the amount in its reserve fund by borrowing against future premiums. If the railroads switch to private insurers, there would be no additional premiums to pay back the loan from the Treasury and the taxpayers would be left paying the damages.

Implementation

The government agency tasked with running the program would need to develop the expertise to set the insurance premiums, develop a billing and collections system, administer claims, and all the other tasks associated with running an insurance program. The agency might elect to charge similar premiums that were charged in the market prior to the event that caused the insurers to exit, or it may decide to charge a different amount. In the long run, a government-run insurance program would ideally operate on a cost

[207] Elias, Yang, and Webel, 2014: 7.
[208] A. R. Foxx to Joseph R. Biden, Jr. and John Boehner, Mar. 31, 2014, in Submission of the Draft Bill "Federal Aviation Insurance Reauthorization Act of 2014."
[209] AAR response to PHMSA *Docket ID: PHMSA-2016-0074-0008.*

neutral basis, but it would be difficult for any entity to perfectly calibrate premiums to achieve that outcome in any given time period, given the level of risk uncertainty associated with low-probability, high-consequence events. As a result, the premiums collected may exceed the payouts or may be lower than the required payouts.

4.5.3 Impacts

Potential Stakeholder Impacts

Potential Victims. For incidents on large railroads, even if the private insurance market disappeared, the large railroads have sufficient assets that might be liquidated in order to pay damages to potential victims. For incidents on smaller railroads, having the federal government provide the insurance in the event of the private market disappearing would provide victims more compensation.

Railroads. In the event private insurance is no longer available, having the government provide insurance would protect railroads from the risk of large-scale financial losses due to an incident. It is not clear if the premiums charged by a government-run program would be higher or lower than a private insurance company would charge.

Shippers. Without knowledge of whether the government program would charge higher or lower premiums than private insurance companies, it is difficult to predict the impact on shippers.

Tariff Setting and Rail Rate Negotiations

Compared to an instance where there is no private insurance and railroads bear all of the financial risk of an incident, having explicit premiums charged to the railroads by the government provides more clarity on the costs of the risk associated with the movement.

Competitive Impacts

Without knowledge of whether the government program would charge higher or lower premiums than private insurance companies, it is difficult to predict any competitive impacts. If private insurance companies re-entered or were still insuring railroads, the government-run insurance could crowd out the private insurance market.

Safety

Private insurance companies would be expected to assess premiums to railroads based in part on the safety practices of the railroad. That is, a railroad with more rigorous safety practices might be offered discounted premiums as a means to incentivize those safe practices and minimize the risk of a costly incident. It may appear inconsistent for a federal agency managing an insurance program to require or incentivize higher standards of safety than are currently required by the HMR or FRA.

4.6 Other Liability and Insurance Issues

This section discusses other issues related to liability and insurance of hazmat on rail transportation:

- An alternative insurance model whereby the federal government provides reinsurance,
- A standalone liability limit for railroads,
- The possibility of exempting the common carrier requirement for hazardous materials,

- Catastrophe bonds,
- Liability sharing agreements between railroads and shippers of hazmat,
- Adjusting STB rate regulation to recognize extra costs of handling hazmat
- Additional measures related to prevention and mitigation of hazmat on rail incidents

Each issue is discussed below.

4.6.1 Government Provides Reinsurance

The study team reviewed other federal insurance programs targeted toward corporations that relate to low-probability, high-consequence events. This category of federal insurance programs includes a federal reinsurance program for terrorism.

Terrorism Risk Insurance Act

The Terrorism Risk Insurance Act (TRIA) was signed into law by President Bush on November 26, 2002. It was reauthorized in both 2005 and 2007. After a brief lapse at the end of 2014, President Obama signed an extension of the program until the end of 2020.[210]

TRIA created a U.S. government reinsurance facility to provide reinsurance coverage to insurance companies following a declared terrorism event. It was originally designed as a short-term measure to help the insurance market recover from industry shocks in the aftermath of the events of September 11, 2001, and to develop solutions to insure businesses against terrorism. It mandates that commercial insurers offer terrorism insurance, although policyholders can strike the coverage from their policies, should they wish (unless state law mandates coverage). It also creates a reinsurance program for commercial reinsurers to subsidize risk, allowing them to offer terrorism coverage at much more reasonable rates. The reinsurance coverage is available to insurance companies or affiliates that are recipients of direct earned premiums for any type of commercial property and casualty insurance coverage.

Insurers are not charged any up-front premiums for the reinsurance. TRIA is not triggered unless the event is deemed a terrorist attack and causes a total insurance payout in excess of $200 million. In the event of a payout, the federal government co-pays 80 percent of the insurers' primary losses after the insurer's deductible, up to $100 billion, with the insurer co-paying the remaining 20 percent. This split has been evolving per legislative language, and the 80/20 split is the target for 2020; in 2017, the federal government would pay 84 percent, with a 1 percent reduction per year until 2020. The deductible is a percentage of the direct-earned premiums each insurer received in the preceding year from the policyholder. This percentage has increased over time, from 7 percent in 2003 to 20 percent since 2007, in order to shift additional risk toward the private sector.[211] The payments by the government would be made from the general fund. A post-event recoupment fee on commercial policies can be charged to

[210] U.S. Department of the Treasury, "Terrorism Risk Insurance Program," *Resource Center*, accessed Oct. 13, 2016. Available at: https://www.treasury.gov/resource-center/fin-mkts/Pages/program.aspx.
[211] Erwann O. Michel-Kerjan, "TRIA at Ten Years: The Future of the Terrorism Risk Insurance Program," Written Testimony prepared for a hearing of the House of Representatives Subcommittee on Insurance, Housing and Community Opportunity Committee on Financial Services, Sep. 11, 2012. Available at: http://opim.wharton.upenn.edu/risk/library/2012-09-11_TRIA-testimony_MichelKerjan.pdf.

insurers to recoup the government's losses; there is a formula-based recoupment amount that is mandatory, though more may be collected at the discretion of the Secretary of the Treasury.[212] A RAND analysis concludes that unless a mega-event (larger than 9/11) occurs, the federal government will bear no long-run costs because of the recoupment fees.[213] It is unclear who is responsible for any payouts greater than $100 billion.[214]

The Terrorism Risk Insurance program is controversial. One analysis found it has likely contributed $40 billion in revenue for insurance companies who have never had to make any payouts and who have never paid the federal government for the reinsurance protection.[215] On the other hand, it appears to have at least partially achieved its goal. Client data from the two largest insurance brokers, Aon and Marsh, indicate commercial take-up rates for terrorism insurance have more than doubled from 27 percent in 2003 to 60 percent in 2006.[216] A Congressional Budget Office report said, "the development of global financial instruments for spreading risk, including catastrophe bonds, would probably be more rapid without TRIA."[217]

In the event a catastrophic incident involving hazmat rail transport occurs and insurance markets for rail are impacted, there may be a role for the federal government to provide either direct insurance or reinsurance (such as developed by TRIA) to fill a gap in the insurance market. Whether direct insurance or reinsurance is more appropriate is an open question. For the terrorism risk insurance, the fact that the policy goal was to provide coverage to millions of entities perhaps influenced the choice of a reinsurance program because it could leverage the existing administrative infrastructure of the private insurance companies. Creating systems to handle premium payments for every commercial property in the United States would be a daunting task. On the other hand the direct insurance program related to aviation war risk insured just 44 U.S. air carriers. With roughly 500 entities, the U.S. railroad industry lies somewhere in between those two examples.

4.6.2 Standalone Liability Limits

As a step in identifying potential alternative insurance models, the study team explored the insurance and liability requirements for passenger rail operators, specifically Amtrak. Amtrak has a statutorily mandated liability cap. The Amtrak Reform and Accountability Act of 1997 (ARAA) established a $200 million cap on passenger liability claims, which has been interpreted to apply to both Amtrak and commuter rail agencies. The cap was put in place so that high insurance premiums and claims would not contribute to Amtrak's financial difficulties. Without a cap on liability, rail operators either have to absorb the full cost

[212] Elias, Yang, and Webel, 2014: 15.
[213] Stephen Carroll, Tom LaTourrette, Brian G. Chow, Gregory S. Jones, and Craig Martin, "Distribution of losses from large terrorist attacks under the Terrorism Risk Insurance Act," *RAND Center for Terrorism Risk Management Policy*, Santa Monica, CA, 2005: 32. Available at: http://www.rand.org/content/dam/rand/pubs/monographs/2005/RAND_MG427.pdf.
[214] Carroll, LaTourrette, Chow, Jones, and Martin, 2005: 8-9.
[215] David Dayen, "New $40bn terrorism insurance law is full of gifts to corporations," *The Guardian*, June 14, 2014, accessed Oct. 13, 2016. Available at: https://www.theguardian.com/business/2014/jun/19/congress-renews-tria-terrorism-insurance-bill.
[216] Erwann O. Michel-Kerjan written testimony, 2012.
[217] "Debate over Terrorism Insurance to Be Renewed," *Insurance Journal*, Feb. 6, 2013, accessed Oct 13, 2016. Available at: http://www.insurancejournal.com/news/national/2013/02/06/280332.htm.

of such events in their limited budgets—potentially bankrupting them—or purchase insurance each year for the most severe losses they can foresee, even if such losses never actually happen. Congress decided to limit liability so that publicly-funded passenger rail operators would not be subjected to these high costs.

As the House Transportation and Infrastructure Committee stated in 1997, "In general, the rationale for imposing limitations on liability in public transportation is to encourage certain activities that yield substantial social benefits that otherwise would not be undertaken due to the exposure to liability, and to protect the taxpayers who ultimately bear the costs of tort liability incurred in providing the public transportation."[218]

That liability cap was in place in 2008 when a Metrolink passenger train crashed into another train in Los Angeles, California, resulting in the death of 24 passengers and injuries of 100 more. The judge who oversaw the distribution of the $200 million found himself unfairly limited, describing the decision as "impossible," since "what was given to one victim had to be taken from another."[219] Had there not been a cap, the judge would have ordered between $320 million and $350 million in damages.[220]

The liability cap was also called into question in the aftermath of the derailment of Amtrak Northeast Regional Train 188 outside Philadelphia on May 12, 2015. In that derailment, 8 people were killed and over 200 injured, 11 critically. The damages from the incident were generally believed to exceed the $200 million liability cap. The FAST Act increased the passenger rail liability cap from $200 million to $295 million and applied the increase to the Amtrak accident. The FAST Act also adjusted the cap for inflation every fifth year going forward.

In its comments, The Fertilizer Institute (TFI) stated unlimited liability risk could threaten the ability of rail carriers to continue operating in the event of a catastrophic incident and the loss of its distribution network would adversely impact the fertilizer industry. Therefore, TFI states "it may be appropriate to consider a cap on total liability that is fair and does not detract from incentives to promote safety."[221]

While a standalone liability cap would reduce insurance costs for large railroads, it would reduce the amount of compensation available for potential victims of hazmat on rail incidents. For that reason, the American Association for Justice (AAJ), formerly the Association of Trial Lawyers of America, expressed its opposition to a cap on liability, stating the following:[222]

> *Accountability is a necessary tool for ensuring safety. The threat of being held financially responsible for negligent conduct incentives investments in safety and disincentives risky behaviors. Similarly, shielding rail corporations from full fiscal accountability for damages caused by accidents only discourages investments in*

[218] U.S. Congress, House of Representatives, House Transportation and Infrastructure Committee, *House Report 105-251 on HR 2247*. 105th Cong., 1st sess., 1997-98: 21. http://www.gpo.gov/fdsys/pkg/CRPT-105hrpt251/pdf/CRPT-105hrpt251.pdf.
[219] Dana Bartholomew and Bob Strauss, "Judge in Metrolink case says he faced Sophie's Choice dilemma," *Los Angeles Daily News*, July 13, 2011. Available at: http://www.dailynews.com/article/ZZ/20110714/NEWS/110719402.
[220] Summary provided by AAJ in its response to PHMSA *Docket ID: PHMSA-2016-0074-0009.*
[221] TFI response to PHMSA *Docket ID: PHMSA-2016-0074-0011*.
[222] AAJ response to PHMSA *Docket ID: PHMSA-2016-0074-0009*.

> *safety to the detriment of the public. For an industry dealing in such dangerous substances, where any given accident could cost over a billion dollars of damage, safety must be paramount. The imposition of liability caps would have disastrous results, and is an inappropriate alternative.*

However, a liability cap for railroads, coupled with an additional source of funding could reduce insurance costs for large railroads, while providing adequate compensation for victims. That structure is represented by the idea of a secondary liability pool funded by shippers (Section 4.4).

4.6.3 Exempting Common Carrier Obligation for Hazmat on Rail

Some rail carriers argue that because available commercial insurance policies do not provide high enough coverage to completely cover potential worst case scenarios they should be exempt from the common carrier obligations for hazmat shipments. Note that trucking firms are not required to handle hazmat shipments; thus, the rates trucking firms charge for hazmat would be expected to reflect the trucking firms' view of their financial risk from handling the shipment. However, recall that trucking firms are only required to prove $5 million of financial responsibility for bulk hazmat shipments under FMCSA regulation.

If hazmat shipments were exempt from the common carrier obligation, railroads might refuse to carry certain types of hazmat—like TIH/PIH —or they might raise rates on certain types of hazmat to a level that would be considered high enough to cover the financial risk attributable to the shipment.

Both actions would likely cause at least a portion those rail shipments to switch to other modes of transportation, particularly trucking. Since trucking has higher rates of crashes compared to rail incident rates, this would likely increase the overall risk from the transportation of these hazardous materials.

Hazmat shippers expressed their preference for retaining the common carrier obligation and pointed out that pushing shipments of hazmat from rail to truck could be less safe for the public.[223]

4.6.4 Catastrophe Bonds

A catastrophe bond is a financial product that acts as a form of insurance. Investors agree to pay a specified amount if a certain catastrophic event occurs during a set time period. If no catastrophic event occurs, the covered entity agrees to pay a relatively high rate of return on the specified amount. If the catastrophic event does occur, the investors pay the specified amount and lose all their principal.

In 2015, Amtrak sponsored a $275 million catastrophe bond covering storm surges, high winds, and earthquakes because Amtrak found it hard to obtain enough traditional insurance.[224,225] If any of those

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[223] TFI response to PHMSA *Docket ID: PHMSA-2016-0074-0011;* Dow Chemical Company response to PHMSA *Docket ID: PHMSA-2016-0074-0015*; ACC response to PHMSA *Docket ID: PHMSA-2016-0074-0019;* The Chlorine Institute response to PHMSA *Docket ID: PHMSA-2016-0074-0004.*

[224] Leslie Scism and Anupreeta Das, "The Insurance Industry Has Been Turned Upside Down by Catastrophe Bonds," *The Wall Street Journal*, Aug. 8, 2016. Available at: http://www.wsj.com/articles/the-insurance-industry-has-been-turned-upside-down-by-catastrophe-bonds-1470598470.

[225] "Amtrak Sponsors $275M Cat Bond for Northeast Storm Surge, Wind, Quake," *Insurance Journal*, Oct. 14, 2015. Available at: http://www.insurancejournal.com/news/east/2015/10/14/385087.htm.

events occur within a period of approximately 3 years, Amtrak will receive up to $275 million to repair its facilities. According to the Wall Street Journal, low interest rates from economic stimulus efforts are pushing investors to seek higher returns, such as those offered by catastrophe bonds.

Catastrophe bonds might be used by railroads as a way to obtain additional insurance coverage or reduce the cost of insurance coverage. However, examples of the extreme events covered by catastrophe bonds include natural phenomena or occurrences outside the control of an insured entity, such as storms, wild fires, pandemics, or meteor strikes. It is not clear if the catastrophe bond market would find buyers to insure risk that is at least partly under the control of the insured entity.

4.6.5 Liability Sharing Between Railroads and Shippers

In its response to the RFC, AAR stated "where there is unpredictable and massive liability exposure resulting from the nature of the commodity itself, the risk inherent to that commodity can be, consistent with the U.S. common carrier obligation, reasonably shared by the manufacturer/shipper of the dangerous commodity who is the main economic beneficiary of its manufacture and transportation." Further, AAR stated it is appropriate to require a liability sharing and indemnity as a condition of rail common carrier transportation of TIH/PIH materials. AAR states that "sharing liability with shippers and receivers should incentivize rail shippers to internalize the risk of hazardous materials shipments, which could result in a shift to safer equipment, closer supply resources, substitute products, or forgoing some shipments altogether." Further, AAR stated that where these private arrangements already exist, the regulatory regime should not interfere with them. AAR has previously urged the STB to issue a formal policy statement to allow railroads to establish common carrier service terms that: "(1) require the shipper of TIH/PIH materials to indemnify the carrier for the full amount of any liability or exposure resulting from a release of TIH/PIH materials above a threshold level that would be the greater of the amount of insurance that the railroad carries for such an incident or, for Class I railroads, $500 million; and (2) require the shipper to obtain insurance or other forms of assurance to support such indemnification at levels depending upon the circumstances of the TIH materials transportation (including the size and financial ability of the shipper)."[226]

The Chlorine Institute opposed such a liability sharing regime, stating shippers who comply with the relevant HMRs cannot be held responsible for liabilities that are not within their control or ability to prevent; once the shipment is accepted for transport, the shipper no longer has control over what happens to the tank car.[227]

4.6.6 Adjust STB Rate Regulation to Recognize Extra Costs of Hazmat Transportation

AAR also urged STB to recognize the extra costs of transporting hazardous materials.[228] These extra costs include the cost of maintaining insurance that covers the higher risks associated with TIH/PIH materials transport. In its response to the RFC, NS stated insurance coverage between the $200 million and $1 billion level is primarily necessitated by hazmat, principally TIH/PIH traffic. Despite this assertion that only a subset of commodities necessitate the higher levels of insurance, the regulatory cost model used by

[226] STB Ex Parte No. 677 (Sub-No. 1).
[227] The Chlorine Institute response to PHMSA *Docket ID: PHMSA-2016-0074-0004.*
[228] STB Ex Parte No. 677 (Sub-No. 1).

STB (the URCS model, described in Section 2.4) assigns the entire cost of insurance to all traffic. The extra cost of transporting hazmat also includes the costs of complying with safety and security operating procedures specific to hazmat and the uninsured financial risks railroads face from transporting hazmat.

Although most hazmat rates are negotiated, the URCS estimate of variable cost influences those rate negotiations. If coupled with the secondary liability fund, which limits the financial liability of railroads to the amount of insurance they are required to hold, all of the financial risk railroads are exposed to from hazmat shipments would be directly observed and reflected in the variable cost estimated by URCS. Those changes to URCS could significantly modify rate negotiations by allowing shippers and railroads to focus on negotiating rates based on the direct costs of transportation, which are more easily observed and quantified, rather than negotiating based on the often unobserved and difficult-to-measure risks related to the particular characteristics of hazmat shipments.

4.6.7 Prevention and Mitigation

Some commenters called for PHMSA and FRA to introduce additional regulations to improve the safety of the system for transporting hazmat by rail. There might also be ways to improve emergency response to mitigate the potential damages from a hazmat release. If judiciously-crafted, cost-effective regulations or response procedures can be identified, they would have the obvious benefit of preventing death, injury, property damage, and environmental damage. They would also be expected to lower the price of insurance coverage by reducing the probability that the insurance companies need to make large payouts. Citizens for Rail Safety – Twin Cities listed speeds traveled, route selection, tank car improvements, two-to-four person crews, reduced volatility of commodity, advance track inspections, and strengthened oversight of bridge/trestle inspections as possible safety improvements that could enable availability of higher coverage limits.[229]

However, NS expressed pessimism that effective new safety regulations can be identified. They note, "Since the early 2000s, the number of government regulations aimed at safer transportation of hazardous commodities has increased dramatically. But they have had minimal effect on safety statistics for the transportation of these commodities."[230] That said, such a simple tabulation of number of rules and number of incidents can be misleading. During that time, volumes of hazardous materials shipped have increased dramatically (See Figure 4); after accounting for exposure it may well be that accident *rates* have declined. Further, simply counting regulations can present a misleading picture of the regulatory environment, since some number of regulatory updates are needed simply to respond to new technologies or new commodities, etc.

4.7 Summary

Requiring a minimum level of insurance could increase the amount of compensation available to potential victims of incidents on smaller railroads. Smaller railroads might pool together to obtain higher levels of insurance coverage at lower cost. A secondary liability pool funded by shippers would incorporate a requirement for minimum levels of financial responsibility and would also provide additional compensation to potential victims of incidents on both small and large railroads. The secondary liability pool could also be structured to provide compensation to victims where no party is found to be at fault.

[229] Citizens Acting for Rail Safety - Twin Cities response to PHMSA *Docket ID: PHMSA-2016-0074-0012.*
[230] NS response to PHMSA *Docket ID: PHMSA-2016-0074-0006*: 20.

Finally, a secondary liability pool would add more financial certainty to the costs and liability of a potential incident, which could benefit both railroads and shippers. The option for the government to provide direct insurance to railroads would be a possible solution if the private market for insurance retracted in the event of large scale incident.

While these alternative models address the gaps identified in this report, they have differing impacts on various stakeholders described above. The requirements for higher levels of insurance may increase costs for small railroads, while the introduction of liability cap for railroads as part of a secondary liability pool may decrease costs and risks for large railroads.

The comments in the RFC seem to indicate there is support from both hazmat shippers and railroads for a secondary liability pool funded by shipper taxes. Shippers, however, want assurances that they will not be required to pay twice for the same financial liability related to hazmat shipments. Safety advocates caution any new program should not reduce levels of safety.

5 Conclusion

This report describes the findings of the study on the levels and structure of insurance for railroads that transport hazardous materials conducted in accordance with Section 7310 of the FAST Act. The study team conducted an extensive review of literature and data, including academic studies, government reports, news media, case dockets, and financial documentation. This review was supplemented by responses received through a request for public comment in the Federal Register. As described in the report, however, insufficient data limited the ability to develop a complete baseline understanding of current levels and structure of insurance, therefore making analysis of the other two study areas more challenging. Key limitations included the unavailability of business-sensitive or proprietary information required to fully assess the FAST Act study requirements, the particularly limited information collected and available on Class II and Class III railroads, and the lack of information with which to estimate precisely the true probability and consequences of extremely low-frequency but high-consequence hazardous materials rail incidents.

Despite these limitations, the analysis conducted for this study reveals a number of preliminary findings under each of the FAST Act specified study questions.

Although there are no current federal requirements for minimum financial responsibility for transportation of hazardous materials by rail, insurance coverage is already an important component of railroads' overall approach to managing business risk and liability exposure, along with other business practices. Insurance coverage levels and costs vary according to railroad class; Class I railroads' liability coverage levels are typically in the range of $1 billion to $1.5 billion. The limited and dated information available suggests typical liability coverage limits for Class II railroads are in the range of $25 to $100 million, with retentions of $250,000 to $500,000, while Class III railroads have coverage of approximately $5 million and retentions of roughly $50,000.

With respect to necessary and appropriate levels of insurance, financial responsibility is critical in order to fairly compensate victims of a catastrophic rail incident and to protect the continued operation of railroads. Class I railroads appear to have access to insurance policies that would cover up to $1.5 billion; insurance in this amount, combined with substantial corporate resources to self-insure, suggests they are likely to have the ability to cover the vast majority of foreseeable incidents. However, based on current insurance structures and levels, Class II and Class III railroads do not appear to hold insurance that would cover the worst case scenario and do not have sufficient company resources to self-insure against such an event. Class II and Class III railroads do not always have a diversified base of clients, so while they may be able to recover their insurance costs, a large change in cost structure might impact their client base in a way that would impact the viability of the railroad. Further, Class II and Class III railroads would be unlikely to survive a catastrophic rail incident without support from a holding company or business partner. Class II and Class III railroads have trended toward consolidation in recent years, and increased insurance costs might accelerate this pressure.

Finally, the alternative models and policies reviewed all address the adequacy of current levels and structure of insurance for social costs, efficient allocation of risk, and ability of railroads to continue operations, namely increasing the compensation available to potential victims of incidents on those railroads with lower levels of insurance. These models and policies can build on or complement each

other as part of a broader set of liability-related policies and programs. The analysis of alternative insurance models, however, was limited to focusing on the *structure* of the various insurance models. Substantial additional research would be required to fully flesh out an appropriate insurance model and identify the exact dollar amounts of coverage provided, taxes or premiums collected, circumstances excluded or included, potential differential treatment of various hazmat commodities, and potential differential involvement by size of rail carrier or shipper.

At the highest level, the study findings reveal a complex, interconnected set of issues involving a large number of stakeholders and a number of safety, security, and economic concerns and issues. Any further decisions or action taken must be accompanied by further analysis and investigation and the full participation and representation of all affected parties and stakeholders.

Appendix A: FAST Act Language

(a) IN GENERAL.—Not later than 120 days after the date of enactment of this Act, the Secretary shall initiate a study on the levels and structure of insurance for railroad carriers transporting hazardous materials.

(b) CONTENTS.—ln conducting the study under subsection (a), the Secretary shall evaluate—

(1) the level and structure of insurance, including self-insurance, available in the private market against the full liability potential for damages arising from an accident or incident involving a train transporting hazardous materials;

(2) the level and structure of insurance that would be necessary and appropriate—

(A) to efficiently allocate risk and financial responsibility for claims; and

(B) to ensure that a railroad carrier transporting hazardous materials can continue to operate despite the risk of an accident or incident; and

(3) the potential applicability, for a train transporting hazardous materials, of an alternative insurance model, including—

(A) a secondary liability coverage pool or pools to supplement commercial insurance; and

(B) other models administered by the Federal Government.

(c) REPORT.—Not later than 1 year after the date the study under subsection (a) is initiated, the Secretary shall submit a report containing the results of the study and recommendations for addressing liability issues with rail transportation of hazardous materials to—

(1) the Committee on Commerce, Science, and Transportation of the Senate; and

(2) the Committee on Transportation and Infrastructure of the House of Representatives.

(d) DEFINITIONS.—ln this section:

(1) HAZARDOUS MATERIAL.—The term “hazardous material” means a substance or material the Secretary designates as hazardous under section 5103 of title 49, United States Code.

(2) RAILROAD CARRIER.—The term “railroad carrier” has the meaning given the term in section 20102 of title 49, United States Code.

Appendix B: Request for Comment Questions

REQUEST FOR COMMENTS: As part of this study, PHMSA is conducting a review of existing data and literature with regard to current insurance liability levels and structure for rail carriers transporting hazardous materials. This review examines publically available insurance and liability data, including information released by the rail carriers, information released by industry trade associations, data and reports regarding the insurance industry, previous academic, government, or industry studies, and other public sources.

Given the large scope of the study, PHMSA is seeking public comment. Specifically, in an effort to provide an opportunity for stakeholder input on the study and potential sources of data and literature, PHMSA is issuing this notice requesting comment on insurance and liability coverage for rail carriers transporting hazardous materials. PHMSA is requesting input that would inform the study, as well as any available insurance and liability literature and data that may be relevant to this topic.

In addition, PHMSA is seeking input and data related to the following specific questions.

Level and Structure of Insurance and Liability Coverage

1. Please comment on, or provide data relating to, the current level, structure, and type of liability insurance coverage (including self-insurance and retentions) available for hazardous materials transportation by rail. Specifically, please address the following:

    - Cost and scope of coverage
    - State and federal Requirements
    - Changes in the cost or availability of liability insurance
    - Issues unique to your industry, commodity, and/or entity size

2. Are the current levels of liability insurance coverage for hazardous materials transportation by rail appropriate?

    - If not, what would be considered an appropriate level?
    - Are there policy or market changes that could change your perspective on what is adequate?
    - How do you anticipate this changing in the future?

3. What are the drivers of the current coverage limits for hazardous materials transportation liability insurance?

    - Are there policy or market changes that could enable the availability of higher coverage limits?
    - How do you anticipate this changing in the future?

4. As hazardous materials transportation by rail is a cross-border enterprise, how, if at all, do foreign requirements related to insurance and liability coverage impact the level, structure and type of insurance and liability coverage held domestically?

Insurance and Liability Alternatives

5. Please comment on, or provide data relating to, any previous or current initiatives for sharing the cost

of insurance and/or legal liability for hazardous material by rail incidents between shipper and carrier.

6. Please comment on, or provide data relating to, any other legislative, policy, or voluntary approaches from other industries that may be applicable to liability and insurance related to hazardous materials transportation by rail. To the extent possible, please comment on any potential economic, safety, and environmental considerations related to these alternative approaches.

7. Other industries and foreign governments have implemented programs that impose fees to fund secondary liability coverage and/or create liability caps. Is this a feasible alternative for hazardous materials transportation by rail?

Other Information

8. Please provide any potential studies and data sources that may inform this study.

9. Commenters are invited to address any other considerations related to liability and the rail transport of hazardous materials not addressed above.