BEFORE THE
U.S. DEPARTMENT OF TRANSPORTATION
OFFICE OF THE SECRETARY OF TRANSPORTATION

DOCKET NO. DOT-OST-2018-0149
PREPARING FOR THE FUTURE OF TRANSPORTATION: AUTOMATED VEHICLES 3.0 (AV 3.0)

SUBMITTED BY
THE ASSOCIATION OF AMERICAN RAILROADS

The Association of American Railroads ("AAR"), on behalf of itself and its member railroads, submits these comments in response to DOT's notice of request for comment on its publication, *Preparing for the Future of Transportation: Automated Vehicles 3.0* ("AV 3.0").[1] AV 3.0 builds upon *Automated Driving Systems 2.0: A Vision for Safety* and seeks to provide a framework and multimodal approach to the safe integration of Automated Vehicles ("AVs") into the broader national surface transportation system.

The railroads applaud DOT for articulating a regulatory approach to automated vehicles that encourages safety innovation and improvement, and we urge DOT to extend these principles to the development of safety technology in the railroad industry. Unlocking the potential of automated technology by reducing or eliminating human error is just as important for railroads as it is for other transportation modes, and we encourage DOT to include our industry in the discussion. We also address in these comments a matter that was specifically highlighted in AV 3.0 – the interaction between automated vehicles and highway-rail grade crossings. Automated vehicles have the potential to increase grade crossing safety by reducing or eliminating human error, but to maximize the tremendous safety benefit promised by this technology, it must be designed to recognize and respond appropriately to warning devices and approaching trains independently of train control systems.

<u>Automation in the Freight Rail Industry</u>

In AV 3.0, DOT recognizes the role the private sector plays in driving safety innovation. DOT appropriately cautions governments at all levels from unnecessarily impeding safety innovation in the private sector.[2] This message recently was emphasized by the Federal

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1 83 Fed. Reg. 50, 746 (Oct. 9, 2018). AAR is a non-profit trade association and the freight rail industry's primary industry organization that focuses on policy, research, standard setting and technology. AAR member railroads constitute 83 percent of the line-haul mileage, employ 95 percent of the workers, and account for 97 percent of the freight revenues of all railroads in the United States

2 AV 3.0 at 5.

Railroad Administration ("FRA") Administrator, Ronald Batory. Speaking to the dangers of what he termed "overregulation," Administrator Batory warned, "Technology will move faster than the ink can be applied or dried [on regulations]. And if we don't unleash technology, it will pass us up."[3]

DOT should apply the same energy and creativity to unleashing automation in the rail industry as it appears poised to apply to other surface transportation modes. DOT's policy prescriptions to encourage and facilitate the development of automated vehicles would be equally impactful (and welcome) in the rail sector, where automation has many safety-enhancing applications, including but not limited to highly automated train operations.

When it comes to smoothing the regulatory path toward autonomy and other technological innovations, governmental policy should also be ***mode-neutral.*** Not only will the public benefit from technology-driven safety gains in the rail industry, but it also will benefit if railroads remain a viable, competitive alternative to other transportation modes, thus ensuring the continued diversity and strength of the transportation network in the United States. Modal equity is an important principle in federal transportation policy. Government should not be in the business of picking winners and losers by creating policies that have the effect of shifting freight from one mode to another.

Railroads are an essential component of our national transportation network. They are environmentally friendly, and without them, highway congestion and emissions would be far worse than they are today.[4] DOT predicts that by 2040, the U.S. will see a 40 percent increase in national freight shipments, underscoring the need for the continuing viability of rail to ease the strain on our nation's public infrastructure.[5] To keep pace with economic growth while providing environmentally-sound transportation alternatives, DOT must support automation in all modes of transportation, including rail.

Safety Benefits from Automation in the Rail Industry

For decades, U.S. railroads have worked diligently to improve the safety of their operations, with great success. Safety has improved dramatically, making recent years the safest on record for the rail sector. According to October 2018 FRA data per million train miles, the overall train accident rate has declined 41 percent since 2000. The equipment-caused accident rate is down 32 percent, the track-caused accident rate is down 54 percent to an all-

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[3] Edmonson, RG, "FRA launches initiative to eliminate trespasser and grade crossing deaths." *Trains*, Nov. 1, 2018. Available at: http://trn.trains.com/news/news-wire/2018/11/01-fra-launches-initiative-to-eliminate-trespasser-and-grade-crossing-deaths.

[4] "Freight Railroads Help Reduce Greenhouse Gas Emissions." Association of American Railroads, June 2018. Available at: https://www.aar.org/wp-content/uploads/2018/07/AAR-Railroads-Greenhouse-Gas-Emissions.pdf.

[5] *See* DOT Releases 30 Year Freight Projections, U.S. DOT (Oct. 11, 2016), available at https://www.transportation.gov/briefing-room/dot-releases-30-year-freight-projections.

time low, and the derailment rate is down 40 percent over that time period. These achievements are not the result of prescriptive regulation – in fact, in many cases progress has been made *despite* the chilling effect of overly prescriptive and outdated rules. The safety record of the rail industry has been achieved through the unwavering commitment of the railroads to improving safety, which has been enabled by the growth of their businesses and relative financial stability. It is a virtuous cycle: safety is good business, and good business is good for safety.[6]

But with increasing success, further improvements have become incremental and harder to achieve. Technology has the potential to create breakthrough gains in rail-safety performance, just as it does for other transportation modes. According to DOT safety data, over one-third of train accidents are caused by human error.[7] Automated technologies can detect more, respond faster, and provide a larger window for action than a safety system that is subject to the limitations inherent in human eyes, minds, and hands. A transition to greater reliance on technology will greatly reduce the level of human input, interaction, and subjectivity required to operate a railroad, enhancing safety through heightened operational visibility, consistent and vigilant monitoring and oversight, and a significant reduction (or even elimination) of human error.

The opportunities in the rail industry are many, as early successes have already demonstrated. For example, automated track inspections can reduce track defects, leading to fewer accidents. Likewise, the railroads have shown that automated inspection of rolling stock can reduce the occurrence of broken wheels and other mechanical problems. However, those technologies may only be used in conjunction with the burdensome and redundant manual inspections required by regulations, unless approved by FRA for an alternative process through a cumbersome and uncertain waiver process. The lack of certainty makes investments in technology and innovation cautious endeavors that result in small gains, not leaps forward. For example, ongoing regulatory uncertainty has delayed investment in continuous rail inspection technology, which has been demonstrated to reduce rail service failures by 50% over traditional methods.

There also are large potential safety gains to be derived from further (and in some cases, full) automation of the locomotive itself. Highly or even fully automated trains (with or without crew on board) are in the future - for at least some operations on some railroads. Given the development of automation in other more complex settings, automating locomotives is an entirely realistic endeavor. The movement of trains are constrained by their tracks, and

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6 *See,* Jerry Ellig and Patrick A. McLaughlin, "The Regulatory Determinants of Railroad Safety," Review of Industrial Organization, May 10, 2016.

7 *See* Raslear, Thomas G, "Human Factors Research & Development (R&D) Program Overview." FRA, 2012. Slide 3 attributes 37% of train accidents in 2002-2011 to human factors. Available at: www.fra.dot.gov/Elib/Document/439.

access to the railroad rights-of-way by others is limited and controlled. Thus, in a world where the automation of millions of interacting trucks and cars is being vigorously pursued, the similar – and in many cases simpler – automation of train operations is not difficult to imagine. Indeed, there already are automated train operations elsewhere in the world, including fully automated freight trains operating over significant distances in Australia.[8]

However, because automation in the rail industry is unfamiliar, there will be pressure for government regulators to identify and resolve every possible risk before allowing testing or early deployment. That pressure must be resisted, because hesitation will come at a cost to safety. DOT recognized that in the context of automated highway vehicles, "delaying or unduly hampering… testing until all specific risks have been identified or eliminated means delaying the realization of global reductions in risk."[9] Just as it is doing on the highways, DOT can and should facilitate the realization of material safety benefits by encouraging the early deployment of autonomous technology on the railroads.

Economic Benefits from Automation in the Rail Industry

Since the early 1980s, railroads have been a remarkable success story, and they owe much of that success to efficiency gains. They have delivered more and more freight without significantly increasing the size of their networks. In 1980, traffic density was 5.58 million ton-miles per mile of road. In 2016, the number was 16.99, an increase of approximately 300 percent. Today, railroads can move one ton of freight 479 miles on one gallon of fuel – doubling the fuel efficiency from 1980. Rail productivity gains have been dramatic. From 1980 through 2017, rail employee productivity (measured by ton-miles per employee) rose 467 percent; locomotive productivity (measured by ton-miles per locomotive) rose 93 percent; and average freight carried per train rose 63 percent. The most commonly used broad measure of rail-industry productivity — ton-miles per constant-dollar operating expense — was 159 percent higher in 2017 than in 1980. All of this has benefitted rail customers: average rail rates (measured by inflation-adjusted revenue per ton-mile) were 45 percent lower in 2016 than in 1981. Safety has benefitted, too. Stronger efficiency and financial performance allow for even more resources devoted to safety.[10] And good safety prevents incidents that are costly to railroads. It is a virtuous cycle.

Just as with safety, though, years of efficiency improvements in the rail industry have made incremental progress harder to achieve. Increased automation will be key to continued efficiency gains, increased capacity to transport customers' freight, further reduction of congestion on the highways, and increased fuel efficiency and emissions benefits. Autonomous

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8 *See* AAR's comments in response to "Request for Information: Automation in the Railroad Industry, May 7, 2018 (FRA-2018-0027-3256).

9 AV 3.0 at 2.

10 *See,* Ellig and McLaughlin, *Id.*

technology has the potential to improve network velocity and fluidity, increasing rail capacity, and promoting the health and growth of the U.S. economy.[11]

Regulatory Principles for Automation in the Rail Industry

As DOT and its modal agencies wrestle with an appropriate regulatory framework to encourage the development of autonomous highway vehicles, it must provide a level playing field for all transportation modes, so that all may take advantage of these emerging technologies. Failing to do will stifle safety and efficiency improvements in the rail industry to the great detriment of its customers, the public, and the national economy. We urge DOT to adhere to the following principles as it fashions regulatory policy to meet the exciting opportunity afforded by autonomous technology in the rail industry:

1. Waivers from existing regulations that impede the deployment of new technology do not give railroads sufficient confidence to invest in that technology. These regulatory barriers must be overcome in ways that are more enduring than waivers.[12]

2. To the greatest extent possible, railroads and railroad equipment manufacturers should be permitted to create voluntary standards for safety technology. After all, no one has a greater stake in the success of new safety technology than railroads and their suppliers. Railroads and railroad vendors internalize the cost of safety failures, which means market pressures already incentivize them to create and implement safety technology that works.

3. Where there are market failures that threaten public safety, new regulations governing automated operations in the rail industry should be performance-based, rather than prescriptive, and flexible enough to support the multiple iterations that emerging technologies undergo.

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11 *See, e.g.,* Irani, Daraius, Siers, Michael, Menking, Catherine, and Nikcey, Zachary, "Economic and Fiscal Impact Analysis of Class I Railroads in 2017." Regional Economic Studies Institute, Oct. 22, 2018. Available at: https://www.aar.org/wp-content/uploads/2018/11/AAR-Class-I-Railroad-Towson-Economic-Impact-October-2018.pdf.

12 AAR has urged FRA to replace prescriptive regulations with an approach that allows for the documentation of risk assessment followed by risk management to a reasonable degree. *See,* Supplemental Comments of the Association of American Railroads, Docket No. FRA-2009-0038: Risk Reduction Program, October 31, 2018. This sort of approach is in use in other countries, including the U.K. and Australia. In the United States, it is used by the Federal Aviation Administration and entirely consistent with the principles articled by DOT in AV 3.0. It is not novel, but not is not currently available to the railroad industry.

4. Regulation of automated operations in the rail industry should occur at the federal level, to avoid a patchwork of state and local rules that would only create confusion and uncertainty, inhibiting the deployment of safety technology.

5. Above all, FRA must engage. As with any new technology, public fear of the unknown, though unfounded, can prove a major obstacle. The public can and will read much into FRA's silence on the issue of automated rail technologies, especially given the vocal support issued for other modes in documents like AV 3.0. As our industry's impartial regulator, FRA has the ability, and responsibility, to follow the lead of other DOT agencies and facilitate technological progress on the rails, both by publicly promoting the significant safety benefits achievable through rail technology and empowering railroads to privately innovate.

AAR encourages DOT and the FRA to embrace these principles. Administrator Batory's warning should not go unheeded. If the rail regulatory landscape does not adapt, technology and all its benefits will indeed "pass us up."

Autonomous Vehicles and Grade-Crossing Safety

AV 3.0 includes a text box discussion highlighting the importance of "the interaction between automated vehicles and highway-rail grade crossings."[13] Grade crossing accidents are a critical safety problem and present an obvious opportunity for automation of vehicles to deliver on its safety promise in substantial ways.

As the FRA noted in a recent study, nearly all deaths at rail-highway crossings are preventable, as "94 percent of train-vehicle collisions can be attributed to driver behavior or poor judgment."[14] The physical and legal realities that govern grade crossings are straightforward – trains cannot stop or change direction at grade crossings, so motor vehicles are legally required to yield to trains. Yet many motor vehicle operators do not obey the law, risking life and limb. In 2017, 274 people were killed at highway-rail crossings, and although this number is much lower than it was as recently as a decade ago, it is still much too high.[15] Designing motor vehicles to eliminate human error and poor judgment by automating vehicular behavior at grade crossings to obey traffic laws and yield to trains could achieve a significant reduction in fatalities and injuries at grade crossings.

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[13] AV 3.0 at p. 19.

[14] Federal Railroad Administration, Office of Railroad Policy and Development, "Analysis of Grade Crossing Accidents Resulting in Injuries and Fatalities," May 2016. *See also* Multer, Jordan and Yeh, Michelle, "Driver Behavior at Highway-Railroad Grade Crossings: A Literature Review from 1990 – 2006." DOT/FRA/ORD-08/03. Available at: https://www.fra.dot.gov/eLib/Details/L01598.

[15] *See* FRA's safety data statistics on railroad crossing deaths, injuries and incidents from 2006-2015, showing a reduction in incidents at railroad crossings of almost 33% from 2006 to 2015. Available at: https://www.fra.dot.gov/Page/P0855

AAR encourages DOT and the autonomous vehicle community to devote appropriate attention and resources to this issue. Just as the behavior of automated vehicles must be governed as they approach busy roadway intersections, so too must their behavior be governed as they approach highway-rail grade crossings. Rail corridors must be afforded respect, regardless of whether the approach to them is equipped with active warning devices (some combination of flashing red lights, bells, or gates) or passive warning devices (the familiar white "Xs" on posts). In most jurisdictions, these devices function as yield signs, requiring approaching vehicles to be prepared to stop until it is determined there are no approaching trains preventing the vehicle from proceeding safely. Some jurisdictions are proactively replacing yield signs at public grade crossings, requiring approaching vehicles to stop, and then proceed through the crossing only when safe to do so.[16]

In order to obtain even partial automation, a motor vehicle will need the ability to visually detect approaching trains and account for any variables that might obstruct its view. In addition to the visual detection of approaching trains, any autonomous-vehicle technology should be able to recognize other signs of the presence of a locomotive and/or train, such as locomotive headlights, horns, and bells. Once the technology has confirmed that it is safe to cross, it also should ensure a complete move through the crossing to prevent the vehicle from stopping on the tracks due to shifting gears, traffic queueing, or other reasons.

Finally, it is critical to disabuse vehicle designers and policy makers of the false notion that Positive Train Control ("PTC"), which is currently being deployed on a portion of the national rail network, can be configured to communicate train location and speed information to highway vehicles as part of the solution to the grade-crossing challenge. This is simply not the case. PTC is a rail-traffic-control safety system designed to reliably and functionally prevent specific types of rail incidents. It is not installed on all rail lines vehicles may cross, only on those lines carrying passengers and toxic materials. The system operates using highly controlled and specialized proprietary digital radio communications, secure messaging, and locomotive equipment built specifically for this purpose, using certain safety assurance engineering principles and to meet performance standards governed by regulation. It has no capability to communicate with highway vehicles, nor can it safely and securely operate that way. More importantly, to maximize the safety promise of an automated highway vehicle, it should be designed to the maximum extent possible to operate independently of, rather than in reliance on, other complex systems designed for a different purpose.

While automated vehicles have the potential to drive improvements in grade crossing safety, these improvements should be accomplished by technology that recognizes when a vehicle is approaching a highway-rail grade crossing, responds appropriately and lawfully to traffic control inputs such as grade warning devices, recognizes when it is safe to proceed over

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[16] *See, e.g.,* Ohio Department of Transportation's policy. Available at: http://www.dot.state.oh.us/news/Pages/2015/Changes-at-Railroad-Crossings-.aspx.

the crossing, and completes a safe move through the crossing, all independently of any railroad signal systems.

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Thank you for your consideration of these comments.

Respectfully submitted,

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