

**CLEANER TRAINS: OPPORTUNITIES FOR REDUCING  
EMISSIONS FROM AMERICAS' RAIL NETWORK**

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**HEARING**

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR, CLIMATE,  
AND NUCLEAR SAFETY

OF THE

COMMITTEE ON  
ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

JULY 26, 2023

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FIRST SESSION

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# **CLEANER TRAINS: OPPORTUNITIES FOR REDUCING EMISSIONS FROM AMERICA'S RAIL NETWORK**

**WEDNESDAY, JULY 26, 2023**

U.S. SENATE,  
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,  
SUBCOMMITTEE ON CLEAN AIR, CLIMATE,  
AND NUCLEAR SAFETY,  
*Washington, DC.*

The committee met, pursuant to notice, at 2:32 p.m. in room 406, Dirksen Senate Office Building, Hon. Edward J. Markey (chairman of the subcommittee) presiding.

Present: Senators Markey, Ricketts, Carper, Kelly, Padilla, Lummis, Boozman.

## **OPENING STATEMENT OF HON. EDWARD J. MARKEY, U.S. SENATOR FROM THE STATE OF MASSACHUSETTS**

Senator MARKEY. Good afternoon, everyone. I am pleased to call the Senate Environment and Public Works Subcommittee on Clean Air, Climate, and Nuclear Safety to order for this important hearing. This is going to be an absolutely fascinating subject for people.

Thank you for joining us today on our hearing on Cleaner Trains: Opportunities for Reducing Emissions from America's Rail Network.

Thank you to my Ranking Member, Senator Ricketts, and to the Chairman and Ranking Member of the Committee on Environment and Public Works, Senator Carper and Senator Capito, for their partnership in holding this hearing. It is my pleasure to welcome our three witnesses.

Railroads were once the crown jewel of America. They were a product of the industriousness and talent of American workers. Massachusetts is proudly home to some of the earliest railroads. The completion of the Western Railroad in 1843 connecting Boston to the Berkshires conclusively demonstrated the feasibility of freight rail in the United States of America.

One hundred and eighty years later, unionized American workers stand at the ready to build today's green locomotives. Our railway system is blocking the crossing. In the midst of America's Green Revolution, our railway operators have lost their taste for American innovation.

Today's new locomotives are built to emission standards set by the Environmental Protection Agency which were last updated in 2008 and have not been revisited for 15 years. The EPA predicted

that with the adoption of the next generation clean locomotive technology, these standards could prevent thousands of deaths and hundreds of thousands of lost work and school days.

However, we have not stayed on track with EPA's projections. Railroad operators have been reluctant to invest in those clean, new locomotives, derailing our pathway to emissions reductions. Nearly half of the Class One railway fleet of locomotives is more than 20 years old, old enough to vote. Those old trains emit almost seven times as much nitrogen oxide and 13 times as much soot as new, cleaner locomotives.

Since the 2008 rulemaking, we have seen more and more evidence that these pollutants are poisoning communities along railways and beyond. These pollutants affect the rail workers who breathe the diesel fumes day in and day out, taking home higher cancer risk and mortality. These pollutants affect the communities who live and work and play next to these railways, burdened with elevated risk of heart and lung disease.

Those pollutants affect the ability of States and municipalities to uphold their responsibility to provide residents with healthy air. We have low emissions technology, and it is built by union workers. We even have zero emissions technology, and it is built by union workers. Railroads powered America's past, but they can also surcharge our future.

We have the technology, we have the work force to make our railroads safe, efficient, and clean, moving goods and people where they need to go.

I am a huge supporter of American railroads and rail workers. I have introduced the BRAIN TRAIN Act, to connect Massachusetts by rail. I have introduced the Freedom to Move Act, to support fare-free transit to get Americans onto our trains and our buses. I have supported increased funding for high-speed rail and I have introduced the Safe Freight Act to support the safe operation of railways for rail crews and railyards.

I believe in American rail. I believe in the workers that build and operate it. Rail can again become a beacon of American ingenuity, American innovation and capability, uplifting the talents and industriousness of the hard-working people who build these next generation locomotives.

Today we will learn about how our outdated regulations have left our communities, our workers, and our rail industry vulnerable. By updating regulations to better reflect the harms of air pollution, and technological advances on locomotives, we can get back on track. I look forward to hearing from all of our witnesses about how we can continue to move forward to clean trains, healthy communities, and a strong union work force.

Before we hear from our witnesses, however, let me turn to recognize the Ranking Member of the Subcommittee, Senator Ricketts.

**OPENING STATEMENT OF HON. PETE RICKETTS,  
U.S. SENATOR FROM THE STATE OF NEBRASKA**

Senator RICKETTS. Thank you, Chairman Markey, for initiating this important hearing. I liked how you worked in the railroad terms into your opening statement. I am going to have to talk to

my team about that when we have those opportunities. Thank you as well to our witnesses who are here with us today to talk about these important issues.

This hearing serves as an incredible opportunity to share the investments and innovations that are being made in our entire rail system. Nebraska has a long history of railroading and much of our development is intertwined with rail expansion in the west. Today, the rail industry employs over 8,000 Nebraskans. Rail ships grain, biofuels, and feed ingredients out of Nebraska while also importing coal, fertilizer, and steel. What I am getting at here is that rail volume is critically important to the economy of Nebraska.

A point that is likely to be reiterated throughout this hearing: U.S. freight railroads can move one ton of freight more than 500 miles, or nearly 500 miles, on a single gallon of fuel. Now, put in that perspective, that is able to cross the entire State of Nebraska, from Iowa to Colorado. That is a pretty incredible efficiency, to be able to move a ton of freight across the entire State of Nebraska with one gallon of fuel.

Nationally, rail makes up about 28 percent of the freight movement by ton miles. Railroads only account for 1.7 percent of the total U.S. transportation-related greenhouse gas emissions. To give you another perspective, it would have taken almost 2 million additional trucks to handle the 34.5 million tons of freight that originated by rail in Nebraska in 2021 alone.

America's railroads have already taken steps to further reduce emissions, including increasing the uses of biodiesel and renewable diesel. In some cases, renewable diesel and biodiesel can reduce carbon emissions by 25 percent.

Utilizing more renewable diesel and biodiesel is a win-win scenario. Renewable diesel and biodiesel are produced from agricultural byproducts, wastes, and residues such as soybeans, echinacea and corn oils, animal fats, and used cooking oils. Creating value through byproducts sustains value for farmers across the country, decreases emissions, and supports renewable refining jobs across rural America. Renewable fuels are the here and now solution to maintaining rail efficiency while decreasing emissions.

There are ongoing efforts to push toward the electrification of our entire rail system. However, there are also many concerns with this approach. As you all know, the freight rail industry is an interconnected system of the seven Class One railroads and hundreds of short line railroads that own and maintain over 180,000 route miles of track throughout North America. At any given moment, 5 to 10 percent of the line haul locomotives being operated by the seven Class One railroads are actually owned and leased by another railroad.

As Class One railroads utilize one another's tracks and cars, this system is wholly reliant on the interoperability of technology. The deployment of unique locomotive technology would create captive fleets that serve small geographic regions, harming the efficiency of railroad operations and disrupting entire supply chains.

Electrification of our Nation's freight rail network would also require building and maintaining a reliable high-voltage catenary system. This kind of system would require infrastructure through cities, deserts, plains, rivers, rail tunnels and bridges. Estimates

put the cost of electrification at millions of dollars per railroad track mile.

I am supportive of and excited for the industry to lead innovation in this space. North Platte is home to the Bailey Yard, the world's largest classification yard. The Bailey Yard is responsible for sorting and building trains covering 2,850 acres and including more than 300 track miles.

The Bailey Yard will be home to four battery electric locomotives in the coming years, where the feasibility, safety, and reliability will be put to the test in Nebraska's hot summers and cold winters. This kind of industry innovation will ensure that our rail industry can make decisions that best support their workers, customers, and supply chain as a whole.

State and Federal regulations cannot put the cart in front of the horse when it comes to reliability and safety. It is important that our railroads maintain their interoperability, efficiency, reliability and safety.

I look forward to hearing our witnesses' testimony and finding ways we can work together. I also have an introduction for Mr. Jefferies, unless you are going to introduce him, in which case I will defer.

Senator MARKEY. We are going to introduce all the witnesses and then hear their testimony in order.

Senator RICKETTS. I am on a roll.

[Laughter.]

Senator MARKEY. At this time, you should introduce Mr. Jefferies.

Senator RICKETTS. Very good.

All right, so, Mr. Jefferies, thank you for joining us. Mr. Jefferies serves as the President and CEO of the American Association of Railroads, where he advocates for and works with member railroads to ensure the continued viability of America's railroad industry. Prior to this role, Mr. Jefferies was the senior vice president of the AAR's governmental affairs, where he led the development and promotion and implementation of legislative priorities for the AAR.

Before joining the AAR, Mr. Jefferies worked within government for more than a decade, including as a senior policy advisor to the chairman of the U.S. Senate Committee on Commerce, Science, and Transportation. In this role, he provided policy guidance on a host of transportation issues, including railroad and economic regulation and rail safety and passenger rail.

Mr. Jefferies began his career in government serving as a senior advisor to the mayor of Lexington, Kentucky, before transitioning to the Federal Government. Prior to serving in the U.S. Senate, he worked for the U.S. Department of Transportation, Office of the Inspector General, and the U.S. Government Accountability Office.

Again, thank you, Mr. Jefferies, for being here. I look forward to having you answer our questions.

Senator MARKEY. Thank you.

Let me continue by also introducing Carl Rosen. Mr. Rosen is the General President of United Electrical, Radio, and Machine Workers of America. UE represents 35,000 workers across America, including railway crew drivers and machinists that build next gen-

eration clean locomotives. Mr. Rosen has been a member of UE since 1984, when he joined as a rank-and-file members.

We will also hear from Ms. Ivette Torres. Ms. Torres will be joining us virtually. She is the lead Community Researcher at the People's Collective for Environmental Justice. Ms. Torres has been raised in freight communities her entire life. She is an expert on the environmental impacts of freight movement on southern California communities.

Finally, we will hear from Mr. Ian Jefferies, who you just have heard introduced by Senator Ricketts.

With the conclusion of the introductions, Mr. Rosen, you are up.

**STATEMENT OF CARL ROSEN, GENERAL PRESIDENT, UNITED ELECTRICAL, RADIO, AND MACHINE WORKERS OF AMERICA**

Mr. ROSEN. Thank you very much, and thank you for having this important hearing today.

Our union represents thousands of workers in the rail industry, both those who manufacture locomotives and parts and rail crew drivers who work in rail yards across the Country. We are unequivocally in favor of stricter emissions standards for rail. Stricter standards would be good for workers and good for the economy, and can be met using existing technology.

In 1998, the Environmental Protection Agency instituted a tier-based system for regulating the emissions of locomotives. Modern Tier 4 locomotives have been in production since 2014 and became the standard for all newly built locomotives in 2015. They are estimated to emit 90 percent less particulate matter and 80 percent less nitrous oxide than Tier 2 locomotives, those built before 2012.

When the EPA issued the Tier 4 standard, it estimated that by 2023, over 30 percent of the locomotives on the rails would be Tier 4. However, the railroads have been slow to upgrade to this cleaner and greener technology.

As of 2021, the most recent data for which the Bureau of Transportation Statistics data is available, less than 10 percent of the Class One railroad locomotive fleet was Tier 4, while over three-quarters was still Tier 2 or lower. Without action by our government officials, the railroads will keep those dirty locomotives running for years, if not decades to come.

Rail yards are well known as hot spots for pollution. In urban areas, they are often located in low-income communities of color. Neighborhoods surrounding high traffic yards in California have a significantly elevated rate of cancer.

When wind carries air from a yard into a residential area, airborne black carbon spikes to twice the normal level for an urban area. Children living near rail yards have twice the incidence of asthma of those living at least four miles away.

Hundreds of UE members work in these unhealthy environments on a daily basis. Many of them live there as well. It is unconscionable that we let this go on, when existing technology can mitigate the issue, and now commercially viable technologies like battery locomotives can all but eliminate it.

Setting stricter emissions standards for locomotives is not only the right thing to do for workers and communities around the railroads, it will also stimulate American manufacturing, as new re-

quirements for railroads to fully modernize their fleet will spur demand.

Essentially, all manufacturing of locomotives for the U.S. market takes place domestically, and much of it is union, with family supporting wages and benefits, such as at the UE represented plant in Erie, Pennsylvania.

A recent report by the University of Massachusetts Amherst shows that if the Erie plant were to be utilized to its full capacity, building clean locomotives, it would create thousands of quality, family supporting jobs in a Rust Belt city that has been hit by both de-industrialization and job loss associated with our transition away from fossil fuels.

The existing regulations are outdated and full of loopholes. There is no mechanism to enforce the adoption of new green technologies. We need stricter, enforceable standards. We need to allow States to take the lead, as California is attempting to do, in protecting the health and welfare of its residents. We also need action on the Federal level to ensure that the benefits of new standards are shared across our Nation.

Tier 4 locomotives have been in production for almost a decade. The zero-emissions battery operated locomotives have been in use for years in rail yards. These are proven technologies. Their adoption is not a matter of technological feasibility, but of priorities.

What is more important for our Country, clean air, addressing the climate crisis, and good jobs, or corporate profits, executive bonuses, and payments to Wall Street?

The Class One railroads, which own 90 percent of the locomotives on the rails, are enormously profitable. However, we need look no further than the disaster in East Palestine to see an example of how they prioritize profits over the public good. The bottom line is that they will not make this investment in our shared future unless our Country requires them to.

Setting stricter emissions standards for the rail industry, requiring that they quickly upgrade their cross-country fleets to Tier 4 and use zero-emission locomotives in rail yards is the right thing for workers, the right thing for the planet, the right thing for working class communities and communities of color, and the right thing for building greener, cleaner manufacturing in the U.S.

Thank you.

[The prepared statement of Mr. Rosen follows:]

**Written Testimony for the Senate Committee on Environment and Public Works,  
Subcommittee on Clean Air, Climate, and Nuclear Safety**

**Carl Rosen, General President,  
United Electrical, Radio & Machine Workers of America (UE)**

**July 26, 2023**

Our union represents thousands of workers in the rail industry; both those who manufacture locomotives and parts, and rail crew drivers who work in rail yards across the country.

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When the EPA issued the Tier 4 standard, it estimated that by 2023, over 30 percent of the locomotives on the rails would be Tier 4. However, the railroads have been slow to upgrade to this cleaner and greener technology. As of 2021, the most recent date for which Bureau of Transportation Statistics data is available, less than 10 percent of the Class 1 railroad locomotive fleet was Tier 4, while over three quarters was still Tier 2 or lower. Without action by our government officials, the railroads will keep these dirty locomotives running for years if not decades to come.

The intent of the EPA standards was to gradually improve emissions standards across the industry by requiring all new locomotives to meet stricter standards. However, railroads are able to evade this intent because, due to a loophole in the regulations, they are allowed to keep rebuilding their existing fleets, rather than purchasing new, modern and efficient locomotives. Rebuilding a pre-Tier 4 locomotive cannot bring it up to Tier 4 standards.

Rail yards are well-known as hotspots for pollution, and in urban areas they are often located in low-income communities of color. Neighborhoods surrounding high-traffic yards in California have a significantly elevated rate of cancer. When wind carries air from a yard into a residential area, airborne black carbon spikes to twice the normal level for an urban area. Children living near rail yards have twice the incidence of asthma of those living at least four miles away. Hundreds of UE members work in these unhealthy environments on a daily basis. Many of them live there as well. It is unconscionable that we let this go on when existing technology can mitigate the issue, and now commercially-viable technologies like battery locomotives can all but eliminate it.

Setting stricter emission standards for locomotives is not only the right thing to do for workers and communities around the railroads, it will also stimulate American manufacturing, as new requirements for railroads to fully modernize their fleet will spur demand. Essentially all

manufacturing of locomotives for the U.S. market takes place domestically, and much of it is union, with family-supporting wages and benefits, such as at the UE-represented plant in Erie, Pennsylvania.

A recent report by the University of Massachusetts-Amherst shows that, if the Erie plant were to be utilized to its full capacity building clean locomotives, it would create thousands of quality, family-supporting jobs. This is especially important for Erie, a city that has been hit hard in recent decades by job losses from deindustrialization, so-called "free trade" deals, and our economy's transition away from fossil fuels. Our union believes that workers and communities that suffer job loss because of large-scale economic transitions deserve a "just transition," rather than being abandoned to poverty. New regulations that require the railroads to purchase new, modern locomotives will help provide that just transition for Erie.

The existing EPA regulations for locomotives are outdated, and there is no mechanism to enforce the adoption of new, green technologies. We need stricter, enforceable standards. We need to allow states to take the lead, as California is attempting to do, in protecting the health and welfare of its residents, but we also need action on the federal level. Federal action will ensure that the benefits of new standards are shared across our nation. Furthermore, climate change is a global process, and carbon emissions in any state affects the climate everywhere. The extreme weather events we are currently seeing all across the country are affecting all of us, regardless of state regulations — in order to meaningfully address the climate crisis, we need the federal government to act.

Tier 4 locomotives have been in production for almost a decade. Zero-emissions, battery-operated locomotives have been in use for years in rail yards. These are proven technologies. Their adoption is not a matter of technological feasibility, but of priorities. What is more important for our country? Clean air, addressing the climate crisis, and good jobs? Or corporate profits, executive bonuses, and payments to Wall Street?

The Class 1 railroads, which own 90 percent of the locomotives on the rails, are enormously profitable. However, we need look no further than the disaster in East Palestine to see an example of how they prioritize profits over the public good. The bottom line is that they will not make this investment in our shared future unless our country requires them to.

Setting stricter emission standards for the rail industry — requiring that they quickly upgrade their cross-country fleets to Tier 4 and use zero-emission locomotives in rail yards — is the right thing for workers, the right thing for the planet, the right thing for working-class communities and communities of color, and the right thing for building greener, cleaner manufacturing in the U.S.

**PERI** REPORT  
APRIL 2023

# Employment Creation through Green Locomotive Manufacturing at Wabtec's Erie, Pennsylvania Facility

**GREGOR SEMIENIUK**  
Assistant Research Professor, PERI  
University of Massachusetts Amherst

**ROBERT POLLIN**  
Distinguished University Professor of Economics and  
Co-Director, Political Economy Research Institute (PERI)  
University of Massachusetts Amherst

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## Summary of Study

This report estimates the prospects for job creation through expanding green locomotive manufacturing at the Westinghouse Air Brake Technologies (Wabtec) Corporation's Lawrence Park facility in Erie, Pennsylvania. We consider the employment effects of three types of green locomotive manufacturing activities at Wabtec's Lawrence Park site: 1) Tier 4 diesel-electric locomotives; 2) battery-electric locomotives *without* onsite battery production and 3) battery electric manufacturing *with* onsite battery production.

We estimate employment creation under 2 scenarios: an initial Phase 1, in which Wabtec produces 500 green locomotives per year at Lawrence Park and a Phase 2 in which production at Lawrence Park expands to 1,000 green locomotives per year. As of 2008, Wabtec had been producing locomotives at the Phase 2 level of about 1,000 locomotives per year. Phase 2 would therefore just return the Lawrence Plant facility to its earlier level of manufacturing activity.

We estimate that by producing 1,000 green locomotives per year at Lawrence Park, employment creation would range as follows, depending on which specific locomotive production activities are operating at the plant:

- 3,400 – 5,100 jobs at Lawrence Park itself;
- 3,060 – 5,100 jobs in Erie County outside of Lawrence Park;
- 9,860 – 14,960 in the U.S. economy overall.

About 800 people are currently employed at Lawrence Park directly involved in locomotive production. Expanding production to 1,000 locomotives per year would therefore produce a *net increase* in employment at the facility by between roughly 2,600 – 4,300 workers.

Expanding green locomotive manufacturing production at Wabtec's Lawrence Park facility will produce major gains in employment conditions in Erie County. This will be true both through the increase in the number of job opportunities relative to the 126,000 people that currently comprise the area's labor market, and through the relatively high compensation levels associated with jobs at the Lawrence Park facility itself.

## Introduction

This report estimates the employment impact of expanding green locomotive manufacturing production at the Westinghouse Air Brake Technologies (Wabtec) Corporation's Lawrence Park facility in Erie, Pennsylvania. We consider two categories of locomotives that can be accurately considered to be "green" locomotives. The first category is the so-called "Tier 4" diesel-electric locomotive. The Tier 4 designation refers to the emissions requirements established by the Environmental Protection Agency for locomotives built after 2015.<sup>1</sup> The emissions generated by Tier 4 locomotives are between 50 – 90 percent lower than those produced by the first regulated "Tier 0" models. The second category of locomotives are fully battery-electric vehicles. With battery-electric locomotives, emissions during operation can be cut to zero if the power source for the electricity is renewable energy.

Wabtec's Lawrence Park facility in Erie has been operating since 1907. Its current production facilities are capable of producing Tier 4 diesel-electric locomotives. Wabtec is also currently developing battery-electric locomotive technology. The company's website states as follows:

Wabtec is leading the transition to a low-carbon rail network with FLXdrive. The world's first heavy-haul, 100 percent battery-electric vehicle...With haulage capabilities comparable to its diesel equivalent, the FLXdrive locomotive is designed to replace a diesel locomotive within a consist, unlocking new levels of operational flexibility.<sup>2</sup>

The capacity for large-scale growth in manufacturing production at Lawrence Park is substantial. Scott Slawson, the President of Local 506 of the United Electrical, Radio, and Machine Workers of AmEriea (UE) describes, as of April 2023, the resources available and potential for growth at Lawrence Park as follows:

As recently as 15 years ago, the Erie locomotive facility employed a workforce of about 4,000 manufacturing workers producing as many as 20 locomotives a week, or up to 1,000 per year, for both domestic and international railroads. The plant currently can have over 40 locomotives in the build process at the same time but has significant excess capacity due to a severe downturn in the purchase of new locomotives by U.S. railroads, resulting in a current hourly workforce of about 1,400. Given that the facility encompasses over 900 acres, ramping up production is simply a matter of increasing the workforce to shorten the cycle times necessary for the build.<sup>3</sup>

In short, there is, at present, an extensive base of underutilized resources at Lawrence Park. These underutilized resources will serve as a benchmark for the estimates we will generate as to the potential for job creation through a major expansion of green locomotive manufacturing at the plant.

With respect to manufacturing battery-electric vehicles specifically at Lawrence Park, we estimate employment creation under two scenarios. In the first scenario, we assume that the batteries for the locomotives are manufactured outside the Lawrence Park facility. At present, the existing equipment at Lawrence Park does not include capacity for manufac-

turing batteries. However, there is at the plant enough warehouse space that could be converted to battery manufacturing production. In addition, the tax credit provisions of the 2022 Inflation Reduction Act (IRA--Section 45X) include support for battery manufacturing. Wabtec will be able to qualify for this subsidy opportunity to lower the costs for installing its battery manufacturing line.

Under either the first or second scenario, Wabtec will spend approximately the same amount of money on the batteries they install in the battery electric locomotives they produce at Lawrence Park. But job creation will be significantly higher under the second scenario, since battery manufacturing itself will take place onsite, rather than elsewhere.

## Generating Employment Estimates

We generate our job creation estimates at Lawrence Park based on two considerations. The first consideration is our estimate of how much employment would be generated through producing green locomotives at the plant for any given level of spending by Wabtec. For example, how many jobs would be created if Wabtec spends \$1 million on manufacturing green locomotives? The second consideration is our assessment as to how much the Lawrence Park plant is capable of expanding its green locomotive manufacturing activity. Our estimate of the potential for job creation at the facility will follow from our figures on: 1) job creation per \$1 million in spending on locomotive manufacturing; and 2) the capacity for expanding manufacturing at the plant. We now proceed to estimate these two sets of figures.

## Job Creation per \$1 Million in Spending

We generate estimates on job creation for a given spending level, such as \$1 million, on green locomotive manufacturing on the basis of an "input-output" statistical model. An input-output model traces the interrelationship between all activities in an economy, showing the range of *inputs*, such as raw metals, glass, engine components as well as workers, that are utilized to produce any given *output*, such as locomotive trains. Within the framework of this input-output statistical model, we are able to generate employment/output ratios—i.e. for a given total amount of spending, such as \$1 million, channeled into the economy to produce an output, such as a locomotive, the employment/output ratio shows how many workers this spending employs.<sup>4</sup>

Spending on green locomotives, as with every other activity in the economy, creates employment through three channels: direct, indirect, and induced effects. These three channels can be described as follows:

- *Direct effects*: the jobs created by manufacturing the locomotive engine and body. This category will correspond closely to the job creation at a given production site for any specific project. That would include, in this case, the Lawrence Park facility itself.

- *Indirect effects:* the jobs associated with the industries that supply intermediate goods for this manufacturing, such as raw metal products, glass, and engine components. Indirect effects, in other words, refer to the employment created through the 'supply chain' of goods that are required for manufacturing locomotives.
- *Induced effects:* the expansion of employment that results when people who are newly employed to build locomotives—through either the direct or indirect employment channel—in turn spend their income on any and all goods and services in the economy. Induced effects are also referred to as 'multiplier effects' in standard economic analysis.

In Table 1, we show our estimates for direct, indirect, and induced employment creation for manufacturing green locomotives at the Lawrence Park facility in Erie County, Pennsylvania. We report these figures for manufacturing both diesel-electric and battery-electric locomotives. We also break out employment creation into four geographic categories. These are:

- Jobs created at the Lawrence Park facility itself;
- Jobs created within Erie County outside of Lawrence Park;
- Jobs created within the state of Pennsylvania outside of Erie County; and
- Jobs created within the United States, outside of Pennsylvania.

As Table 1A shows, considering first manufacturing of Tier 4 diesel-electric locomotives, we estimate that there will be 1.5 direct jobs created at Lawrence Park when Wabtec spends \$1 million on manufacturing diesel-electric locomotives at this facility. This level of spending by Wabtec will also generate 0.5 indirect jobs and 0.9 induced jobs in Erie County beyond the Lawrence Park facility. In addition, 0.4 jobs will be created elsewhere in Pennsylvania, and another 1.2 jobs in U.S. states other than Pennsylvania. Total job creation throughout the U.S. generated by Wabtec through manufacturing diesel-electric locomotives at Lawrence Park will therefore be 4.5 jobs per \$1 million in spending.

As we see in Table 1B, our estimate of job creation per \$1 million in spending will be lower for manufacturing battery-electric locomotives. We estimate that total direct employment at the Lawrence Park plant will be 1.0 jobs per \$1 million in spending. Another 0.9 jobs will be generated within Erie County outside of Lawrence Park. Including the rest of Pennsylvania and rest of the U.S., we estimate that total job creation will be 2.9 jobs per \$1 million in spending.

The major factor causing the lower level of employment creation through manufacturing battery-electric locomotives versus diesel-electric locomotives is that, with battery-electric locomotives, producing the battery itself represents a significant share of the overall manufacturing operation. We therefore present in Table 2 our estimate of the employment impact of producing the batteries that power locomotives. In Table 2A, we show our estimate for battery production itself, assuming that Lawrence Park plant is producing the batteries onsite. Table 2B then shows the full employment impact of Wabtec producing both the battery and the full locomotive at Lawrence Park.

**TABLE 1. Job Creation per \$1 Million in Spending on Locomotive Manufacturing at Lawrence Park Facility, Erie County, Pennsylvania**

**1A) Job Creation for Tier 4 Diesel-Electric Locomotives**

	1) Direct Jobs [=Jobs at Lawrence Park]	2) Indirect Jobs	3) Induced Jobs	4) TOTAL: Direct + Indirect + Induced Jobs
1) Lawrence Park	1.5	0.0	0.0	1.5
2) Erie County outside of Lawrence Park	0.0	0.5	0.9	1.4
3) Pennsylvania outside of Erie County	0.0	0.2	0.2	0.4
4) U.S. outside of Pennsylvania	0.0	0.7	0.5	1.2
5) Total Job Creation throughout U.S.	1.5	1.4	1.6	4.5

**1B) Job Creation for Battery-Electric Locomotives without Onsite Battery Manufacturing**

	1) Direct Jobs [=Jobs at Lawrence Park]	2) Indirect Jobs	3) Induced Jobs	4) TOTAL: Direct + Indirect + Induced Jobs
1) Lawrence Park	1.0	0.0	0.0	1.0
2) Erie County outside of Lawrence Park	0.0	0.3	0.6	0.9
3) Pennsylvania outside of Erie County	0.0	0.1	0.1	0.2
4) U.S. outside of Pennsylvania	0.0	0.5	0.3	0.8
5) Total Job Creation throughout U.S.	1.0	0.9	1.0	2.9

Source: IMPLAN.

As we see in Table 2A, we calculate that the battery manufacturing operation at the Lawrence Park site will generate 0.5 direct jobs at Lawrence Park per \$1 million in spending on battery-electric locomotives by Wabtec. In addition, battery manufacturing will generate 0.1 indirect jobs and 0.5 induced jobs within Erie County itself, for a total of 0.6 jobs per \$1 million in Erie County outside of Lawrence Park through spending on battery-electric locomotives. Battery manufacturing at Lawrence Park will also generate a total of 0.2 additional jobs per \$1 million in spending in the rest of Pennsylvania and 0.2 jobs in the U.S. outside of Pennsylvania. Overall, battery manufacturing at Lawrence Park will generate 1.5 jobs per \$1 million in spending.

**TABLE 2: Job Creation per \$1 Million in Spending with Onsite Battery Manufacturing at Lawrence Park Facility, Erie County, Pennsylvania**

**2A) Job Creation for Battery Manufacturing**

	1) Direct Jobs [=Jobs at Lawrence Park]	2) Indirect Jobs	3) Induced Jobs	4) TOTAL: Direct + Indirect + Induced Jobs
1) Lawrence Park	0.5	0.0	0.0	0.5
2) Erie County outside of Lawrence Park	0.0	0.1	0.5	0.6
3) Pennsylvania outside of Erie County	0.0	0.1	0.1	0.2
4) U.S. outside of Pennsylvania	0.0	0.1	0.1	0.2
5) Total Job Creation throughout U.S.	0.5	0.3	0.7	1.5

**2B) Job Creation for Battery Manufacturing + Battery Electric-Locomotives (figures from Tables 1B + 2A)**

	1) Direct Jobs [=Jobs at Lawrence Park]	2) Indirect Jobs	3) Induced Jobs	4) TOTAL: Direct + Indirect + Induced Jobs
1) Lawrence Park	1.5	0.0	0.0	1.5
2) Erie County outside of Lawrence Park	0.0	0.4	1.1	1.5
3) Pennsylvania outside of Erie County	0.0	0.2	0.2	0.4
4) U.S. outside of Pennsylvania	0.0	0.6	0.4	1.0
5) Total Job Creation throughout U.S.	1.5	1.2	1.7	4.4

Source: IMPLAN.

Table 2B combines the results from Table 2A with those from Table 1B. In other words, Table 2B shows our estimate of job creation assuming that Wabtec manufactures both battery-electric locomotives and the batteries for these locomotives onsite at the Lawrence Park facility. We estimate that this combination of manufacturing activities will generate, per \$1 million in spending, 1.5 direct jobs at Lawrence Park, as well as another 1.5 indirect and induced jobs in the rest of Erie County. Beyond these, the \$1 million in spending will generate 0.4 jobs within Pennsylvania outside of Erie County, and 1.0 jobs in the U.S. outside of Pennsylvania. Total job creation throughout the U.S. will therefore be 4.4 jobs per \$1 million for manufacturing battery-electric locomotives and batteries at Lawrence Park.

## Expanding Locomotive Manufacturing at Lawrence Park

Working with our estimates on job creation per \$1 million in spending, we still need to establish, by assumption, two sets of figures on Wabtec's spending level at Lawrence Park in order to estimate job creation prospects generated through the facility's expanded green locomotive manufacturing activity. These two sets of figures include 1) the extent to which green locomotive manufacturing can expand at the Lawrence Park facility; and 2) the average costs of producing green locomotives at Lawrence Park. We consider these in turn.

As noted above, about 1,400 people are currently employed at Lawrence Park. About 700 – 800 of these workers are directly involved in locomotive production. Working with the higher end current employment figure of 800, our estimates for job creation at the facility will include these workers currently employed at the facility. We will therefore be able to estimate from this base of 800 currently employed workers the extent of *new* job creation through expanding green locomotive manufacturing at Lawrence Park.

**Expanding production activity.** We have noted above that the capacity for expanding manufacturing activity at Lawrence Park is substantial. According, again, to UE Local 506 President Scott Slawson, the Lawrence Park facility produced up to 1,000 locomotives per year as recently as 2008. It is therefore reasonable to allow that Wabtec is capable of expanding green locomotive manufacturing back to this approximate production level of 1,000 locomotives per year.

Of course, returning production at Lawrence Park to this previous level will create a range of significant challenges, even as the physical resources to undertake such an expansion are mostly available onsite. Our approach is therefore to estimate job creation potential at Lawrence Park under two scenarios, occurring in sequence: a Phase 1 scenario, in which production expands by 500 locomotives per year over the current production level for an initial 2 – 3 year period; and a Phase 2 scenario, in which, after the 2-3 year initial phase in, production increases to 1,000 green locomotives per year over the current level.

**Average production costs.** According to a 2022 *Forbes* article, the average price for purchasing a battery-electric locomotive is \$4 million. According to UE Local 506 President Slawson, the costs to purchase Tier 4 diesel-electric locomotives is somewhat lower, ranging between \$3 - \$3.5 million.<sup>5</sup>

These figures for purchase prices include the manufacturer's mark-up over its production costs. According to Wabtec's 2022 *Annual Report*, the company earned profits that year of 14.4 percent over their production costs.<sup>6</sup> Thus, if we assume that Wabtec's average production costs for locomotive manufacturing are 86 percent of their sales price, that would imply that production costs would range between \$2.6 - \$3 million for manufacturing diesel-electric locomotives and \$3.4 million to manufacture battery-electric locomotives. For the purposes of our estimates, we will assume, through rounding upward modestly, that production costs average \$3 million for diesel-electric and \$3.4 million for battery-electric locomotive production.

## Job Creation Estimates Based on Assumed Production Levels and Costs

In Tables 3 and 4, we report a range of estimates for job creation through producing both 500 green locomotives per year in Phase 1 (Table 3) and 1,000 green locomotives per year in Phase 2 (Table 4) at Lawrence Park. For both Phase 1 and Phase 2, we report 5 different production scenarios at Lawrence Park:

1. Diesel-electric production only, at \$3 million/locomotive;
2. Battery-electric production *without* battery manufacturing only, at \$3.4 million/locomotive;
3. Battery-electric production *with* battery manufacturing only, at \$3.4 million/locomotive;
4. Combined production: 50 percent diesel-electric and 50 percent battery-electric *without* battery production; and
5. Combined production: 50 percent diesel-electric and 50 percent battery-electric *with* battery production.

In Table 5, we then show the range of our job creation estimates under the five scenarios. We report separate job creation ranges for Lawrence Park itself, Erie County outside of Lawrence Park and total job creation, including all of Pennsylvania and the overall U.S. economy. Of course, our job creation estimates for Phase 2 are simply twice those of our estimates for Phase 1. This follows from our assumption that under Phase 2, locomotive production at Lawrence Park doubles from 500 to 1,000 locomotives per year.<sup>7</sup>

The summary figures in Table 5 convey clearly the broad job creation prospects under the alternative scenarios we have estimated. As we see in Table 5, with production at 500 locomotives per year during Phase 1, between roughly 1,700 – 2,500 jobs will be generated at Lawrence Park itself. Another roughly 1,500 – 2,500 will be generated in Erie County outside of Lawrence Park, and about 4,900 – 7,500 jobs will be created in total throughout the U.S.

The doubling of locomotive production at Lawrence Park to 1,000 locomotives per year during Phase 2 will then produce: between about 3,400 – 5,100 jobs at Lawrence Park itself; between about 3,000 – 5,100 jobs in Erie County outside of Lawrence Park; and between about 9,900 – 15,000 jobs overall throughout the U.S. economy.

Focusing on Lawrence Park itself, we show in row 2 of Table 5 *net increase* in employment at the facility, i.e. after factoring in the roughly 800 workers who are currently directly involved there in locomotive manufacturing. As we see, we estimate this net increase in employment to be between 900 – 1,750 jobs with annual production at 500 locomotives per year and between 2,600 – 4,300 with annual production at 1,000 locomotives per year.

**TABLE 3. Total Job Creation under Phase 1:  
Lawrence Park Production at 500 Green Locomotives per Year**

**3A) Job Creation through Single Manufacturing Operation at Lawrence Park Facility**

	1) Diesel-Electric Annual production costs = \$1.5 billion	2) Battery-Electric <b>without</b> Battery Manufacturing Annual production costs = \$1.7 billion	3) Battery-Electric Locomotives <b>with</b> Battery Manufacturing Annual production costs = \$1.7 million/locomotive
1) Lawrence Park	2,250	1,700	2,550
2) Erie County outside of Lawrence Park	2,100	1,530	2,550
3) Pennsylvania outside of Erie County	600	340	680
4) U.S. outside of Pennsylvania	1,800	1,360	1,700
5) Total Job Creation throughout U.S.	6,750	4,930	7,480

**3B) Job Creation through Multiple Manufacturing Operations at Lawrence Park Facility**

	1) 50% Diesel-Electric Locomotives; 50% Battery- Electric Locomotives <b>without</b> Battery Manufacturing	2) 50% Diesel-Electric Locomotives; 50% Battery- Electric Locomotives <b>with</b> Battery Manufacturing
1) Lawrence Park	1,975	2,400
2) Erie County outside of Lawrence Park	1,815	2,325
3) Pennsylvania outside of Erie County	470	640
4) U.S. outside of Pennsylvania	1,580	1,750
5) Total Job Creation throughout U.S.	5,840	7,115

Sources: See Tables 1 and 2.

**TABLE 4. Total Job Creation under Phase 2:  
Lawrence Park Production at 1,000 Green Locomotives per Year**

**4A) Job Creation through Single Manufacturing Operation at Lawrence Park Facility**

	1) Diesel-Electric Annual production costs = \$3 billion	2) Battery-Electric <b>without</b> Battery Manufacturing Annual production costs = \$3.4 billion	3) Battery-Electric Locomotives <b>with</b> Battery Manufacturing Annual production costs = \$3.4 million/locomotive
1) Lawrence Park	4,500	3,400	5,100
2) Erie County outside of Lawrence Park	4,200	3,060	5,100
3) Pennsylvania outside of Erie County	1,200	780	1,360
4) U.S. outside of Pennsylvania	3,600	2,720	3,400
5) Total Job Creation throughout U.S.	13,500	9,860	14,960

**4B) Job Creation through Multiple Manufacturing Operations at Lawrence Park Facility**

	1) 50% Diesel-Electric Locomotives; 50% Battery- Electric Locomotives <b>without</b> Battery Manufacturing	2) 50% Diesel-Electric Locomotives; 50% Battery- Electric Locomotives <b>with</b> Battery Manufacturing
1) Lawrence Park	3,950	4,800
2) Erie County outside of Lawrence Park	3,630	4,650
3) Pennsylvania outside of Erie County	990	1,280
4) U.S. outside of Pennsylvania	3,160	3,500
5) Total Job Creation throughout U.S.	11,680	14,230

Sources: See Tables 1 and 2.

TABLE 5. Job Creation Ranges for Phases 1 and 2

	Phase 1: Production at 500 Locomotives/year	Phase 2: Production at 1,000 Locomotives/year
1. Lawrence Park	1,700 – 2,550	3,400 – 5,100
2. Net Job Creation at Lawrence Park (= row 1 – 800, with current loco- motive manufacturing at ~ 800)	900 – 1,750	2,600 – 4,300
3. Erie County outside of Lawrence Park	1,530 – 2,550	3,060 – 5,100
4. Total (= rows 1 + 3)	4,930 – 7,480	9,860 – 14,960

Sources: Tables 3 and 4.

## Impact on Erie, Pennsylvania Employment Conditions

**Employment Level.** As of February 2023, the overall labor force in Erie County, Pennsylvania was 126,000. Of that total, 119,200 people were employed and 7,000 were unemployed. This amounts to an unemployment rate in the region of 5.5 percent.<sup>8</sup>

A gain of roughly 2,000 jobs at Lawrence Park itself and another roughly 2,000 jobs in Erie County under Phase 1, with Lawrence Park producing 500 locomotives per year, would represent an increase in employment in the area of over 3 percent. Considered relative to the area's current pool of 7,000 unemployed workers, the increase of about 4,000 jobs would be equivalent to a nearly 60 percent reduction in this pool of unemployed workers.

The impact on the regional job market would be greater still under Phase 2, with Lawrence Park manufacturing 1,000 locomotives per year. Relative to the current Erie County labor market, the roughly 4,000 jobs at Lawrence Park itself and the additional 4,000 jobs in Erie County would be equal to an employment expansion in the region of over 6 percent. The total of roughly 8,000 new jobs in the area—including those at Lawrence Park and throughout the county—would be larger than the current overall pool of 7,000 unemployed people in Erie County.

It is notable here that, as of 2008, at the time when Wabtec was producing about 1,000 locomotives per year, overall employment in Erie County was at 134,000—i.e. 15,000 more people were employed in the county than at present. The area's labor market should not face major difficulties to expand back to its 2008 level in conjunction with Wabtec increasing locomotive manufacturing at Lawrence Park back to roughly its 2008 production level.

**Compensation Levels.** Based on current labor market conditions, the newly created direct jobs at the Lawrence Park facility would be high-paying relative to other economic sectors in Erie and throughout Pennsylvania. The average employee compensation (wages and benefits) in direct jobs at the facility is \$114,837. Of course, there are also wide pay differences at the facility between the more highly paid engineers and the various craft positions. Table 6 reports estimates for the ten most common occupations involved in rolling stock manufacturing. All occupations pay well above the median 2021 wage in Pennsylvania of \$44,570.<sup>9</sup> All but two of the listed occupations pay 1.5 times or more than the Pennsylvania median wage. Newly created indirect jobs within Erie County currently pay well below the figures for locomotive manufacturing. The indirect jobs within Erie County currently pay an average of \$63,517 in total compensation and the average for induced jobs is \$48,521.

Overall then, expanding green locomotive manufacturing production at Wabtec's Lawrence Park facility will produce major gains in employment conditions in the area. This will be true both in terms of the increase in the number of job opportunities available in the area and especially in terms of the compensation levels associated with jobs at the facility itself.

**TABLE 6. Average Wages and Compensation (wages and benefits) for the Most Common Occupations at the Factory in Descending Order of Number of Jobs**

Occupation	Annual Wages	Annual Total Compensation
Metal Workers and Plastic Workers	\$74,550	\$93,748
Assemblers and Fabricators	\$69,458	\$87,352
Other Production Occupations	\$73,698	\$92,556
Material Moving Workers	\$50,223	\$62,281
Vehicle and Mobile Equipment Mechanics, Installers, and Repairers	\$81,660	\$101,469
Engineers	\$142,661	\$179,025
Business Operations Specialists	\$90,709	\$112,120
Other Installation, Maintenance, and Repair Occupations	\$87,477	\$109,005
Supervisors of Production Workers	\$116,958	\$146,965
Motor Vehicle Operators	\$49,403	\$61,081

Sources: IMPLAN.

## Accounting for Labor Productivity Gains over Time

Our estimates on employment creation, per \$1 million or \$1 billion in spending, respectively, are based on the U.S. Commerce Department's most recent survey figures on production methods used for manufacturing locomotives in the Erie, Pennsylvania region.

To provide a broader set of results on employment creation prospects through expanding green locomotive manufacturing at the Lawrence Park facility, it will be useful to consider how the trajectory of employment at Lawrence Park could proceed over time. To illustrate this, we consider a scenario in which, extending our Phase 2 scenario over a decade, Wabtec produces 1,000 green locomotives per year over this 10-year period.<sup>10</sup> As Wabtec maintains this manufacturing operation over a decade, it will certainly incorporate some improvements in its production methods. These improvements will translate into gains in labor productivity. This means that, over a decade, Wabtec will be able to produce 1,000 new diesel-electric and/or battery-electric locomotives through employing a smaller number of workers. We can estimate how much employment creation will decline through gains in labor productivity by working with an assumption as to what the average rate of productivity growth is likely to be over the decade.

Between 2010 and 2022, Wabtec reported an increase of 2.6 percent per year in labor productivity.<sup>11</sup> If we assume as a lower-end approximation that labor productivity at the Lawrence Park facility improves at an average rate of 2 percent per year between 2023 – 2032, that implies that labor productivity in 2032 will be approximately 16 percent higher than it was in 2023. It correspondingly means that, by 2032, Wabtec will be able to operate with 16 percent fewer employees in order to produce a given number of green locomotives—e.g. 1,000 locomotives per year under our Phase 2 scenario.

We see the results of this illustrative pattern of labor productivity gains in Table 7. As the table shows, the range of job creation falls as follows:

- At Lawrence Park: from a range of 3,400 – 5,100 jobs per year in 2023 to 2,845 – 4,267 in 2032;
- In Erie County outside of Lawrence Park: from a range of 3,060 – 5,100 jobs per year in 2023 to 2,560 – 4,267 in 2032; and
- Throughout the U.S. overall: from a range of 9,860 – 14,960 jobs per year in 2023 to a range of 8,250 – 12,518 jobs in 2032.

Of course, Wabtec could choose to increase production above our assumed level of 1,000 locomotives per year between 2023 and 2032. In that case, the fall in employment between 2023 – 2032 would be diminished in proportion to the increased production level.

**TABLE 7. Phase 2 Job Creation in 2023 and 2032 with 2 Percent Annual Labor Productivity Growth**

*Phase 2 Lawrence Park Production at 1,000 Green Locomotives/year*

Occupation	2023 Employment Range	2032 Employment Range
Lawrence Park	3,400 – 5,100	2,845 – 4,267
Erie County outside of Lawrence Park	3,060 - 5,100	2,560 – 4,267
Total	9,860 – 14,960	8,250 – 12,518

Sources: See Tables 1 and 2.

## Endnotes

- 1 For the most part, Tier 4 standards require the use of exhaust gas aftertreatment technologies, such as diesel particulate filters and urea-SCR. However, some commercial locomotive engines were able to meet Tier 4 standards without aftertreatment (Air Resources Board, 2016; Dieselnet, 2023).
- 2 See Wabtec (2023a). For detailed general background on the viability of battery electric locomotives, see Casey (2021) and Popovich et al. (2021).
- 3 Personal correspondence with authors, 4/18/23.
- 4 The input-output table that we use for generating estimates in this study are based on survey data provided by the U.S. Commerce Department. The survey data that we utilize here are focused on input-output data specifically for Erie County, Pennsylvania, as well as for the remainder of the Pennsylvania economy and the rest of the United States. A detailed discussion of the strengths and weaknesses of input-output (I-O) models and their application to estimating employment can be found in Appendix 4 of Pollin et al. (2014).
- 5 See Ohnsman (2022); the Slawson estimate is from personal correspondence with authors, 4/19/23.
- 6 <https://ir.wabteccorp.com/static-files/d44caffd-48b4-4378-9a99-c3c5ffabea99>.
- 7 To be more specific, this result depends on assuming that the relationships between inputs and outputs in our model are linear. This means that the employment/output ratios that we report in Tables 1 and 2 will remain fixed regardless of whether the spending level for these activities is \$1 million, \$1.5 billion, \$1.7 billion, \$3 billion, \$3.4 billion or any other figure. The viability of working with this linearity assumption is discussed, among other places, in Pollin et al. (2014).
- 8 See BLS (2023).
- 9 See Census (2023).
- 10 We also assume that the purchasing power of this spending will remain constant in 2023 dollars.
- 11 More precisely, they reported an average annual increase in revenue per worker between 2010 and 2022 of 2.6 percent. We calculated this from data provided in the Compustat data files.

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## About the Authors

**Gregor Semieniuk** (Ph.D., Economics, New School for Social Research, 2015) is Assistant Research Professor at PERI and the Department of Economics at University of Massachusetts Amherst. His research focuses on the energy and resource requirements of global economic growth and on the political economy of rapid, policy-induced structural change that is required for the transition to a low carbon economy. Gregor has testified before the U.S. Senate Committee on the Budget, consulted for the United Nations Environment Program and the UK Government on policies spurring low-carbon innovation, and has won grants to study these matters as well as transition risks for finance.

**Robert Pollin** is Distinguished University Professor of Economics and Co-Director of the Political Economy Research Institute (PERI) at the University of Massachusetts Amherst. He is also the founder and President of PEAR (Pollin Energy and Retrofits), an Amherst, MA-based green energy company operating throughout the United States. His books include *The Living Wage: Building a Fair Economy* (co-authored 1998); *Contours of Descent: U.S. Economic Fractures and the Landscape of Global Austerity* (2003); *An Employment-Targeted Economic Program for South Africa* (co-authored 2007); *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States* (co-authored 2008); *Back to Full Employment* (2012), *Greening the Global Economy* (2015), and *Climate Crisis and the Global Green New Deal: The Political Economy of Saving the Planet* (co-authored 2020). In 2018, he co-authored *Economic Analysis of Medicare for All*. He has worked as a consultant for the U.S. Department of Energy, the International Labour Organization, the United Nations Industrial Development Organization and numerous non-governmental organizations in several countries and in U.S. states and municipalities on various aspects of building high-employment green economies. He has also directed projects on employment creation and poverty reduction in sub-Saharan Africa for the United Nations Development Program. He has worked with many U.S. non-governmental organizations on creating living wage statutes at both the statewide and municipal levels, on financial regulatory policies, and on the economics of single-payer health care in the United States. Between 2011–2016, he was a member of the Scientific Advisory Committee of the European Commission project on Financialization, Economy, Society, and Sustainable Development (FESSUD). He was selected by *Foreign Policy* magazine as one of the "100 Leading Global Thinkers for 2013."

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## United Electrical, Radio and Machine Workers of America

CARL F. ROSEN  
General President

ANDREW C. DINKELAKER  
General Secretary-Treasurer

MARK D. MEINSTER  
Director of Organization



August 18, 2023

Senator Ed Markey  
Chairman  
Subcommittee on Clean Air, Climate, and Nuclear Safety  
Senate Committee on Environment and Public Works

Senate Pete Ricketts  
Ranking Member  
Subcommittee on Clean Air, Climate, and Nuclear Safety  
Senate Committee on Environment and Public Works

Dear Senators Markey and Ricketts:

Thank you for the opportunity to testify before the Senate Committee on Environment and Public Works, Subcommittee on Clean Air, Climate, and Nuclear Safety on Wednesday, July 26, 2023, at the hearing entitled "Cleaner Trains: Opportunities for Reducing Emissions from America's Rail Network."

I have attached answers to the follow-up questions submitted by members of the Committee.

Please feel free to contact me if you have any further questions.

Sincerely,

A handwritten signature in black ink that reads "Carl F. Rosen". The signature is written in a cursive style.

Carl Rosen



Senate Committee on Environment and Public Works  
Hearing Entitled, "*Cleaner Trains: Opportunities for Reducing Emissions from America's Rail Network*"  
July 26, 2023  
Responses to Questions for the Record for Carl Rosen

**1. Mr. Rosen, in your testimony, you mention that stricter locomotive emissions standards would stimulate American manufacturing, and you reference the work being done at the Wabtec plant in Erie, Pennsylvania as an example of the potential to create thousands of good-paying jobs.**

**a. Please elaborate on how establishing stricter locomotive emissions standards would benefit American workers and the economy.**

Establishing stricter locomotive emissions standards would increase demand for new locomotives, both "Tier 4" diesel locomotives, which reduce emissions by up to 90 percent when compared with older locomotives, and zero-emission battery-electric locomotives. Virtually all locomotive production for the U.S. market takes place domestically. It is highly skilled work, and most of it is union with family-supporting wages. Stricter emissions standards would thus create thousands, if not tens of thousands, of new jobs.

The study by the Political Economy Research Institute (PERI) at the University of Massachusetts, Amherst, submitted in connection with my testimony, looked specifically at the Wabtec plant in Erie, which employs the most highly-skilled locomotive building workforce in the world. That study found that use of the Erie plant at its full capacity would create between 9,860 and 14,960 jobs throughout the country.

Establishing stricter locomotive emissions standards would directly benefit the health and safety of the more than 150,000 workers who work on the railroads and in rail yards, by reducing the amount of harmful emissions they breathe in at work.

It would also improve the health of the communities which surround rail yards. Those communities are generally low-income, with a relatively high percentage of residents who receive taxpayer-supported health benefits like Medicaid, so in addition to the general benefit to the American economy of having a healthier population, stricter locomotive emissions standards would lower direct costs to the taxpayers. In effect, Medicaid is currently subsidizing the railroad industry by paying for the excessive and unnecessary healthcare costs they impose on surrounding communities.

New, emissions-compliant locomotives also have better safety standards than old, polluting locomotives, so stricter emissions standards would lead to a safer and more reliable rail network, making life-threatening train accidents (and their associated economic costs) less likely.

Finally, by reducing carbon emissions, stricter standards would contribute to fighting climate change. As the massive economic costs of this year's record heatwaves, flooding and fires make clear, climate change is having a negative impact on the economy and working people, in terms of direct economic losses, healthcare costs, and even death.

**b. I know that railroads, including Union Pacific, have begun ordering and testing battery-electric locomotives for yard operations, which is great news. What challenges might the manufacturing industry face that could impede the delivery of battery electric locomotives, and how can the Federal government best support the industry?**

The biggest challenge for the manufacturing industry is the lack of guaranteed, or at least expected, demand for battery-electric locomotives. Companies are going to be hesitant to invest in the capacity to build battery-electric locomotives on a large scale if the railroads aren't going to buy them.

The problem is not technological: Battery-electric locomotives are a proven, tested, viable technology for use in rail yards and, in consist with Tier 4 locomotives for use on cross-country hauling, a testament to the innovation and know-how of American engineering. The challenge is gearing up the manufacturing capacity to produce them at the scale necessary. The Federal government can best support this industry by requiring the railroads to upgrade their fleets. This will create the expected demand that will encourage manufacturing companies to expand their production.

Battery technology is improving and will continue to improve, but what is necessary to drive this continued innovation is continued and increasing demand, which, again, must be driven by the Federal government.

The size of the U.S. railroad fleet, and the longevity of locomotives, will make it virtually impossible to replace all of the old locomotives immediately. This makes it imperative to begin the process as soon as possible, otherwise the railroads will continue to run old, polluting locomotives for a long time.

Finally, while we are glad to see a focus on battery-operated locomotives, it is important to keep in mind that we currently have the capability to replace old, polluting locomotives with modern, "Tier 4" diesel locomotives, which reduce emissions up to 90 percent when compared with older locomotives. Replacing old locomotives with Tier 4 locomotives is especially important for cross-country trips, which cannot currently be done on battery power alone.

Senator MARKEY. Thank you, Mr. Rosen.

Ms. Torres, if you are ready, we can proceed with your testimony at this time.

**STATEMENT OF IVETTE TORRES, COMMUNITY RESEARCHER  
LEAD, PEOPLE'S COLLECTIVE FOR ENVIRONMENTAL JUSTICE**

Ms. TORRES. Thank you, Chair Markey, Ranking Member Ricketts, and the Clean Air, Climate, and Nuclear Safety Subcommittee of the Senate Environment and Public Works Committee, for inviting People's Collective for Environmental Justice to testify today.

My name is Ivette Torres. I am the Lead Community Researcher at the People's Collective for Environmental Justice in San Bernardino, California and a Ph.D. student in environmental engineering at the University of California Berkley. PCEJ is a community-based environmental justice organization in the Inland Empire in southern California. We fight against pollution and environmental racism caused by the freight and logistics industry.

I am a member of the Moving Forward Network. MFN is a network of over 50 member organizations led by environmental justice communities representing over 2 million members working to eliminate the deadly public health and environmental impacts caused by the freight transportation system.

I want to thank the members of MFN who are here today and those who share their stories in my written testimony. I want to honor those who are not able to be here because of their health and those in the fight who have left us too soon because the regulators and rail industry failed to protect our communities from the environmental burdens those same diesel-fueled industries caused.

I was raised in freight communities my whole life. The Inland Empire is made up of San Bernardino and Riverside Counties. We have desert, forest, and beautiful mountain landscapes. Picturesque hills surround our communities. Our elected say these same hills and mountain ranges trap the L.A. smog and cause the Inland Empire to have the worst ozone pollution in the Nation.

What our elected officials fail to see and what the community has been pleading for years is that the logistics and freight industry is the real reason our communities suffer from the worst air quality in the Nation.

Freight communities are hubs for the logistics industry. We see 40,000 diesel trucks come in and out of our neighborhoods every single day, and thousands of diesel trains that are miles long carrying tens of thousands of heavy containers coming into rail yards near our homes.

Cargo air freight is also presently expanding. All these cumulative impacts are slowly killing my community and many others across the Nation. The whole freight system is interconnected. It is poisoning us left and right.

The California Air Research Board ran a rail health impact study with community advocates and found that anyone living close to a rail yard, rail line or port is most likely to have a lower life span due to risk of cancer, dubbing these communities, our communities, cancer clusters. I worked with community members who lived by the San Bernardino Intermodal Facility to monitor both indoor and

outdoor air quality. Community-collected data that revealed, inside their homes, where they should feel comfortable and safe, the levels of particulate matter were ten times higher than the EPA standard.

Communities having to monitor the pollution is not unique to San Bernardino. MFN members across the Nation are collecting their own data. This is because the railroads refuse to share any data with us. It is impossible to know when locomotives will idle for more than 30 minutes. When locomotives idle, they create a safety hazards. Communities like Colton, California are locked in, trapped by rail lines and truck traffic. Idling trains prevent emergency vehicles from being able to get to the hospital. We have also seen children jumping over trains to get to school.

Over 13 million of us in the United States live and work near rail yards, rail lines and ports. That is 13 million people who are most likely to be black and brown communities dealing with these realities day to day. The last time EPA updated its emissions standards was 15 years ago. We continue to suffer.

There is no reason why our communities must suffer. The technology is here for locomotives and rail yard machines to switch to zero emissions. One-third of the world's rail lines are electrified. Electric rails have been used for hundreds of years and transports the heaviest freight cargo, which use technology like overhead catenary in the United States. Yet we have outdated diesel locomotives still operating today that are older than many of us in this room.

Our goal is not to stop freight as we know it. This movement is an essential part of our Country's lifeline. We want to transition our communities to safer, zero-emission technology. Many of us are products of the freight industry.

I want to ensure we create more employment and investment opportunities in my community. That should not mean it should cost our lives. We can create opportunities while prioritizing community health and safety.

EPA must adopt a zero-emissions locomotive standard.

[The prepared statement of Ms. Torres follows:]



Written Testimony to the  
U.S. Senate Committee on Environment & Public Works  
Subcommittee on Clean Air, Climate, and Nuclear Safety

“Cleaner Trains: Opportunities for Reducing Emissions from America’s Rail Network”

Ivette Torres  
Community Researcher Lead  
People’s Collective for Environmental Justice  
San Bernardino, California  
July 26, 2023

#### **Executive Summary**

The Moving Forward Network (MFN)’s mission is to build power with frontline and fenceline communities, transform the global freight transportation system, and advance environmental justice. We are a national network with 50 organizations in 20 cities representing over 2 million people from across the country who are working together to eliminate the deadly public health and environmental impacts caused by the freight transportation system.

The rail industry remains one of the most significant sources of environmental injustice impacting our communities. We live near railyards and freight rail routes, where some of the dirtiest switcher and line-haul locomotives belch diesel pollution into our neighborhoods every day, often just feet from our homes, schools, and workplaces. In order to address the impacts of locomotives and rail yards, MFN demands comprehensive regulations that center the needs of frontline and fenceline workers and communities. To date, the rail and locomotive industry has been permitted to operate with very little oversight and accountability, relying on voluntary measures and disclosures.

Rail pollution is a national issue with local impacts. The freight system remains one of the largest sources of pollution in the country and locomotives, in particular, are responsible for a large amount of pollution in communities across the country. Rail pollution impacts our health, safety, and well-being. Bright lights, noises, and vibrations that feel like earthquakes are torturous consequences of passing trains. Asthma, cardiovascular disease, and other dangerous diesel-related illnesses contribute to shorter lifespans. Rail pollution has serious negative effects on our air quality and the climate. In fact, more than 13 million of us in the United States live and work near railyards, rail lines, and ports. We are forced to breathe in diesel pollution day after day. Cancer clusters in neighborhoods near railyards show the undeniable link between diesel emissions from locomotives and other railyard equipment and adverse health harms—yet

our well-being rests on outdated locomotive emission standards that no longer reflect the current state of technology.

The EPA last issued an updated emission standard for locomotives 15 years ago. At that time, the Tier 3 and 4 standards were created. Yet, these new tiers did not result in any meaningful retirement or turnover of the lower, more polluting tiers.

*Kansas City, Kansas – Atenas Mena, CleanAirNow*

*My hometown, Kansas City, is home to the second-largest rural transportation center in the country. In fact, the rail industry remains one of the most significant sources of this environmental injustice for many of our communities. Diesel-powered locomotives emit large quantities of nitrogen oxide, diesel particulate matter, and volatile organic compounds. Residents of Armourdale, which is a neighborhood in Kansas City, Kansas, predominantly Latino, Hispanic working class, is enclosed between large rail yards, dirty industry and heavily trafficked highways. They experience a life expectancy 22 years shorter, according to the CDC... Healthcare and other resources are limited, and climate change weather patterns are felt regularly with record-breaking heat waves, floods, droughts and concerning poor air quality days. KCK is not siloed in this large and impactful discrepancy. Our nation has been overburdening environmental justice communities by having them bear the brunt of systemic racism with the legacy of redlining, zoning and dumping practices, leaving families without access to clean air, water and land.*

To make matters worse, regulatory loopholes allow the powerful railroad industry to skirt obligations to meet federal locomotive emission standards. Under EPA's current requirements, freight trains can recertify their engines repeatedly until the locomotive operator chooses to retire the locomotive. This explains why so many of the dirtiest, pre-Tier 0 trains that are 50+ years old continue to operate in railyards and pollute communities across the country. Despite EPA adopting the most stringent Tier 4 standards 15 years ago, these trains make up less than 10 percent of locomotives today. This failure to adopt cleaner technologies has made railyards some of the most toxic facilities in the freight movement system. For the sake of our health, this loophole must be fixed.

We have the technology today to require all rail in the United States to use electric, zero-emission technology. Locomotives powered by electricity via an overhead catenary system are the most established and widely used locomotives around the world. These electric locomotives are also the highest-powered locomotives in the world, which are capable of carrying the heaviest loads. This explains why many of the world's largest freight rail systems are fully electrified—from China, France, Russia, and South Africa to Switzerland, Ethiopia, Japan, and South Korea. It is time for the United States to catch up with the rest of the world.

Battery-electric locomotive technology has also made tremendous advances over the past decade that make them well-suited for deployment across the United States. Important advances in battery-electric locomotive technology, rapidly declining costs of batteries, and increasing availability of fast charging show that the technology is ready for the transition to zero-emissions. In fact, lead researchers find that battery-electric freight trains can achieve cost parity with diesel trains today.

We are committed to working with the EPA to address the deadly pollution from freight locomotives and rail yards. We also implore regulators to demonstrate leadership in responding to the deadly and dangerous impacts from rail and locomotives, in line with President Biden's commitments to environmental justice. The Moving Forward Network calls on Congress and EPA to take the following actions:

1. Call on EPA to adopt a Tier 5 zero-emission locomotive standard that requires all locomotives and engines used in locomotives operate in zero-emissions by 2045 in the United States.
2. Require EPA and states to collaborate in developing a program to scrap all non-Tier 5 locomotives and locomotive engines by 2045.
3. Ask EPA to finalize its locomotive preemption regulations in the Phase III Greenhouse Gas rule by the end of October 2023.
4. Close the regulatory loophole that allows the locomotive industry to operate old locomotives (i.e., pre-Tier 0-Tier 3) for decades without reducing their pollution.
5. Deploy regulatory air monitors near railyards around the United States to better understand on-the-ground emission impacts. Data should be public and accessible. Deployment of monitors should be in consultation with environmental justice leaders.
6. Conduct emissions modeling that looks at the proximity of railyards to sensitive receptors, cumulative impacts, and health impacts, accounting for race and socio-economic factors.
7. Develop a nationwide locomotive registry for all Class I, II, and III locomotives. Registry should include the tier, years in operation, locations, routes, and hours of operation for each locomotive.
8. Use the authority in section 108(f)(1)(C) of the Clean Air Act to identify strategies to clean up the toxic hot spots associated with rail and railyard activities to "protect the health of sensitive or susceptible individuals or groups."
9. Work with Moving Forward Network and other environmental justice community leaders to apply the Biden Administration's whole-of-government approach to create a strategy to eliminate pollution burdens from concentrated railyard operations that pose significant health and safety risks, including but not limited to pollution and impacts from the operation of

locomotive maintenance facilities, locomotive parking/idling, and supporting warehouses, which are often located in environmental justice communities.

The communities present here today represent just a small portion of the families, children, and workers around the country that are being dumped upon by the rail industry. We cannot wait another minute for clear, actionable regulations and programs that finally prioritize the protection of communities that have been suffering for too long. Zero-emission solutions are available today—it's time to take action.

### **I. Background on Locomotives & Current Regulations.**

The nearly \$80-billion freight rail industry is operated by seven Class I railroads (each of which have operating revenues of \$490 million or more per year), 22 regional Class II railroads, and 584 local or short-line Class III railroads. Diesel-electric locomotives, which are the most commonly used locomotives in the United States, are incredibly polluting. They have a large diesel engine with up to 4,400 horsepower that generates electricity to power traction motors near the wheels and propel the locomotive. **Because diesel serves as the power source that drives the electric generator or alternator, developing zero-emission locomotives is a matter of changing the source of electricity generation from diesel to non-combustion alternatives.**

There are two main duty cycles for freight locomotives: switcher operations and line-haul operations. Line-haul locomotives transport heavy freight over long distances and have over 2,300 horsepower. Line-haul operation involves traveling long distances and transporting tons of cargo, so the operational duty cycles of high horsepower line-haul locomotives are dominated by higher power notch settings (i.e., notches 5-8). When operating in railyards, line-hauls typically operate in idle or lower power settings. The pollution from line-hauls is considerable. For example, Class I interstate line-haul locomotives in California contribute 85% of statewide locomotive NOx emissions.

Switchers are used in rail yards to assemble and disassemble trains and to move trains from one point of the rail yard to another. EPA defines switcher locomotives to be between 1,006 and 2,300 horsepower. Beyond idling, switchers are supposed to operate primarily in the lower-powered notches (i.e., notch 1-4). Oftentimes, locomotives performing line-haul operations are downgraded to switcher operations over the course of their service life as the engine wears down and hauling heavy loads over long distances becomes more taxing. Because of this, switcher locomotives are often amongst the oldest models of locomotives and, therefore, the dirtiest.

Some railyards also have major locomotive repair and maintenance facilities. The activities associated with the repair and maintenance of locomotives often require idling and other operations that result in additional localized emissions. Routine servicing and maintenance are common to prepare for locomotive operation. Routine maintenance includes refueling and checking oil levels, performing minor repairs, and addressing major repairs of locomotive components, including services like traction motor replacement and diesel engine maintenance requiring load testing. In addition to routine service, locomotives are required to undergo several types of periodic inspections and major maintenance activities, including load testing. Depending on the maintenance test and locomotive model, these maintenance activities and tests require

some period of idling, notch 1 operation, and notch 8 operations, adding to the pollution toll on nearby communities. It is common practice for locomotives to be remanufactured every seven to ten years to ensure the locomotive engine continues to function properly and to extend the life of the locomotive. Through this process, the locomotive is disassembled to the frame, and its components are replaced as needed.

Locomotives must be recertified at each remanufacture before they may be placed back into service. Under EPA's current regulations, EPA has determined that "existing locomotive engines, when they are remanufactured, are returned to as-new condition and are expected to have the same performance, durability, and reliability as freshly-manufactured locomotive engines." This has the effect of allowing decades-old locomotives to continue to pollute at the same levels today as they did many years ago, without updating their technology. This loophole is exploited by the rail industry to evade adopting cleaner locomotive technology—and means communities pay the price with their health.

## **II. Locomotive and railyard pollution is very harmful to our human health and the environment.**

### **A. Railyard pollution has created a national public health crisis.**

There is no debate that rail pollution negatively affects the health, safety, and well-being of communities across the country. Exposure to diesel exhaust from locomotives is deadly. Exposure to the pollutants in diesel exhaust—especially long-term exposure—has clear, adverse health effects. More than 90% of diesel exhaust consists of ultra-fine particles that are less than 1 micron in diameter. These ultra-fine particles are so small that they can cross the air-blood barrier in the lungs and enter the bloodstream, allowing them to travel to virtually any organ system in the body and disrupt normal cell function.

The California Air Resources Board (CARB) performed health risk assessments for every major railyard in California from 2005 to 2008. While these reviews are dated, they remain some of the most robust studies of health risks from railyard pollution. This speaks to the need for more current, detailed health assessments of the impacts of railyard pollution on local communities. Thankfully, the U.S. Federal Railroad Administration (FRA) has recognized that there is a disparity in the communities who suffer from railyard pollution. The FRA is developing a mapping tool overlaying railyards on environmental justice communities to assess where these harms are being inflicted. We look forward to engaging with the FRA on the development of this tool. In addition, **we urge EPA to work with sister agencies to invest in developing public health research in railyard hubs around the country, including but not limited to Chicago, Kansas City, Charleston, Houston, and New Jersey.**

In the meantime, CARB's data paints a vivid picture about the **significantly elevated cancer and other health risks from living or working in close proximity to a railyard.** In 2008, the estimated diesel emissions from railyard operations at BNSF San Bernardino, BNSF Barstow, and UP Colton railyards in Southern California was 66.4 tons of PM emissions. Residents living near each of the San Bernardino County railyard facilities experienced between 575 to 3,300 in a million increased risk of cancer from railyard pollution alone—excluding any additional cancer risk from other cumulative impacts or regional air pollution. The UP Colton railyard, which is 5.5 miles long and one-third of a mile wide, is just 350 feet from the nearest homes and

neighbors a local high school. Locomotive operations account for 99% of diesel PM emissions at UP Colton, highlighting the need for stricter locomotive regulations. Residents and local workers near these San Bernardino County railyards were also found to be at increased risk for asthma-related emergency room visits, increased risk of death from cardiopulmonary issues, and increased hospitalizations for cardiovascular and respiratory illness. CARB's assessment also highlights the communities that are saddled with these health risks. For example, residents who live near the BNSF San Bernardino and UP Colton railyards are more likely to be low-income and to self-identify as Latinx than residents in other parts of San Bernardino, Barstow, and Colton.

Given that some of these railyards have since grown and adoption of Tier 4 locomotives remains at less than 5% in California, we can expect that these health impacts have not improved much and in fact, may have worsened over the last 15-20 years. Moreover, a study in Newark, New Jersey, found that “[e]missions of PM2.5, black carbon, and NOx from non-roadway sources, particularly locomotives and port operations, have the highest air quality impact in the total study area, followed by medium- and heavy-duty vehicles.” Critically, emissions from locomotives and port operations “contribute around 95 percent of the total emissions” from the area, which included much of southeast Newark and north Elizabeth, including Newark Airport and the ports of Newark and Elizabeth, New Jersey.

**B. States cannot meet the National Ambient Air Quality Standards without addressing locomotive pollution.**

In addition to local health effects, locomotive pollution makes up a considerable portion of regional air pollution and therefore presents challenges for states to reduce regional air quality and to achieve attainment of the federal air quality standards. The Clean Air Act's cooperative federalism scheme holds both states and the federal government accountable for reducing regional air pollution—all parties must do more. Regardless of who is responsible for reducing this pollution, there is no question that locomotive emissions are a major contributor to states' total pollution. Again, we lack sufficient data about the amount of pollution from locomotives in each state, so California's data must serve as a stand in. **In California, rail pollution contributed 15% of all freight sector NOx emissions and 11% of all freight sector PM2.5 emissions in 2022.** In California's case—and likely in the case of other states—it is next to impossible to achieve the National Ambient Air Quality Standards (NAAQS) without addressing locomotive pollution.

Locomotive pollution impacts all of the NAAQS, and ozone and particulate matter in particular. EPA has progressively strengthened the ozone and particulate matter standards in light of new scientific evidence demonstrating health impacts at lower levels of pollution. Most recently, in 2015, EPA revised the primary and secondary 8-hour ozone standard from the 2008 level of 75 parts per billion (ppb) to 70 ppb, and in 2013, the primary annual PM2.5 standard was revised from 15 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) to 12  $\mu\text{g}/\text{m}^3$ .

Although states are required to comply with these standards, many continue to fail to meet one or more ozone standards. In fact, almost 125 million people, or 37.7 percent of the U.S. population, live in areas currently classified as being in nonattainment of the 2015 8-hour ozone standard (70 ppb). These areas include 204 counties in 23 states, including California, Illinois, Missouri, New

Jersey, and New York. Parts of California and Pennsylvania are also in nonattainment of the PM2.5 standard.

Many of the states that continue to fail to meet the ozone standards also have high concentrations of rail activity, which adds to the pollution burden that local residents breathe and that states must clean up. For example, California is home to some of the most polluted air basins in the country. Two of California's airsheds—the South Coast Air Basin and the San Joaquin Valley Air Pollution Control District—suffer from some of the highest levels of ozone and PM2.5 levels in the country. About 12 percent of statewide NOx emissions and 8 percent of statewide PM2.5 emissions originate from locomotives, making the need to regulate rail pollution undeniable. Locomotive pollution is expected to make up about 14 percent of California's NOx inventory and 16 percent of the state's PM2.5 inventory in 2030. This is a staggering proportion of California's total pollution. California and other states have a federal obligation to show how they will attain the NAAQS, and this is nearly impossible without addressing the pollution from locomotives.

**C. The impacts of locomotive pollution are compound and widespread.**

The impacts of this crisis are being felt across the country. Class I railyards are located in almost every single state, as shown in the following figure.



**Figure 2. Rail Yard Locations in the United States**

**Figure 1: Rail Yard Locations in the United States**

But the harms from railyards do not stop with public health. Living near a railyard comes with a slew of other debilitating consequences. Stadium-style lights beam into neighboring homes at all hours of the night; trains blare their horns unexpectedly and at jarring levels; and the vibrations from passing trains rumble homes like an earthquake. There have been numerous reported instances of emergency vehicles being unable to travel to where they need to be because a miles-long train or idling locomotive stops them in their path. Trains are often stopped for hours and days at a time, creating safety issues for children walking to school. All of these side effects result in significantly reduced quality of life and shorter average lifespans in our communities. The generational trauma from these cumulative incidents carries the legacy of these dangerous facilities through our communities' family lines.

### **III. Testimonials from community members living near railyards across the United States.**

The health and safety impacts described in the previous section are far from theoretical. Environmental justice communities are very aware that the system we live in does not serve our basic needs for health and safety. Residents living near railyards and rail lines are often

forgotten. These environments are known as “diesel death zones” and “sacrifice zones” because of the very high concentrated levels of diesel pollution, cancer clusters, and premature death suffered in these communities. It is plain to see that our social systems do not protect communities of color and low-income communities in the same way as they protect others. While the powerful logistics industry almost always easily secures prime seats at the table, people most affected by industry’s pollution are often locked out of policy and decision making. The freight rail and locomotive industry is a prime example of this. For decades this industry has been allowed to grow largely unregulated and at the expense of the health and environment of frontline and fenceline communities across the country.

In my own experience, two of the biggest rail communities in the Inland Empire, California, are Colton and San Bernardino... Colton is not only worried about freight. Colton is a small community. There are no official sensors and no official monitoring. **Yet, they're impacted by two industry highways, gas plants, cement plants, and huge warehouse logistics, as well as the expansion of rail coming their way through BNSF and Union Pacific. For San Bernardino, we have the BNSF rail facility that has been in San Bernardino since the beginning. But the facility has expanded throughout the years and continues to expand.** This last year the city council passed another rail expansion, another line, and that is displacing homes and buying out homes on the west side community of San Bernardino, which is already really impacted by the thousands of trucks and trains that come out of that community. And those are during COVID, they took advantage and bought out some homes, and most of these people are renters, so they had no idea they were going to be kicked out of their homes so the BNSF could expand their day-to-day trade.

Community members across the country, from Florida to New Jersey, Illinois to Kansas City, Washington, to Texas and California, share their own experiences and expertise on the impacts they struggle with from the freight rail and locomotive sector.

#### **West Long Beach & Carson, California – Jan Victor Andasan, East Yard Communities for Environmental Justice**

- I was born in the Philippines and had the privilege to immigrate to the US where I grew up in West Long Beach. Our apartment was located right next to Union Pacific Intermodal Container Transfer Facility (ICTF). **I thought it was normal growing up next to these facilities. I did not know the health impacts it was ravaging on my body, my family's and my community.** My brother was conceived and born when we were living next to the railyard. Growing up, I was both fascinated and anxious every night because he would have to get on his nebulizer so he can breathe. I didn't understand why he needed this machine, I was 8 years old and this was normal to us. Every night for his young life, he continued to rely on this machine. I didn't understand goods movement, trains, ports, railyards back then but what I know now is that the poor air quality we were exposed to was not normal. It was responsible for why we couldn't breathe. It doesn't have to be a struggle to breathe for a child when they just are born into this world. Both my brother and I grew up with asthma and it's become normal for many families in communities adjacent to railyards and rail lines to have some type of respiratory issues.

We can prevent this. Our communities can breathe cleaner air. We deserve to breathe cleaner air.

**Kansas City, Kansas and Missouri – Beto Lugo Martinez, CleanAirNow**

- Hello, I am Beto the executive director of CleanAirNow, an environmental justice organization in Kansas City, and have been a member of the Moving Forward Network since its inception. I grew up in Southern California. In my community on the east side of town, 50 feet away from a petrochemical facility, I was exposed to chemical pollution every day. Living on the east side where redlining practices were present, we grew up near continuous engine locomotives transporting industrial and agricultural commodities, including live cattle and compressed chemicals posing a threat to our lives. As these tracks sliced throughout our community, kids grew up jumping on the train to jump off the other side on their way to school. Emergency response units, such as ambulances or even access to the hospital, were not available to us as the rail sliced through our neighborhood, and the train barricaded us. My oldest son could not enjoy life like other children. When he joined sports, specifically little league baseball, he would hold an inhaler in one hand and the glove in the other.

We have been organizing for decades, initiating our own community-led research. Even when our regulators acknowledged there was a problem, they looked the other way and chose to prioritize profits over people, so we continued organizing. The disinvestment of the same communities that built the rail are experiencing lower life expectancy than other communities just a few miles away. The KCMO public health data demonstrates that the life expectancy difference is between 15 and 18 years. **According to the CDC, neighborhoods like Armourdale and Argentine in Kansas City, Kansas, have a shorter life expectancy by 22 years.** We have high-risk zip codes where asthma, heart disease, and cancer are above the national average and are the same areas sliced by highways, the second largest rail system in the nation, and chemical facilities. **We recently had a fire at an industrial recycling facility within the railyard that burned for over 10 hours, with bomb trains within feet of the fire.**

We need ZERO Emissions. You must be intentional in moving this forward. This means implementing this through an environmental justice lens to ensure that disadvantaged, overburdened, redlined communities are a priority.

**Newark, New Jersey – Dyna Anderson, New Jersey Environmental Justice Alliance**

- I live 20 minutes from Express Rail Elizabeth, 12 minutes from Port Newark-Elizabeth, and near several warehouses. A study conducted of Newark and Elizabeth, including Newark Airport and Port Newark-Elizabeth by M.J. Bradley & Associates, LLC (MJB&A) in close consultation with NJEJA concluded that **“Emissions of PM2.5, black carbon, and NOx from non-roadway sources, particularly locomotives and port operations, have the highest air quality impact in the total study area, followed by**

**medium- and heavy-duty vehicles.** These sources far outweigh the emissions exposure from passenger vehicles and together contribute around 95 percent of the total emissions exposure modeled within the study area (from mobile source emissions).” We need strong regulations now.

**Tallahassee, Florida – Brian Lee, ReThink Florida**

- I live and work in Tallahassee, Florida. My work is often in one of the Low-Moderate Income Neighborhoods that sits on the south side of the railroad track that splits Tallahassee. These neighborhoods fall within a Zip Code with the highest energy burden in the state, and Tallahassee was found to be the most economically segregated city in the United States of America less than ten years ago. In these neighborhoods and throughout the state, we are working towards correcting long-time systemic climate justice and energy justice issues by helping residents with energy efficiency and renewable energy to foster healthier communities. **The Florida Gulf & Atlantic Railway line that splits our city, between HBCU Florida A&M University and Florida State University; between Southside and Killbuck Estates, has long been a symbol of injustice.** Moving towards safer, cleaner technologies and practices that affect historically vulnerable areas needs to be the highest priority. Zero Emissions freight is a crucial part of transitioning to clean energy locally, statewide, and nationwide for the health and safety of our communities, especially those who are most vulnerable.

**Joliet, Illinois – Zhenya Polozova, Warehouse Workers for Justice**

- Warehouse Workers for Justice (WWJ) is a worker center based in Will County, IL, in the vicinity of North America’s largest inland port. WWJ fights for the interconnected goals of winning quality, living-wage jobs for workers in Illinois’ warehouse, logistics, and transportation industries and minimizing the environmental injustices faced by communities encircled by networks of freight, including locomotives.

Home to some of the largest companies in the world, nearly \$735 billion, or 4% of the country’s GDP moves through the port district every year. Despite their reliance on the area’s centrality, resources, and workforce, these industries offer little in return to workers and communities in this vital region. As a result, Will County is in the 98th percentile of diesel-related negative health impacts in the nation even while jobs remain low paying and dangerous, with low union density and a high concentration of contingent labor.

The two Norfolk Southern locomotive derailments in Ohio, among hundreds of others that happen in the US on an annual basis, underscore the real existential threat posed to our communities, which serve as a vital rail hub, by a lack of enforced safety rules and meaningful accountability.

Even without derailments, railroad locomotives already inflict severe damages on workers, public health, surrounding communities, and the environment at large by way of diesel emissions containing particulate matter and nitrogen oxides. No amount of diesel

pollution is safe for human consumption, and the heavy concentration of diesel pollution impacts frontline and fence-line communities located around rail infrastructure first and worst. These impacts are concentrated for workers and communities working or living near rail yards. Moreover, the diesel pollution emitted by locomotives contributes to our ongoing climate crisis that contributes to extreme conditions that disproportionately impact and harm working people.

To protect workers, public health, communities, the environment, and climate, we urge you to create incentives for a rapid transition to zero emissions locomotives by encouraging public ports, state departments of transportation to create switching leasing programs, so that the assets remain public. The defense production act might be combined with a climate and/or public health emergency declaration could be combined to address the current harm and avoid future harm. This is an essential first step in both the gradual electrification of rail lines and a general shift toward the big solutions necessary to meet the current crisis.

**Chicago, Illinois – Jose Acosta, Little Village Environmental Justice Organization**

- There are schools and parks and other things that are near these rail yards (in Chicago). But these are essentially inland ports, right? They function as a port, although they're not... they don't have access to water, but they're just as busy. **If you look at all of our 19 ports, our 19 inland ports, they're all just as busy as or almost as busy as the Los Angeles and Long Beach ports. So this is an issue that primarily impacts black and brown communities. Where the intermodal are located people of color are also living and as a result, we're dealing with the most concentrated pollution.** And in addition to the intermodal, you also have other logistics activities that locate as closely as possible to these intermodal, so distribution centers and warehouses and trucks, other trucking yards, and just all other logistics facilities want to be as close to these as possible. In addition, many of these are also close to highways, so there's that combination of that as well.

**Long Beach, California – Theral Golden, West Long Beach Neighborhood Association**

- The West Long Beach Neighborhood Association's purpose is to work for an improvement in the quality of life in all Long Beach, Ca. Giving attention to West Long Beach, to include elimination of pollution burdens, health and safety threats from the Goods Movement Industry and issues that directly relate to the quality of life in West Long Beach. Work with the residents, businesses and civic leadership to make the “Westside” of West Long Beach the greatest place to live, in Long Beach, California. West Long Beach is a community in Long Beach, California. It is one of the most ethnically diverse communities in California. We are bordered on the North by the 405 FWY, East by the 710 FWY and, South by The Ports of Long Beach and Los Angeles, West by the city limits and a railroad line that run the length of the city limits from Wardlow Road to the Ports of Long Beach and Los Angeles. This rail line extends to Vernon Yards in East Los Angeles, Ca. and is one of two major rail lines that move goods in and out of the Ports of LB and LA., adjacent to the ports is an approximately five Sq. mile oil refinery facility. West Long Beach is part of a larger community that

includes Carson and Wellington Ca. The port pollution burden has not improved in fifteen years. Combined the ports increase the use of rail to move goods and oil refineries use of rail, their pollution burdens are killing more than three residents a day in these communities. Equivalent to one mass shooting a day. The entire geographical area is in southwest Los Angeles County, has a population of two million people, and their health is threatened twenty-four-seven by one of the largest active toxic sites in the United States. I am a resident. Since the Industrial Revolution, a hundred and seventy years started air and water pollution without any control. Oil spills and oil fires are nothing new. On June 22, 1969, an oil slick caught fire on the Cuyahoga River just southeast of downtown Cleveland, Ohio. The image that “the river caught fire,” motivated change to protect the environment. However, this was, in fact the thirteenth recorded time that the river had caught fire since 1868. Resulting in the creation of the federal Environmental Protection Agency (1970). I am here today to witness what has taken more than seventy-five years of work by the EPA to get to this point and recognize the work of the environmental community over a longer period a job well done. For me Winston Churchill said it best: “Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning”

**Seattle, Washington – Christian Poulsen, Duwamish River Community Coalition**

- My name is Christian Poulsen, and I am representing the Duwamish River Community Coalition in the Duwamish Valley, Seattle, Washington. The impact of rail and locomotive activity on our community cannot be overstated. The constant noise and vibrations from passing trains disrupt our daily lives, making it difficult to concentrate, sleep, and enjoy our homes. The emissions and air pollution stemming from locomotives pose severe health risks, particularly the dangers of diesel emissions to human health. This issue disproportionately affects vulnerable communities like South Park, where my family resides. As a parent raising two young sons in a fenceline community, the personal anxiety, guilt, and distress caused by the proximity of rail and locomotive operations are overwhelming. Urgent action is needed on a national level to address the adverse effects of rail and locomotive activity, protect the well-being of residents, and find sustainable solutions for the future. The Duwamish River Community Coalition stands united with communities nationwide, emphasizing the urgent need for immediate attention and decisive measures to alleviate these impacts.

**West Long Beach & Carson, California – Paola Vargas, East Yard Communities for Environmental Justice**

- I was born and raised around Carson, CA and the Long Beach area, constantly traveling between railyards and industrial facilities. It wasn't until I went away to college that I came back and paid attention to where I live and why facilities were located around my community. After progressing through my education away from home, I started noticing the differences of redlined communities and why my mother developed asthma only after moving to the United States. Unknown to the effects of the nearby railyards and

refineries, we had no way to prevent or act against these facilities that my mother has lived around for more than 20 years. The need for clean air and zero emissions is long overdue, as asthma and other respiratory diseases are increasingly common in our households and have already had severe impacts on our communities. It is an important transition to ensure that exposed communities attain the healthy air they've long deserved.

#### **IV. EPA's current locomotive regulations are decades-old and deeply outdated.**

Despite EPA adopting four tiers of locomotive emission standards starting in 1998, the state of locomotive pollution in the US remains dire. The nearly \$80-billion freight rail industry remains one of the most polluting industries in the country. Not only is railyard pollution of specific concern, but long-distance line-hauls continue to pollute at concerning levels. The basic reason for this is that the majority of locomotives still in operation are far outdated and therefore emit unnecessarily high levels of diesel exhaust, NOx, and PM.

EPA has a duty to set emission standards for locomotives. However, the agency has not updated its locomotive emission standards since 2008, 15 years ago. Technology has developed significantly since then, making it crucial that EPA adopt new regulations. Under the current emission standards, switchers are subject to slightly more lenient standards than line-hauls, with the justification that, as a total fleet, switchers emit less pollution than line-hauls. While that may be true, this disregards the health impacts of switcher pollution at railyards. In fact, switchers have an outsized impact in the immediate vicinity of where they operate, which is typically near communities. Railyard pollution in particular remains exceptionally harmful to the health of people who live and work near these facilities.

**Switcher locomotives make up the largest share of railyard locomotives, yet they are also notoriously some of the most outdated and highest-polluting locomotives.** The following table shows that two-thirds of Class I locomotives operating in railyards in 2020 were Tier 0 or Tier 0+. This means that 67% of the locomotives that operate closest to where people live are emitting at extremely high levels.

**Table 1: 2017-2020 Yard Engine Fleet Composition Comparison**

Emission Tier	2020 Locomotive Count	2017 % of Fleet	2020 % of Fleet
0	673	23.61	23.75
0+	1,182	25.99	41.71
1	0	0.00	0.00
1+	26	4.76	0.92
2	7	2.33	0.25
2+	0	4.64	0.00
3	11	10.18	0.39
4	23	2.47	0.81
Not Controlled	912	26.01	32.18

Even more concerning is that **Class I railyard fleets became dirtier over time**. From 2017 to 2020, locomotive fleets used in railyards moved toward older technology and away from cleaner, higher tier engines. This trend is deeply concerning.

This shocking information communicates three things clearly:

1. **The railroads cannot be trusted to voluntarily adopt cleaner technology over time—and in fact will revert to older, dirtier technology if given the choice.**
2. The railroads have no interest in being good neighbors to frontline communities living near railyards.
3. Twenty-five years after EPA adopted its first locomotive emission standard, federal, state and local regulations to address rail pollution remain far too weak.

The current locomotive emission framework categorizes standards by tier. Locomotives must meet emission standards for nitrogen oxide (NOx), particulate matter (PM), hydrocarbon, and carbon monoxide based on the year the locomotive was originally built. The tiers run from pre-Tier 0 up to Tier 4, with increasingly stringent NOx and PM standards. For example, locomotives originally built in 1973 to 1999 are subject to pre-Tier 0 standards, while locomotives built in 2015 or later are subject to Tier 4 standards.

Tables 2 and 3 show the current emission tiers for line-hauls and switchers.

**Table 2: Federal Locomotive Emission Standards and Percent Control - Line Hauls**

Line Haul Locomotives							
Emission Tier	Year of Manufacture	NOx		PM		HC	
		Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control
Pre-Tier 0	1973-1999	13.5	n/a	0.6	n/a	1.0	n/a
Tier 0	2000-2001	9.5	30	0.6	0	1.0	0
Tier 1	2002-2004	7.4	45	0.45	25	0.55	45
Tier 2	2005-2011	5.5	59	0.2	67	0.3	70
Tier 3	2012-2014	5.5	59	0.1	83	0.3	70
Tier 4	2015	1.3	90	0.03	95	0.14	86

**Table 3: Federal Locomotive Emission Standards and Percent Control - Switchers**

Switcher Locomotives							
Emission Tier	Year of Manufacture	NOx		PM		HC	
		Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control	Standard (g/bhp-hr)	Percent Control
Pre-Tier 0	1973-1999	17.4	n/a	0.72	n/a	2.1	n/a

Tier 0	2000-2001	14.0	20	0.72	0	2.1	0
Tier 1	2002-2004	11.0	37	0.54	25	1.2	43
Tier 2	2005-2011	8.1	53	0.24	67	0.6	71
Tier 3	2012-2014	5.0	71	0.1	86	0.6	71
Tier 4	2015	1.3	93	0.03	96	0.14	93

**Forty-five percent of Class I locomotives are Tier 0 and emit a jarring 860% more NOx, 2,130% more PM2.5, and 1,200% more VOC than Tier 4 line-hauls.** Table 4 below shows the emission factors for criteria pollutants for 2020 line-haul locomotives by tier. NOx, PM and VOC emissions for Tier 3 and older locomotives are dramatically higher than for Tier 4 locomotives. For instance, even jumping up just one tier from Tier 3 to Tier 4 results in impressive emission reductions: Tier 3 line-hauls emit almost 500% more NOx, 533% more PM2.5, and 325% more VOC than Tier 4 line-hauls. Yet, **only 9% of Class I locomotives—whether switcher or line-haul—were built in 2015 or later**, meeting the most restrictive Tier 4 standard.

These figures warrant a pause—almost half of all Class I locomotives operating in the United States in 2020 emitted criteria pollution at unnecessarily high levels. These toxins are known to cause conditions like cancer, cardiac and respiratory issues, reproductive issues, asthma, lowered lung function, chronic obstructive pulmonary disorder, and premature death.

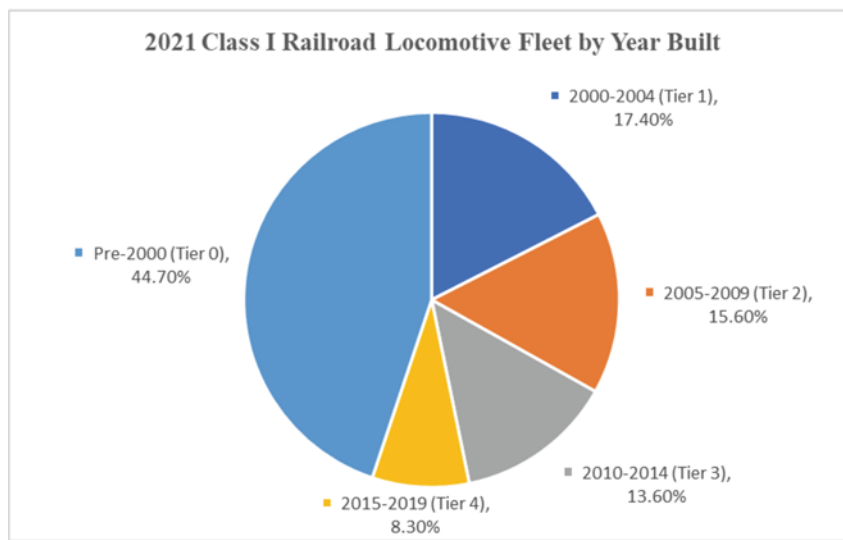
**Table 4: 2020 Line-haul Locomotive Emission Factors by Tier, AAR Fleet Mix (g/gal)**

Tier	Tier Name	CH4	CO	CO2	N2O	NH3	NOX	PM10	PM25	SO2	VOC
0	1973-2001	0.8	26.624	10,150	0.26	0.0833	178.88	6.656	6.45632	0.0939	10.513152
0+	Tier 0 Rebuild	0.8	26.624	10,150	0.26	0.0833	149.76	4.16	4.0352	0.0939	6.57072
1	2002-2004	0.8	26.624	10,150	0.26	0.0833	139.36	6.656	6.45632	0.0939	10.294128
1+	Tier 1 Rebuild	0.8	26.624	10,150	0.26	0.0833	139.36	4.16	4.0352	0.0939	6.351696
2	2005-2011	0.8	26.624	10,150	0.26	0.0833	102.96	3.744	3.63168	0.0939	5.694624
2+	Tier 2 Rebuild	0.8	26.624	10,150	0.26	0.0833	102.96	1.664	1.61408	0.0939	2.847312
3	2012-2014	0.8	26.624	10,150	0.26	0.0833	102.96	1.664	1.61408	0.0939	2.847312
4	2015 and later	0.8	26.624	10,150	0.26	0.0833	20.8	0.312	0.30264	0.0939	0.876096
4C	Tier 3 Built after	0.8	26.624	10,150	0.26	0.0833	102.96	1.664	1.61408	0.0939	2.847312
NC	UNCONTROLLED Pre-1973	0.8	26.624	10,150	0.26	0.0833	270.4	6.656	6.45632	0.0939	10.513152
2020 Class I Line Haul Fleet-Weighted		0.8	26.624	10,150	0.26	0.0833	120.5	3.042	2.95076	0.0939	4.854434

#### V. Industry will continue to exploit regulatory loopholes absent additional oversight.

Because of loopholes in the regulatory scheme, the adoption of Tier 4 locomotives has been incredibly slow. EPA adopted the Tier 4 standard 15 years ago, yet as of 2021, less than 10% of Class I locomotives meet the Tier 4 standard. A recent report by the California Air Resources Board confirms that “Tier 4 locomotive engine penetration rates sit at under 1 percent per year

on average because the railroads have been purchasing fewer than expected Tier 4 units for the past few years, instead choosing to operate remanufactured Tier 1+ and Tier 2+ units.” Instead, three out of four Class I locomotives are still using Tier 2 or older technology. At the same time, **more than 75% of Class I switcher locomotives—i.e., locomotives operating in railyards near communities—remain at Tier 0.**



**Figure 2: 2021 Class I Railroad Locomotive Fleet by Year Built**

A key loophole in EPA’s regulations is to blame for this delay. Under EPA’s regulations, a locomotive is allowed to continue to meet the same emissions tier year after year, so long as the locomotive is remanufactured. Upon remanufacture, the locomotive regains its status as a “new” locomotive, and can therefore remain under the same or a largely similar emissions tier. In effect, this means locomotives are allowed to remain under the same emissions tier from the year they were originally built until the year the engine blocks are finally unable to continue operations and the locomotive must be retired—up to 60 or 70 years in some cases. **In other words, a locomotive may operate for its entire service life without ever having to reduce its emissions.** With this loophole there is no reason for the railroads to purchase a new, cleaner locomotive.

In fact, railroads typically shift line-hauls to railyard operations toward the end of a locomotive’s life. Railyard operation is not as demanding as long-distance line-haul service because switchers mostly transport rail cars within the boundaries of the railyard. The consequence of this is that railroads are moving their oldest, most polluting locomotives to railyard operation, which has a much more direct, negative impact on communities.

**We urge this Committee to ask EPA to close this loophole: when a locomotive is remanufactured, it should be required to meet the latest emission standard, which at the moment is Tier 4.** Once EPA adopts a Tier 5 zero-emission standard, locomotive operators should be required to meet this standard upon remanufacture.

**VI. Zero-emission locomotive technology is widely available today and cost-effective.**

Today, zero-emission locomotive technology is already technically feasible for both switcher and line-haul duty cycles. In fact, this technology is not even new—about one-third of the world’s rail lines are electrified. There are several kinds of zero-emission locomotive technologies primed for wide scale adoption across the United States, including locomotives powered by overhead catenary systems, battery-electric models, and hybrid options like discontinuous catenary. In addition, this technology can actually offer cost savings compared to traditional diesel locomotives because the cost of electricity as a fuel source is significantly cheaper than diesel. As background, traditional diesel locomotives use a diesel-powered engine to generate electricity to propel the locomotive. Therefore, transitioning diesel trains to zero-emission operations involves replacing the electricity generation system with one or more non-combustion options.

**A. Locomotives Powered by Overhead Catenary Systems.**

Locomotives powered by electricity via an overhead catenary system are the most established and widely used zero-emission locomotives around the world—and can be widely replicated in the United States. Power lines located along the railway deliver electricity directly to the train’s electric motor via a contact system on the locomotive. These trains are incredibly efficient. While diesel-powered trains transfer about 30-35% of the energy generated by combustion to the wheels, overhead power lines transfer an incredible 95% of the electricity to the wheels.

Electric locomotives are also the highest-powered locomotives in the world, and capable of carrying the heaviest loads. All-electric line-haul locomotives in China, Russia, South Africa, and Australia carry some of the heaviest hauls in the world. In fact, the world’s highest-powered locomotive is an electric overhead catenary coal train in China with 28.8 MW—almost five times as powerful as the average American line-haul. Similarly, South African catenary locomotives carry iron ore in excess of 40,000 metric tons, which is more than double the weight of a typical line-haul in the United States.

This explains why many of the world’s largest freight rail systems are fully electrified. Almost every industrialized country, including almost all of Europe and Japan, has an extensive network of electrified freight rail. Ethiopia and Switzerland, both very mountainous countries, have freight rail systems that are 99-100 percent electrified. Likewise, 70 percent of railroads in South Korea and Japan are electric.

Moreover, **several countries have embarked on significant overhauls of their diesel-powered rail lines to transition them to electric operation.** China rapidly increased the percentage of its electrified rail from 5 percent in 1975 to over 60 percent as of 2015, and climbing. Russia electrified its Trans-Siberian Railway, the world’s longest continuous rail line measuring 6,000 miles long. Last year, India began operation of the world’s first overhead catenary line that accommodates double-stacked intermodal trains. **The United Kingdom’s rail system is currently 42 percent electrified, and it recently announced that diesel-only trains will be**

**phased out by 2040. Likewise, France has set a goal of phasing out diesel trains by 2035.** A lack of action could mean our rail industry and those manufacturing locomotives could lose on competitiveness to other countries pursuing these technologies.

Zero-emission electric locomotives powered by overhead catenary are well-established, and they can already be cost-effective compared to diesel locomotives. In fact, the cost of a fully electric engine is about 20% lower than that of a comparable diesel engine, and maintenance costs are also 25-35% less for electric engines because they have fewer moving parts.

Even more importantly, electricity as a fuel is cheaper than diesel. In addition, renewable electricity is already half the price of electricity from fossil fuels and is expected to continue declining even faster than models projected. If locomotives have flexibility in their recharging times, they can charge batteries primarily when there is surplus renewable electricity available. Exploiting low-cost, surplus renewable energy can make locomotives cheaper to fuel with electricity than diesel, even in the near term. **For example, in 2018, researchers examined a simulation of a line-haul locomotive traveling a 2,800 kilometer route from Kansas City to Los Angeles, and found that it would be significantly cheaper for an electric locomotive powered by overhead catenary to travel the route compared to diesel.** In fact, this overhead line-powered locomotive was estimated to have an excellent cost-benefit ratio and a payback period of about 11 years.

Finally, the job creation benefits of building out a nationwide electric freight rail system would be astounding. The president and CEO of Wabtec Corporation, a Pennsylvania-based rail company, testified that increased rail utilization and zero-emission locomotives could create up to 250,000 jobs.

#### **B. Battery-Electric Locomotives.**

Battery-electric locomotives are also well-suited for deployment across the United States, particularly for switcher operations in railyards but also for line-hauls. These locomotives are powered by on-board batteries that provide energy to the motor and replace the train's diesel engine. Battery-electric locomotives are also uniquely able to take advantage of regenerative braking, which allows the train to capture enormous amounts of otherwise wasted energy from braking a large, heavy load traveling at high speeds. Important advances in battery-electric locomotive technology, rapidly declining costs of batteries, and increasing availability of fast charging show that the technology is ready for a mandatory transition to zero-emissions. In fact, lead researchers find that battery-electric freight trains can achieve cost parity with diesel trains today.

There are already battery-electric switchers being ordered today. **Union Pacific announced plans to purchase 20 battery-electric locomotives for in-yard operations in 2022.** The battery-electric locomotives will be acquired from Progress Rail and Wabtec Corporation. Progress Rail's EMD Joule Switcher has up to 3,000 horsepower, and a run time of up to 24 hours, depending on charging and utilization. Like any other battery-electric transportation, the switcher's battery recovers energy through dynamic braking, which allows the battery to restore its energy reserves in route. Similarly, Wabtec Corporation completed tests in April 2021 of its battery-powered line-haul locomotive, FLXdrive. BNSF tested the battery-powered heavy line-

haul locomotive in Southern California on a 350-mile track between Barstow and Stockton, California. The electric, battery-powered locomotive was operated between two Tier 4 diesel locomotives as part of a hybrid consist. Wabtec plans to commercialize this battery-powered locomotive for hybrid operation, and this research will also undoubtedly support the further development of fully zero-emission line-haul locomotives.

Electrifying our freight locomotive system also offers attractive cost savings over operating traditional diesel locomotives. Advances in battery energy density translate to lighter, energy-packed battery packs that can carry a battery-electric locomotive very long distances. Indeed, a single typical boxcar can hold a 14-MWh battery and inverter capable of delivering enormous range. In fact, a typical diesel line-haul retrofitted with this technology is capable of traveling an impressive 450 miles—three times the average daily distance for a freight train in the United States. Even with the added weight of the battery car, all-electric drives are far more efficient than diesel trains, and can travel these long distances at cost parity with diesel, assuming electricity charging costs of 0.06\$/kWh.

As the size and capacity of battery packs continue to grow, their costs rapidly decline, outpacing even expert predictions. In 2010, battery packs cost \$1,000 per kWh, and many assumed it might take until 2030 to reach battery pack prices around \$200/kWh. But instead, between 2010 and 2020, battery energy densities tripled and battery pack prices declined 87 percent. The actual average cost in 2020 blew past estimates to \$137/kWh, with some battery packs pricing less than \$100/kWh. Now, average costs of \$100/kWh are expected as early as 2023, and the new estimate for battery prices in 2030 is \$50/kWh.

At the same time, commercial, high-capacity fast charging is increasingly available, which allows battery-powered locomotives to travel longer distances without needing to charge. This rise in fast chargers also allows railroads to have more flexibility in determining their routes without having to necessarily return to a single base to charge and adds the option of quickly charging locomotives during operational hours. All of this is to say that the costs of operating a battery-electric locomotive are already, and will continue to, rapidly decline.

### **C. Combination of overhead power lines & battery-electric locomotives.**

Finally, battery-powered trains are already being blended as hybrid systems with overhead catenary power or fuel cells to perform as fully zero-emission locomotives. Batteries used in conjunction with locomotives that have overhead line power can allow for continued zero-emission operation, whereas some locations, like tunnels, might make it challenging to erect power lines. Hybrid systems can also yield energy savings and improve overall operations since batteries can store braking energy for later use and reduce the strain on overhead lines during peak power periods, while power lines allow the train to travel long distances without recharging.

Several hybrid locomotive systems are already in development. For example, Bombardier plans to convert five diesel-hybrid trains to zero-emissions by 2023 through a combination of overhead catenary and battery power. Likewise, BNSF piloted Wabtec's FLXdrive, a hybrid battery-electric diesel line-haul locomotive, earlier this year. Last year Hitchi Rail and Trenitalia unveiled the first tri-hybrid train, making it a big step in UE's goal in becoming climate neutral by 2050. Green transportation development company, Alstom, is a big proponent of this combination system, stating the importance of a modular number of battery packs for flexible

ranges and using tactics such as regenerative braking to ensure long-lasting batteries, minimizing the need for new infrastructure. In fact, some researchers have studied the efficiencies and feasibility of hybrid systems and found that even without regenerative braking, battery-electric trains should still perform well. Their realistic simulations showed the economic and technological feasibility of this electric transition. Even though some of these hybrid developments are not fully zero-emissions, they have tremendous value in showing that the technology is primed for further direction from EPA, and that various kinds of fully zero-emission switchers and line-hauls are on the horizon.

In sum, there is no question that zero-emission locomotive technology is already technically feasible for both switcher and line-haul duty cycles. In fact, this technology can offer cost savings compared to traditional diesel locomotives. EPA should adopt health- and climate-protecting zero-emission locomotive standards for switcher and line-haul locomotives that requires the industry to clean up its pollution on a wide scale.

#### **VII. Conclusion: We need a Tier 5 zero-emission locomotive standard by the end of 2023.**

*Now is the time.* Progress toward a zero-emission freight rail system has been delayed because of the political economic factors of private rail ownership and upfront costs. There is no question that the rail industry—which includes some of the most profitable companies in the world—is capable of developing the technology to meet a zero-emission mandate. However, the industry will not do so unless regulators and legislators demand these powerful corporations clean up their pollution. The existence of a diesel pollution health crisis in rail-adjacent communities for decades means we are well past the time for voluntary measures.

Locomotive pollution is a national issue. Environmental justice communities across the country continue to bear the public health and environmental consequences of this system. For decades, the rail industry has poisoned families, workers, and communities with a barrage of pollution from outdated locomotives. Issues regarding rail and locomotives go beyond the disastrous effects of air emissions. Locomotives contribute to a range of cumulative impacts further burdening environmental justice communities: bright lights, noises, vibrations that feel like earthquakes, idling locomotives that prevent emergency vehicles from passing, tracks that cut through communities, and parked trains that kids have to jump through to get to school. These cumulative impacts go largely unnoticed, unacknowledged, and unaddressed by our elected leaders and regulators.

The lack of action to clean up rail pollution also indicates a systemic lack of engagement of the federal government with rail-impacted communities. The EPA and its companion agencies in the federal government, like the Department of Transportation, need to engage more with frontline groups to more fully understand the harms the rail industry imposes. We welcome the opportunity to speak at the Senate Environment and Public Works Committee hearing to examine cleaner trains, focusing on opportunities for reducing emissions from America's rail network. We invite legislators and staff, along with critical regulatory agencies, to engage with the MFN to develop an engagement strategy that provides the requisite input from frontline groups.

Our regulators and decision-makers must prioritize community inclusion in the decision-making process and address the urgent climate and public health crisis being caused by the freight rail and locomotive industry. We cannot wait another minute before setting clear, actionable regulations and programs that prioritize protecting community health and well-being. This is especially true knowing that the solutions are there and can be implemented.

Sincerely,

Ivette Torres  
Community Research Lead  
People's Collective for Environmental Justice

#### IV. Attachments/Resources/Appendix

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Senator MARKEY. Thank you so much for your testimony.

Now, having already been introduced, we welcome you, Mr. Jefferies. Whenever you feel comfortable, please begin.

**STATEMENT OF IAN JEFFERIES, PRESIDENT AND CHIEF EXECUTIVE OFFICER, ASSOCIATION OF AMERICAN RAILROADS**

Mr. JEFFERIES. Chair Markey, Ranking Member Ricketts, members of the subcommittee, thank you for the opportunity to speak with you today about the freight rail industry's environmental profile and how we can work together to drive down transportation-related emissions.

You have heard the stat today: a Class One railroad on average moves one ton of freight about 500 miles on a single gallon of fuel. To use a different city pairing, that is farther than the distance from Boston to Washington, DC. using I-95. Railroads do this on infrastructure they own, and they maintain, spending some \$25 billion of their own money per year on the network.

Pick your stat: the numbers recognized by the White House's Decarbonization Blueprint speak for themselves. While transportation is the largest source of U.S. emissions, rail, which moves approximately 40 percent of long-distance freight, is less than 2 percent of those total emissions. Rail today is three to four more times fuel efficient than trucks. The possibilities are exciting as well. If just 10 percent of the freight that currently moves across the Nation's highways moved by rail instead, annual emissions would fall by roughly 20 million tons, equivalent to taking 4.1 million cars off the highways every single year.

None of this is by accident. It is a result of innovation, vigorous spending, and an understanding of the societal and economic benefits of continued environmental progress. Over the last 20 years, railroads consumed 11.8 billion fewer gallons of fuel and emitted 133 million fewer tons of carbon dioxide than they would have if they had not improved their efficiency.

These gains emanate from buying or retrofitting better locomotives, incorporating anti-idling technologies, fine-tuning fuel management systems, and increasing the use of low-carbon fuels. Simply getting trucks in and out of yards quicker through technological innovation has made a marked impact as well. The result is a strong foundation for the future.

The next wave of progress on the main line and in yards is in sight, as railroads are using more zero-emissions cranes, purchasing electric switcher locomotives for yard use, and testing battery and hydrogen powered locomotives in revenue service. While the latter technologies are in pre-commercial stage, observers are justifiably encouraged.

Yet progress does not stop, especially in driving further gains for particulate and overall emissions. We understand the urgency, including for fence-line communities closest to rail operations. Progress will be best realized through practical policies grounded in data and collaboration as a necessity.

Some policies are easy wins, and we just saw that this morning in this committee. We encourage Congress to reauthorize and continue the Diesel Emissions Reduction Act and to support relevant

grant and loan programs particularly those most critical to short lines to help modernize their equipment.

We also encourage Congress to support mode neutrality and sustainable fuel programs and to ensure research in this area considers the broadest possible base of feedstocks and resources.

Other measures, however, are bigger lifts, namely, the need to reestablish a user pay system in transportation in a way that removes market distortions and uncompetitive subsidies for competing freight modes with higher emissions. We were encouraged to see the chair of this committee's call this week for DOT to make progress on a national vehicle miles traveled pilot program. Most of all, we must be pragmatic.

On the contrary, proposed mandates like what we have seen in California, which would force the adoption of technology that is not commercially viable at odds with Federal law does not add up. While regulators in that State may think they are expediting decarbonization, in fact they are diverting resources that could be used in accomplishing shared goals.

The impact on small business alone with this proposed rule would be staggering, with 25 percent of short lines in the State of California expected to go out of business. The result of that, additional trucks on the highway, is not something that I think is the goal of CARB.

Much of the same can be said about the widespread catenary electrification ideas. This notion is simply unrealistic on a 142,000-mile network operating 24-7 in all climates across tunnels and bridges and all topographies.

However, expressing concern is not obstinance, it reflects reality. We cannot ignore the industry's measurable actions today and to date and let the hope of perfection stand in the way of continued meaningful progress made together.

We are proud of our progress in this area, and will continue to drive down emissions.

Thank you, and I look forward to your questions today.  
[The prepared statement of Mr. Jefferies follows:]

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**TESTIMONY OF  
IAN JEFFERIES  
PRESIDENT & CHIEF EXECUTIVE OFFICER  
ASSOCIATION OF AMERICAN RAILROADS**



**BEFORE THE  
UNITED STATES SENATE  
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS  
SUBCOMMITTEE ON CLEAN AIR, CLIMATE, AND NUCLEAR SAFETY  
CLEANER TRAINS: OPPORTUNITIES FOR REDUCING EMISSIONS FROM  
AMERICA'S RAIL NETWORK**

**JULY 26, 2023**

**Association of American Railroads  
425 Third Street Southwest  
Washington, DC 20024  
202-639-2100**

On behalf of the members of the Association of American Railroads (AAR), thank you for the opportunity to testify. AAR's members account for the vast majority of freight railroad mileage, employees, and traffic in Canada, Mexico, and the United States. Amtrak is also a member of AAR, as are several commuter railroads that account for more than 70 percent of U.S. commuter rail trips.

Shipping freight via railroad substantially drives down emissions. Today, freight railroads make up approximately 40 percent of U.S. freight long distance ton-miles while accounting for only 1.8 percent of transportation-related greenhouse gas (GHG) emissions. As cumulative global emissions and CO<sub>2</sub>-attributable warming continue to rise annually, freight railroads recognize the urgency of continuing to reduce their own emissions. Every North American Class I railroad has an approved emissions reduction target with the Science Based Targets Initiative, an organization driving ambitious climate action in the private sector and working to curb temperature rise and mitigate climate change-related impacts. Freight railroads are committed to finding and implementing technological and operational innovations that further improve fuel efficiency and reduce GHG emissions for themselves and their customers.

To facilitate long-term, sustainable reductions in GHG emissions, policymakers should leverage market-based competition and support proposals grounded in data and developed through a collaborative approach involving stakeholders. Freight railroads commit to remaining a responsible partner capable of delivering sustainable transportation solutions in the near- and long-term.

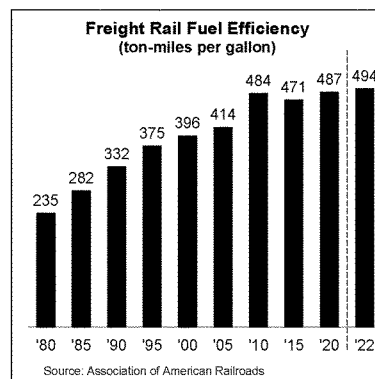
### Railroads Are the Most Fuel-Efficient Way to Move Freight Long Distances Over Land

According to the Environmental Protection Agency (EPA), transportation accounted for 28.4 percent of U.S. GHG emissions in 2021,<sup>1</sup> and the vast majority of transportation-related emissions are directly attributable to fossil fuel consumption. Railroads, however, are already the most fuel-

efficient way to move freight long distances over land. In 2022, Class I freight railroads moved one ton of freight an average of 494 miles per gallon of fuel—roughly the distance from Wilmington, Delaware to Columbus, Ohio or Huntington, West Virginia to Atlanta, Georgia.

Freight railroads, on average, are three to four times more fuel efficient than trucks. The recent "U.S. National Blueprint for Transportation Decarbonization" (Blueprint), a joint effort between EPA and the Departments of Energy (DOE), Transportation (DOT), and Housing and Urban Development, identified modal shift as a key means to reduce transportation-related emissions:

Road freight vehicles such as trucks...are the largest contributor to freight emissions....Using more efficient modes...is essential to reduce overall transportation emissions and energy use. Using more efficient modes could also reduce the number of vehicles on the road and reduce congestion, improving travel time and traffic flow, thereby further reducing GHG emissions and other harmful air pollutants.<sup>2</sup>



<sup>1</sup> Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2021 (April 2023)*, Tables ES-5, A-95, and A-98.

<sup>2</sup> Available at <https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf>.

Based on data from the Federal Highway Administration (FHWA) and the American Transportation Research Institute, if just 10 percent of the freight that currently moves by Class 7 or 8 trucks (the largest trucks) moved by rail instead, fuel savings would be around 1.8 billion gallons per year and annual GHG emissions would fall by more than 20 million tons—equivalent to taking 4.1 million cars off the highways or planting 300 million trees. Additionally, as noted in the Blueprint, moving more freight by rail reduces highway congestion and associated emissions, as a train carries the freight of several hundred trucks. Decreasing congestion also reduces highway wear and tear and the need to build new highways.

*Policymakers Should Restore the Highway Trust Fund (HTF) to a User-Pays System*

The United States has historically relied upon a “user-pays” system for federal funding of public road and bridge infrastructure. Unfortunately, the user-pays model has been eroded in recent years as HTF revenues have not kept up with inflation and investment needs, requiring repeated general fund transfers—\$275 billion since 2008—to cover the shortfall. The federal tax on diesel fuel is currently 24.4 cents per gallon and has been unchanged since 1993. It would be approximately 50 cents per gallon today if adjusted for inflation alone.

This shift has artificially distorted the freight transportation marketplace by making trucks appear less expensive than they really are and putting freight railroads, who pay for building, maintaining, and improving their own infrastructure, at a disadvantage. Congress should reaffirm the “user pays” standard and eliminate existing modal inequities stemming from trucking’s underpayment into the HTF.

One way to accomplish this goal is through the imposition of a fuel tax increase and, eventually, a vehicle miles traveled fee (VMT) that takes into account vehicle weight. Freight railroads support DOT’s expeditious completion of a Highway Cost Allocation Study, as

directed in the Infrastructure Investment and Jobs Act (IIJA), which will help Congress better ensure different highway users, including commercial motor vehicles, cover their fair share of costs to maintain our nation's roads and bridges.

#### **Railroads Are Constantly Working to Improve Fuel Efficiency**

On a ton-miles per gallon basis, rail fuel efficiency in 2022 was up 110 percent over 1980 and up 25 percent over 2000. From 2000 through 2022, U.S. freight railroads consumed 11.8 billion fewer gallons of fuel and emitted 133 million fewer tons of carbon dioxide than they would have if they had not improved their fuel efficiency. Railroads have accomplished this through billions of dollars invested in technological innovations and improved operating practices, including:

- Acquiring or retrofitting thousands of more fuel-efficient, lower-emission locomotives
- Developing higher-strength, lighter-weight railcars that save fuel by allowing for heavier loading and employing more aerodynamic designs.
- Incorporating anti-idling systems known as Automatic Engine Start Stop and Auxiliary Power Units that shut down the locomotive and restart it when needed, which reduces unnecessary fuel waste and idle time by 50 percent.
- Developing and installing fuel management and network optimization systems that calculate the most fuel-efficient speed for a train over a given route; determine the most efficient spacing and timing of trains; minimize the need to slow or stop trains during trips; and monitor locomotives to ensure peak performance. These systems can improve fuel efficiency by up to 14 percent.

Railroads are also working to incorporate and expand the use of some technologies, such as trip optimizer, which the Federal Railroad Administration (FRA) must approve. It is important that railroads be permitted to use trip optimizer for the first and last mile of movements as it will save millions of gallons of fuel per year and reduce emissions in and around rail yards and customer facilities. Unfortunately, railroads' applications for permission to continue testing and approval of a product safety plan have been pending before the FRA for more than 18 and 6 months, respectively.

*Policyholders Should Ensure Railroads Have Access to Low-Carbon Fuels*

Freight railroads are working with locomotive manufacturers and refiners to test higher percentage blends of low-carbon fuels, including biodiesel and renewable diesel, which could result in substantial GHG emissions savings. The Blueprint noted, "Sustainable fuels can play a key role in reducing rail emissions, especially in the near and medium terms, but they are currently not cost competitive." Additionally, many freight railroads struggle with a lack of consistent availability of these fuels.

Freight railroads encourage policymakers to support mode-neutral programs to domestically produce a sufficient supply of sustainable fuels and construct the necessary infrastructure to ensure supply meets demand. These programs will provide essential scaling to assist railroads in reducing emissions associated with their existing locomotive fleets. However, policymakers should ensure that programs that prioritize the availability of alternative fuels for one mode do not undermine the ability of railroads and other modes to access these fuels.

Additionally, policymakers should support research to ensure that sustainable fuels are developed from a broad base of feedstocks, minerals, and other natural resources. For example, freight railroads are supportive of DOE's "Clean Fuels and Products Shot" to accelerate the development of low-carbon fuels for rail and other modes of transportation from various biomass and renewable fuel sources, such as municipal waste, agricultural and forest trimmings, algae, and carbon dioxide. This effort will be essential to driving down costs and scaling up the technology to manufacture these fuels.

**Railroads are Working Diligently to Reduce Emissions in Their Yards**

The work of efficiently moving freight across the nation begins in rail yards. At these busy hubs, rail employees sort rail cars to build trains and transfer containers and trailers

between trucks and rail. Using powerful equipment, a large rail yard can handle thousands of rail cars each day, with each rail car potentially weighing 140 or more tons.

Railroads recognize that every operational decision and piece of equipment in their yards represent an opportunity to reduce GHG and criteria emissions and lessen impacts on local communities. Through a disciplined, innovative, top-to-bottom approach, railroads are lowering emissions from the moment a train pulls into the yard to when its cargo leaves either by train or truck, including investments in:

- Zero-emission intermodal cranes that eliminate a significant source of emissions while reducing ambient noise.
- Low-emitting natural gas hostlers that reduce criteria emissions by up to 90 percent compared to diesel hostlers, and early testing of battery-electric hostlers.
- Diesel switcher locomotive filters that reduce particulate matter emissions and improve air quality near yards.
- Switcher locomotives powered by experimental battery and hydrogen fuel cell technologies.

Yards are also where railroads pass the baton to their trucking partners, who haul containers to their final destination. Helping trucks get in and out of yards quickly reduces idling, fuel usage, and, ultimately, emissions. Railroads have deployed mobile apps to expedite truckers' entire intermodal experience. Many yards also have biometric scanners that recognize truck drivers' thumbprints, video portals that automatically read truck ID numbers, and apps that provide receipts and digital paperwork as part of Automated Gate Systems.

#### **Railroads are Working to Accelerate the Viability of Zero-Emission Locomotives**

Today, numerous railroads are participating in demonstration programs for alternative fuel line-haul and switcher locomotives that hold great promise. Railroads, suppliers, and academic institutions are testing and researching technology, including:

- Battery-electric locomotives through real-world pilots of line-haul locomotives in a hybrid configuration, as well as switcher locomotives that are foundational to yard

operations. A 3-month demonstration in California's San Joaquin Valley used this prototype locomotive along with two traditionally-powered locomotives and found that this configuration reduced fuel consumption and GHG emissions by at least 10 percent.

- Hydrogen Fuel Cell Locomotives, including zero-emission line-haul and switcher locomotives that have the potential of replacing diesel locomotives.

It is important to note that railroads have committed to purchase some zero-emission locomotives for the purpose of testing these locomotives. Significant research still needs to be conducted for these locomotives to become competitive with diesel-powered locomotives in terms of safety, reliability, and functionality. As the Blueprint notes: “[Freight rail research should be prioritized] to determine the most promising paths to decarbonization, including ... the design and manufacture of new locomotive propulsion and fueling systems.”

Railroads appreciate policymakers continuing to include rail eligibility for DOE research and ensuring that railroads are regularly consulted to determine which research projects will best advance the commercial viability of these respective technologies. Accelerated, widespread availability of these technologies is important as locomotives are capital assets with extended economic lifespans, and delay would slow potential fleet transition and the rail industry's ability to join the net-zero emissions economy.

#### **Railroads Appreciate Policymakers' Efforts to Help the Industry Reduce Emissions**

Freight railroads urge policymakers to support grant and loan programs that will ensure the rail industry is able to successfully reduce emissions now and fully decarbonize when such technologies are commercially viable and operationally safe and reliable. These programs help short line railroads reduce emissions by modernizing and/or retrofitting their equipment and assist locomotive manufacturers and other rail suppliers in re-equipping, expanding, or establishing facilities to produce alternative fuel locomotives or related technologies and equipment.

Freight railroads praise the bipartisan solutions developed by this Committee in the IJJA to address these concerns. One such program within this Committee's jurisdiction is the Diesel Emissions Reduction Act (DERA) program, which provides grants to retrofit existing technologies, such as locomotives, to significantly reduce emissions or long-duration idling. Freight railroads are also supportive of the bipartisan efforts being undertaken by Chair Carper and Ranking Member Capito to extend the authorization of this program through S. 2195, the DERA Act of 2023. This program and others administered by DOE, EPA, DOT, and the U.S. Department of Agriculture will play a critical role in reducing emissions and addressing the health impacts on communities.

**Policyholders Should Allow Railroads to Transition Their Locomotive Fleets Once Zero-Emission Locomotives are Operationally Safe and Reliable**

Policyholders should avoid imposing prescriptive means for reducing emissions in the rail industry. Because zero-emission locomotives are only now in the demonstration/prototype stage, short-sighted mandates that attempt to immediately reduce emissions via premature replacement of locomotive fleets would compel freight railroads to purchase newer internal combustion engines that will then be in service for decades.

Instead, as the Blueprint discussed, "[a]ll levels of government and the private sector should align their efforts to enact solutions through technical assistance and collaborative work." It is essential that any plan for reducing rail emissions be the result of a partnership with industry and, as called for in the Blueprint, provide "safe, effective, affordable, and sustainable solutions to existing and emerging challenges." Rail stands ready to engage in a collaborative partnership with the federal government to reach goals based on "[t]imely and impartial data collection and analysis" and timelines grounded in a realistic understanding of the current state of technology.

*Policymakers Should Oppose the California Air Resources Board's (CARB) Untenable Locomotive Rule*

As noted above, railroads are committed to furthering their sustainability and being a valuable part of a competitive economy that supports quality jobs. Railroads' past partnerships with CARB have successfully reduced emissions from main-line and yard operations across the state. Unfortunately, CARB has decided to forego the proven path of collaboration in favor of regulations that lack legal authority and display a casual, willful disregard for technological realities and federal law. While the spirit behind CARB's proposed regulation is consistent with the rail industry's environmental commitments, the rule itself is unworkable and unfeasible.

That's why AAR and the American Short Line and Regional Railroad Association filed suit in June against CARB's proposed rule that would prohibit the operation of federally certified locomotives in California based on an arbitrary date established as a locomotive's "useful life," while also mandating railroads replace their existing locomotive fleets with zero-emission locomotive technologies that do not yet exist.

Despite a lack of viable zero-emission locomotives, CARB's rule would charge railroads that operate locomotives within the state billions of dollars in total annually. These fees would also apply to short line railroads that provide critical first- and last-mile service on lower density branch lines and are capital-intensive, low-margin small businesses. CARB has conceded the costs of implementing the rule would bankrupt some short lines and has failed to acknowledge the impacts of the elimination of short line rail service to Californians, including eliminating an efficient means to market, rising costs of products, and a modal shift to trucks.

Furthermore, it is important to note that the freight rail industry is not a combination of discrete, unconnected railroads; rather, it is a single interconnected system of six Class I railroads and hundreds of short line railroads that own and maintain nearly 140,000 route-miles of track.

Additionally, at any given time, roughly 5 to 10 percent of the line-haul locomotives being operated by the six Class I railroads are owned or leased by another railroad. This allows for railroads to maximize the efficiency of locomotives and reduce transportation time by eliminating the need to exchange locomotives when moving from one railroad's line to another. As a result, it is common to see line-haul locomotives from railroads in the United States, Canada, and Mexico operating far from the owning railroad's tracks. This interconnectivity is only possible through the minimization of technical and operational differences among locomotives in each railroads' fleet.

In recent proceedings, CARB has conceded that this regulation will have substantial impacts on railroad operations not only in California, but on a national level and that it intends for railroads to modify their entire fleets to comply with the regulation. It is simply not appropriate for an individual state to impose such tremendous burdens on interstate commerce.

#### **Conclusion**

America's freight railroads offer a simple, cost-effective, and meaningful way to reduce transportation-related GHG emissions by reducing fuel consumption in transportation. Railroads are already working in earnest to meet ambitious emission reduction targets. They look forward to working with members of this Committee, other policymakers, and their suppliers and customers to ensure railroads remain a responsible partner capable of delivering sustainable transportation solutions in the near term and for the long haul.

Senate Committee on Environment and Public Works

Hearing Entitled, “*Cleaner Trains: Opportunities for Reducing Emissions from America’s Rail Network*”

July 26, 2023

Questions for the Record for Ian Jefferies

**Ex-Officio Chairman Carper:**

1. **Mr. Jefferies, in your testimony, you discuss the operational changes that railroads have made to reduce emissions in yards. I also appreciate the interest in testing new battery electric locomotives for future use. But I’d like to ask about current fleet turnover and investments to date.**
  - a. **Low-emission locomotives have been available for nearly a decade, yet railroads have purchased very few new locomotives for yards. How do you explain that choice, and given the local health impacts and the climate impacts of rail yards, how can we ensure that railroads do better?**

Freight railroads are working diligently across the entire industry to reduce both greenhouse gas and criteria emissions associated with their operations. In the short-term, railroads have made significant investments into modernizing their existing locomotive fleets and increasing blends of biodiesel and renewable diesel to reduce emissions. The rail industry is also working with the Department of Energy and locomotive manufacturers to accelerate the commercial viability of zero-emissions locomotives which are now in the demonstration/prototype stage.

There are several factors that influence a railroad’s decision to purchase a new locomotive as opposed to remanufacturing or modernizing a locomotive in the current fleet. Over the last decade, railroads have significantly increased their efficiency through a combination of technological and operational improvements. As a result, railroads can move more freight with fewer locomotives, reducing fuel consumption by 11.8 billion gallons and emitting 133 million fewer tons of carbon dioxide between 2000 and 2022. These efficiency improvements have also led to a reduced demand for new locomotives, particularly the line-haul locomotives that make up most locomotives manufactured today. Because locomotives are such long-lived assets and will be in service for decades, some Class I railroads are reluctant to purchase new diesel-powered locomotives while other Class I railroads are investing in Tier 4 locomotives.

In addition, the rail industry has invested heavily in testing battery electric locomotives for use in railyards as switchers. But the long lead times between order placement and delivery significantly delay testing of these new

technologies. For example, battery locomotives ordered in early 2022 will not be delivered until late 2025 at the earliest. In the interim, railroads have invested in zero-emission intermodal cranes, low-emitting natural gas hostlers, and after-market products that lower criteria pollutant emissions from railyards and reduce railyard impacts on air quality for the communities in which they operate.

**b. What are the obstacles to electrifying railyards and switchers? Are catenary lines a feasible technology in railyards to run switchers? Combined with batteries, wouldn't switchers at railyards be prime to operate with zero emissions?**

Battery electric locomotives provide significant promise for use as yard locomotives, even in the current early stages of development. While the railroad industry remains open to pursuing a variety of options for reducing emissions, catenary electrification of freight railroads in North America poses significant practical and safety challenges. In 2016, the Rail Transportation and Engineering Center at the University of Illinois at Urbana-Champaign examined electrification of the rail network through catenary technology and concluded that electrification was likely to be far more costly than other potential alternatives for achieving desired emission-reduction goals.

Significant physical and safety challenges arise having overhead, electrified lines strung over a railyard operating 24/7/365 where cranes, trucks, and railcars carry loads at varying heights, from chassis carrying two stacked intermodal containers to car transporters whose height depends on their load. Creating captive fleets of locomotives that cannot move between railyards would also interfere with interoperability and harm railroad operations.

Outside of railyards, attempting to electrify a portion of the 140,000-route mile freight rail network would create serious operational difficulties. A major benefit of the North American rail network is its interoperability. Attempting to incorporate locomotives that can use catenary electric lines into the national fleet would create major costs, delays, and inefficiencies because of interchanging freight to and from diesel locomotives at the edges of electrified territory.

The rail industry is investing heavily in testing new, lower- and zero-emission technologies for locomotives, including battery electric locomotives and hydrogen fuel cells. In addition, several Class I railroads have undertaken a modernization effort to retrofit their existing locomotive fleet, which reduces emissions while improving efficiency.

**c. How much has the railroad industry invested in zero-emission locomotives and technology? What factors would make it more likely for railroads to invest more in zero-emission technologies?**

The rail industry has made significant investments in testing prototype battery electric and hydrogen fuel cell locomotives, as well as other emissions reducing technologies. These technologies, however, are not commercially viable today. They are experimental at this point and must be tested for safety and operability. Contrary to statements made by some advocates, zero-emission locomotive technologies are not widely available in North America today. Complicating efforts to test these new technologies are supply issues and the current physical limitations of batteries.

Supply issues have resulted in long lead-times for battery electric locomotives. For example, in early 2022, one Class I railroad placed an order for 10 battery electric locomotives to test in railyards. The first of those 10 locomotives will not be delivered until the Spring of 2025, and the last locomotives are not slated for delivery until late 2025. This delay demonstrates the complexities and constraints railroads face in the transition to zero-emission locomotives.

Regarding the physical limitations of battery technology, the largest batteries being built today produce less than 20 megawatt hours (MWh) of energy. To replace a single diesel locomotive with a 5,000-gallon fuel tank, a battery would need to produce approximately 100 MWh of energy. Clearly, there is a significant differential in the energy required by locomotives and the energy today's batteries can provide. Research to increase battery capacity and develop new battery technologies, such as solid-state batteries, is ongoing, but no solutions exist today. Even if developed, all new technologies will need to be tested for safety and operability. In the past, battery electric locomotives introduced to the fleet were prone to fires and explosions, an untenable risk given the commodities that railroads transport.

Setting aside the need to test the safety and operability of new technologies, there are significant infrastructure changes and long lead times required for the transition to battery electric and hydrogen fuels. Federal and state investment in this infrastructure on a national scale is critical to the success of an economy-wide transition to zero-emission transportation.

2. **While rail offers significant safety benefits and fuel efficiency relative to other modes of goods movement and travel, rail emissions still negatively impact vulnerable communities. A common complaint about railroads is regarding idling of locomotives in their neighborhoods.**
  - a. **How are railroads complying with federal requirements so that they do not idle over 30 minutes except for limited exceptions?**

Federal regulations require that all new locomotives, including remanufactured locomotives, be equipped with automatic engine stop/start (AESS) devices, and be designed so that locomotives can restart at least 6 times each day without negatively impacting the engine.<sup>1</sup> AESS devices shut off the locomotive engine

<sup>1</sup> See 40 C.F.R. § 1033.115(g).

after 30 minutes of idling with certain exceptions. Specifically, the device will power down the locomotive unless doing so would result in damage to the engine because of freezing, in situations where the engine must remain on to allow the cab of the locomotive to be heated or cooled, and several other specific situations identified in the regulations. AAR's members make every effort to comply with these idling regulations but are sometimes confronted with operational needs to trigger periodic idling.

**b. How do the railroads currently track that idling in excess of 30 minutes was indeed due to an allowable exception?**

There is no mechanism for tracking exceptions to the 30-minute idling requirements prescribed in the federal regulations.

**c. What opportunities are there to further limit idling near vulnerable communities?**

AESS devices installed on locomotives are programmed to shut-down engines after a specified period of time but will also restart engines in response to specified conditions and/or operational needs, consistent with the exceptions identified by federal regulations. Railroads continue to work to limit these situations and to reduce emissions from other yard equipment to improve air quality for vulnerable communities.

**3. A Class 1 recently announced plans to modernize 600 locomotives to be more fuel efficient, while only gaining marginal emissions benefits. In general, the rail industry has made important long-term net zero GHG plans, but has fewer public commitments regarding criteria and toxic pollutants such as NOx and Diesel PM.**

**a. Can you walk through the decision-making process to continue to run older locomotives rather than purchase a new low-emission locomotive?**

Locomotive modernization does not result in only marginal emissions benefits. According to Wabtec, the original equipment manufacturer working with several of the Class I railroads to modernize portions of their locomotive fleet, the Union Pacific modernization effort will provide, among other benefits, approximately 350 tons of carbon reduction per locomotive per year in addition to improving fuel efficiency by up to 18%.<sup>2</sup> Similarly, Canadian National's modernization effort is expected to result in 50,000 metric tons of annual greenhouse gas emissions reductions – the equivalent of removing nearly 10,700 non-electric passenger cars.<sup>3</sup> Increased fuel efficiency necessarily leads to reduced

<sup>2</sup> See <https://www.wabteccorp.com/newsroom/press-releases/union-pacific-signs-largest-locomotive-modernization-deal-in-rail-industry-history-with-wabtec>.

<sup>3</sup> See <https://www.wabteccorp.com/newsroom/press-releases/cn-to-modernize-60-additional-locomotives-with-wabtec>.

combustion of diesel fuel, which results in reduced emissions of criteria pollutant emissions, including NO<sub>x</sub> and particulate matter.

Locomotives are long-lived and expensive capital assets with a lifespan of many decades. The rail industry has made significant investments in testing and demonstrating new, still nascent zero-emissions locomotive technologies. Purchasing new diesel locomotives that will be in operation for many decades runs counter to the rail industry's efforts to transition to a zero-emission future as it simply extends the timeframes that diesel locomotives will be operating on the national network. Instead, some railroads are looking at ways to modernize and retrofit the existing fleet to reduce emissions in the short-term while investing heavily in the next generation of zero-emission locomotives.

**b. Can you describe the railroads plan to transition to cleaner locomotives and eventually zero emission?**

Every North American Class I railroad, in collaboration with the Science Based Targets Initiative (SBTi), has an approved emissions reduction target. But each plan differs slightly based on the corporate approach, geographic regions, and existing locomotive fleets of each railroad. However, these plans have many common elements:

- In the short to medium term, many railroads are testing different blends of low-carbon fuels, including biodiesel and renewable diesel, in their existing locomotive fleet while zero-emission locomotive technologies are being developed and tested. As noted by the federal government in the National Blueprint for Transportation Decarbonization, low-carbon fuels play a key role in reducing rail emissions. The supply and distribution of these fuels remains a challenge. AAR encourages Congress to support mode-neutral programs that increase the domestic supply of these fuels and develop the necessary infrastructure to deliver these fuels to yards across the nation.
- Railroads are also replacing yard equipment, such as intermodal cranes, hostlers, and other heavy-duty equipment with low- or zero-emission options. In addition, railroads have deployed technologies to reduce idling time for trucks as they move in and out railyards. This transition reduces the greenhouse gas footprint of the railroad and lessens the impact on the air quality of the communities in which we operate.

Railroads are investing heavily in testing and demonstrating zero-emission locomotive technologies, but these new locomotive technologies are not yet commercially viable and require testing for safety and operability before being deployed across the nation. Therefore, railroads are also modernizing and retrofitting the existing fleet to reduce greenhouse gas and criteria pollutant

emissions. Significant infrastructure and grid capacity are required to transition to battery or hydrogen technologies on a national scale.

**c. What is the rail industry’s plan and timeline to reduce NOx and Diesel PM and other pollutions?**

As explained above, the rail industry is currently investing in low- or zero-emission yard equipment to reduce the greenhouse gas and criteria pollutant (which includes NO<sub>x</sub> and particulate matter) emissions from our yard operations. At the same time, railroads have installed technology to reduce both locomotive and truck idling inside and near our railyards while testing higher blends of low-carbon fuels that also reduce emissions. The rail industry will continue to work to reduce both greenhouse gas and criteria pollutant emissions from our operations.

**d. How do railroads plan to maintain an emissions advantage relative to other forms of freight transport such as trucks that are transitioning to zero-emission technologies, and how important is it to maintain that advantage?**

On a ton-miles per gallon basis, rail fuel efficiency in 2022 was up 110 percent over 1980 and up 25 percent over 2000. Railroads have accomplished this improvement by investing billions of dollars in innovations and improved operating practices, including: the modernization of the existing locomotive fleet; higher-strength, lighter-weight railcars that save fuel by allowing for heavier loading and employing more aerodynamic designs; the use of technologies to reduce locomotive idling; and the use of fuel-management and network optimization systems that calculate the most fuel-efficient speed for a train over a given route.

**4. What infrastructure projects or other actions could federal and state agencies prioritize that would help kickstart the transition to zero-emission locomotive operation among railroads?**

The industry and the federal government are researching alternative propulsion mechanisms to determine which approach will best speed the transition to less emissive locomotives. These technologies include low-carbon fuels, battery electric locomotives, hydrogen fuel cells, hybrid fuel configurations, and other alternative liquid fuels, among others.

One example of necessary research in which the federal government could invest is the development of new battery technologies that provide the additional power locomotives, airplanes, and marine cargo ships will need to decarbonize. Today’s largest batteries produce less than 20 MWh of power, leaving a significant shortfall before there can be a one-to-one replacement of today’s diesel locomotive with a battery electric locomotive. Continued research by agencies like the Department of Energy could speed development of technologies hard-to-

decarbonize sectors, like the rail industry, need to transition to less-emissive technologies.

Much of the success railroads have had in reducing emissions to date is the result of major technological advances. Railroads must be able to test and incorporate new technologies, such as trip optimizer, that continue improving the overall efficiency of rail operations. Unfortunately, the Federal Railroad Administration is slow in approving the testing and use of these new technologies. Streamlining these processes and making them consistent will speed up the development and deployment of new technology that helps the industry become more efficient.

In addition, federal and state governments will need to support development of necessary infrastructure as the transportation sector transitions away from fossil fuels. The electric grid must be sufficiently robust to handle the additional burdens of electric vehicles and other transportation infrastructure and resilient enough to also withstand the additional demand due to increased heat and climate-related fires and storms. To the extent that hydrogen fuel will play a role in the transition away from carbon fuels, a national distribution system must be built to produce, store, and deliver this fuel to customers across the nation.

Broadly, federal and state policymakers should avoid prescriptive measures that dictate how industries reduce emissions. Policies should provide long-term regulatory certainty to businesses and permit capital-intensive industries, such as rail, to make economically rational investment and planning decisions while also maintaining their competitiveness.

Senator MARKEY. Thank you, Mr. Jefferies.

Now we will turn to questions for the panel. Let me begin by recognizing myself.

The Environmental Protection Agency hasn't updated its locomotive standards in 15 years. A lot has happened in 15 years. The science connecting air pollution and health impacts is stronger. Our clean technologies are much cheaper and better.

During that same period, the EPA strengthened or proposed to strengthen emissions standards for trucks and cars at least five separate times.

We are taking action on emissions across the transportation sector, and our workers and companies are on the road to success. Our railroads have been left to fall behind.

In 2008, the EPA set longer-term standards, known as Tier 4 standards for newly built locomotives that reflected the advanced State of high efficiency technologies in 2008. It also tightened standards for existing locomotives when they are remanufactured to varying degrees.

Those standards made key assumptions that railroad operators would continue business as usual rather than pumping the brakes on innovation.

Ms. Torres, do the locomotive emissions standards established in 2008 meet the needs of communities today?

Ms. TORRES. No, unfortunately not. Tier 4 is still diesel-fueled. Our communities have been suffering and continue to suffer. We know that the technology is here, and it is feasible, economically feasible to go completely zero-emissions. We need standards that are higher and better than the 2008 standards.

Although it was adopted 15 years ago, and I know others may say that is something that could have helped us then, technology has moved and will continue to move toward zero emissions to make it feasible.

We need something that is not diesel-fueled for Tiers.

Senator MARKEY. Mr. Rosen, can you describe what a Tier 4 locomotive is, just so everyone can understand who is watching this across the Country?

Mr. ROSEN. Sure. The Tier 4 locomotive became the standard for locomotives in 2014. It reduced particulate matter by 70 percent. It reduced nitrogen oxide by 76 percent. It is a very substantial step up on any of the other diesel locomotives that are out there.

I would agree with Ms. Torres that we have the ability to also be moving toward zero emissions. There is an awful lot of very old locomotives on the rails right now that could be quickly replaced in terms of the cross-country piece by Tier 4, while we get zero emissions over the coming period to cover that also eventually.

Certainly in urban areas, there is no reason we shouldn't be using the zero emissions locomotives right now.

I will also point out, they need higher crash standards, too. There were better crash standards put into place in 2009, and by continuing to have the overwhelming majority of locomotives out there being older locomotives means that there is continued danger both to the communities where crashes might take place as well as of course the workers.

Senator MARKEY. Just expand, what zero emissions options are available for the railway industry to adopt for locomotives?

Mr. ROSEN. Sure. Right now, the company where we represent workers has developed what they call the FLX locomotive, which is a battery locomotive, which can operate independently. There are other companies that have battery locomotives, which can certainly operate very well in rail yards where they can be recharged there.

They can also operate while going cross country in what they call a consist, which is basically in tandem with a diesel locomotive, ideally a Tier 4 locomotive. You can really bring the emissions down farther. Then when you get into the cities, shut off the diesel altogether and run off just the battery locomotive at that point.

Senator MARKEY. Let me ask this. In terms of these low-emissions and zero-emissions trains, are they commercially available right now?

Mr. ROSEN. They are.

Senator MARKEY. Are there ways to purchase?

Mr. ROSEN. Orders have been taken for these battery locomotives. In addition, they have run good tests with them in California. There was a famous example of that being done within the last couple of years to show how much better off they are.

Then in addition, there are electric locomotives that are in use in a number of places in this Country, and very heavily overseas. Those are all available, too.

Senator MARKEY. Where are these low-emissions and zero-emissions trains manufactured in our Country that are available now? Where are they made?

Mr. ROSEN. There are multiple locations, but the biggest source, especially for these battery locomotives, would be the large facility in Erie, Pennsylvania.

Senator MARKEY. Thank you, sir.

Senator Ricketts.

Senator RICKETTS. Thank you, Mr. Chairman.

Mr. Jefferies, some have accused the railroads of having opposed methods to reduce emissions. Can you speak about the industry's efforts to reduce emissions within their existing fleet of locomotive? Are there Federal programs that you support to help with these efforts?

Mr. JEFFERIES. Sure, thank you, Senator.

Well, I think we, it is not a joke, but if you want to reduce emissions right now, take trucks off the highway and put them on the rail, and you reduce emissions by three to four times. Again, truckers are our biggest partners and our biggest competitors as well. I say that with a smile on my face. It is fact.

Railroads, as we mentioned, 40 percent of long-haul freight, less than 2 percent of transportation related emissions. That is due to the investments we have made over the years. Certainly there have been billions invested into modernizing or re-equipping locomotives. Some of the examples about next generation locomotives were mentioned by my colleague, as far as getting battery electric into revenue service, proof of concept, working on hydrogen powered locomotives, in the yards, getting electric cranes, electric switcher locomotives.

Even again, using technology to get the throughput faster in yards. Idling trucks, for example, are leading to additional emissions, additional release of particulate matter. Anti-idling technologies in locomotives in yards as well.

I would also add that as a transition, as we move into the next generation of locomotives and of power, increasing the use of biofuels, whether it is renewable diesel, whether it is other renewable fuels into the feedstocks of how we are powering our locomotives is absolutely key as well. It is certainly a multi-pronged approach.

Senator RICKETTS. Great. You know what, you just mentioned biofuels there. According to a recent Blueprint for Transportation Decarbonization, biodiesel and renewable diesel can play a key role in reducing rail emissions, especially in the near and medium terms. Can you discuss how the industry is utilizing these fuels, and are there things Congress can do to ensure that these fuels are in sufficient supply and cost competitive?

Mr. JEFFERIES. Sure. Increasing the percentage of biofuels in our overarching power structure, and whether that is again a mix of renewable diesel or biofuels, an 80/20 mixture there. What can Congress do? I think really hold a level playing field when it comes to how you approach sustainable fuel development, sustainable fuel subsidies, sustainable fuel feedstock, so that all modes have an opportunity to increase deployment.

You want to raise availability, decrease the price, and that will increase use overall across all modes.

Senator RICKETTS. Great. Then CARB is once again working toward a significant regulation to impact the transportation sector. How would the regulation being considered by CARB impact the functioning of the national network?

Mr. JEFFERIES. Well, you hit the nail on the head when you said national network. Our network is over 140,000 miles that operates in an interconnected nature. Locomotives and trains on the west coast end up on the east coast and mixed and matched throughout the network.

Really, when you are looking at a proposed regulation of that magnitude, it has national impacts, national consequences on the ability of the network to operate. We do not operate just within the bounds of one State. That is why we have Federal law that actually prohibits efforts along these lines when it comes to regulating new or retrofitted locomotives.

We think the appropriate place to have this discussion is at the Federal Government. We are happy to play a productive role in that process.

Senator RICKETTS. Can you discuss what sort of impact this regulation would have on short line railroads?

Mr. JEFFERIES. Well, it would be nothing short of a death knell to about 25 percent of the short lines in California.

Senator RICKETTS. Why do you say that?

Mr. JEFFERIES. On average, estimates show that to comply with the regulation, about 40 percent of the average short line revenue, average short line's revenue, would be required and dedicated to complying here. Frankly, 25 percent of the short lines in that State, they can not function with that sort of cost structure.

What is the result? The result is that freight is going to get diverted onto the highways, increasing congestion, with less efficient, more emissions transmitting, modes of transportation. I think that is the opposite of the direction we want to go to. Again, this should be a collaborative effort focused on what the market can support when it comes to production and what our small businesses can afford when it comes to transitioning to a cleaner future.

Senator RICKETTS. Are you familiar with what I mentioned in my opening remarks with regard to the Bailey Yard in North Platte and their battery electric locomotives? Are you familiar with that Union Pacific project by chance?

Mr. JEFFERIES. Yes.

Senator RICKETTS. How long do you think it would take, then, to get those implemented and be able to look at the feasibility with regard to those, and what they would be able to do going forward?

Mr. JEFFERIES. Well, certainly we are already deploying battery electric, as I said, in yards. There have been orders made by the railroads. I know one railroad is only getting half as many as they have ordered, because of production capability and availability when it comes to the batteries required. There is a bit of a long lead time there.

What we are really looking at is a generational fleet overturning, over a significant amount of time. These are long-life assets. We want to make sure we can continue to move America's freight. We all want to do a job in a way that reduces emissions and continually reduces our environmental impact. It has to be done in a way that can allow us to continue to operate, serve our customers, serve our communities, and that the production market can actually handle.

Thank you.

Senator RICKETTS. Thank you, Mr. Jefferies. Thank you, Mr. Chairman.

Senator MARKEY. Thank you.

The Chair will recognize himself again. I am a technological optimist. It was the hydroelectric mills that brought my grandfather to Lawrence, Massachusetts, to work in the mills of Lawrence during the Industrial Revolution. Today we have new advances in battery technologies that we now celebrate. The American story is one of technological ingenuity.

We have heard from Mr. Rosen about advances in battery technology and catenary lines to power our railways. Our technological optimism and our well-trained union workers are our best source of clean and renewable energy. Combined with our existing technologies we can protect community health and support American innovation.

Ms. Torres, you painted this beautiful picture of a zero emissions future for communities. How far away from that are we in terms of the actual technology?

Ms. TORRES. The technology is here now. It is time to work with EPA, elected officials, the Class One rails, the workers and our community members to get that transition moving into our communities that are most impacted. We have, as mentioned earlier, overhead catenary that has been used and can be used as a bridge as

well to still continue the work, and make it economically feasible as we continue with technology to advance.

Specifically zero emissions technology, we can continue to come back to assess the current technology available. It is here now, it is economically feasible. CARD mentioned around \$25 billion of savings, not to mention the health savings, to get to that.

There is a lot of unintended costs that are not talked about when we look at this. Thank you.

Senator MARKEY. Thank you.

Mr. Rosen, my father was actually a local vice president in the UE. Obviously, I am familiar with the work ethic, people want to go to work, make good money, take care of their families. My father's son is a United States Senator, so thank you, UE, for helping to get that funding.

What kind of answer would you give to Mr. Jefferies saying, we just can not afford to, railroads have to purchase these more fuel-efficient trains in our Country. Workers want to make these trains, but they are saying, we can not afford to buy them. What is your answer to him?

Mr. ROSEN. The money is certainly there in the railroads. These are very profitable industries. They have returned a great return to their shareholders, to Wall Street, to the executives. It is a question of priorities. It is also a question of how they want to look at the costs and benefits, too, because in the longer term, with the fuel savings that you will see, with the greater durability actually of non-diesel locomotives, et cetera, it is an excellent long-term investment.

The problem is, they are operating according to the mandates of Wall Street, which are not so interested in what is going to happen in the long term, but what is going to happen in the next quarter. That is why they really need to be given a directive at this point by the government, you have to do this, if they want to remain in business.

They have shirked the responsibility for the last 8 years. They should have had 30 percent at Tier 4 already, and it is less than 10 percent. That would have made a huge difference right now. It would have also resulted in some of the slightly better but not worst locomotives being moved down into the rail yards, where we have, I believe, the figure in Ms. Torres' documents that were presented as part of her written testimony, something like two-thirds of the locomotives in the rail yards are Tier 0 or Tier 0-plus. These are 30, 40-year-old locomotives. It is outrageous.

Senator MARKEY. You are saying that the railway industry just is not investing in these clean technologies? The union workers are ready to make, construct the new locomotive engines that would go to low or zero emissions standards, and the technology does exist. The railways just refuse to do it, is that what you are saying?

Mr. ROSEN. Absolutely. There has been deep, deep reductions in the number of workers making locomotives in this Country. Not because they are being made overseas, they are not being made at all. The rail industry just stopped ordering new locomotives, and are running the old ones to death. It is also to the death of the American population.

Senator MARKEY. Yes. That is what it sounds like to me. These numbers are the most recent that I have. Only 7 percent of Class One locomotives were Tier 4 locomotives in 2020? Old locomotives that emit five times as much dangerous pollution as the current top tier of locomotives make up nearly one-fourth of all Class One locomotives? That does not sound like investment to me. That sounds like inaction to me, Mr. Rosen.

Mr. ROSEN. Absolutely. That is what our concern is, and I think that is what you are also hearing from Ms. Torres on behalf of the environmental justice communities, too, that the time has run out for the rail industry to do this voluntary on their own, driven by the market, whatever terminology they want to use. This is absolutely an area that is crying out for government intervention.

Senator MARKEY. Senator Ricketts.

Senator RICKETTS. Thank you, Mr. Chairman.

Mr. JEFFERIES, it has just been described about the locomotives and the claim that the railroads are not replacing their engines. What, do you have any knowledge of what would the estimate be of the average lifetime of a locomotive? How much do they cost and how long are they expected to last?

Mr. JEFFERIES. An average locomotive costs about \$4 million, and upwards of a 40-year lifespan.

If I could make one comment on the investment discussion that occurred. The rail industry, I mentioned in my opening statement, invests about \$25 billion of its own dollars every year. The result of that is the highest-rated infrastructure of any type in this Country as graded by the American Society of Civil Engineers. Again, that is privately owned, that is privately maintained.

It is not federally owned; it is not nationalized. Take a look at that type of infrastructure, take a look at the northeast corridor, it is at about a \$100 billion investment deficit. This industry invests almost 19 cents per revenue dollar, that is six times more than the average industry.

I do not want to hear that this industry is not investing. We can talk about the turnover of the locomotive fleet, and absolutely, that is something we are interested in. That is why we have been out in revenue service when it comes to battery electric, when it comes to hydrogen. That is why we are deploying different types of power in our yards to reduce emissions.

It does not add up that the investment is not occurring there. We are happy to have that discussion about a new Federal standard, absolutely. It needs to be done in an achievable manner.

Senator RICKETTS. Also, one of the things that Mr. Rosen said was at the time the new regulations came out in 2014 it was estimated, and I presume it was by the EPA, that 30 percent of the Class One railroads would have Tier 4 engines by 2023, which is just next year.

Was the railroad industry consulted, do you know, as part of those estimates? I can tell you based on my experience with the EPA, they do not talk to industry when they make regulations. I was not personally involved in any of this. Do you have any knowledge of this, by chance?

Mr. JEFFERIES. I certainly can not speak to the level of consultation or engagement that occurred. I know that based on my experi-

ences with some other estimates that have occurred with other agencies, what is said and what is real does not always add up.

Again, we are investing literally billions in the modernization of locomotives, new types of locomotives. Any sort of mandate or forcing into purchasing Tier 4s right now, for those that want to get away from diesel, all that does is lock in diesel power for the next four decades.

We are focused on the beyond. I think that is one area that Mr. Rosen and I can agree on, is that we do need to continue development of battery electric and we would say other alternate sources of power. We should all be working together toward that goal and figuring out the best way to get things into the marketplace at a faster clip.

Senator RICKETTS. If I could just add on, talking about biodiesel and renewable diesel, which also reduces emissions, as we talked about, the EPA set their goals in the RVOs, the renewable volume obligations for the oil industry, at below what the current industry is actually producing. Once again, the EPA, not talking to industry.

Let's talk a little bit now about the catenary system that was described before for the electrification of it. What are your thoughts on this? Describe a little bit what would be some of the challenges to go to an electric system. Wouldn't you have to again build this through every one of those 144,000 miles you were talking about?

Mr. JEFFERIES. Absolutely you would, and you would have to develop the power stations and power sources along those. Often, as you know, in the great State of Nebraska, we operate across very rural areas, where power sources are not readily available. That is grid development that we would be responsible for. You are talking about hundreds of billions of dollars. You would have to rework tunnels, rework bridges, thousands of bridges, never mind what needs to be done on the locomotives themselves.

Certainly it works well in urban areas, up and down the northeast corridor. Absolutely. You know, I take the train every time I go up to the northeast. Across a 142,000-mile network in a network that locomotives from one rail operate across another company's lines all the time, everything has to be interconnected, everything has to function seamlessly, that level of an endeavor, one, it is not realistic, and two, it just does not make sense for the future.

Senator RICKETTS. The estimate to do that per mile, do you know?

Mr. JEFFERIES. I think it is in the millions.

Senator RICKETTS. Do you know, has anybody actually put pencil to paper to do the calculation to say, hey, if we were going to electrify this entire system, how much power generation would we need and how long would it take to do it?

Mr. JEFFERIES. I would venture to guess that no one has contemplated that. It is a leap of faith unlike any other.

Senator RICKETTS. Do you know how long, assuming we could meet the power generation standards, do you know how long it would take to actually do something like that, if you were going to try and do it?

Mr. JEFFERIES. Decades.

Senator RICKETTS. Thank you very much, Mr. Jefferies.

Mr. Rosen, kind of the same question to you. Has anybody done the calculations to know how much power generation we would need if we were going to electrify the entire rail system?

Mr. ROSEN. There is actually somebody in this room who has done a lot of work on that from an organization called Solutionary Rail, who has some very creative ideas about how to do it. I will agree, this would be a project for the entire Nation that would probably take decades. It is probably the kind of investment that our Country needs to do. Whether the individual railroads would be willing to do that, left to their own, or whether it has to become something that the government has a direct role in is another question.

It also does not require putting catenary on every single mile. You can use the battery electric locomotives for some in-between sections. They can get well charged in the sections where you have the electric lines up, and then coast through the other areas on the battery electric, including places like tunnels, et cetera.

It does require probably rethinking the electrical grid. We need to do that anyway as a Country. We are converting our entire power system in this Country. We have to. This is not about, does it cost too much money or not. This is a question of, what is it going to cost the human race if we do not electrify everything.

Senator RICKETTS. I see I am out of time, Mr. Chairman. Thank you.

Senator MARKEY. The Senator from California, Senator Padilla.

Senator PADILLA. Thank you, Mr. Chair. In my limited time, I am going to try to get through a couple of important issues, beginning with Ms. Torres. I know you are joining virtually. I want to thank you for testifying on behalf of the communities who are on the front lines of California's air pollution crisis.

I agree with how you described that rail pollution, it is a national issue with local impacts. While many Americans love getting untold numbers of products delivered to our doorstep, it does come at a significant cost to people who live near the ports and railroads that are the backbone, frankly, of America's goods movement infrastructure.

Ms. Torres, your written testimony shares that despite the EPA's efforts 15 years ago to update locomotive regulations, there are somehow still locomotives in rail yards that are 60 to 70 years old. My question is, can you help explain how it is possible that a locomotive can operate its entire service life without having to reduce emissions?

Ms. TORRES. Yes. That loophole, there wasn't a phase-out of any older trains or older locomotives. A lot of that happens with the rebuilding. Because it is refurbished, it does not have to meet the new emissions standards of that current year.

If you are using older trains, and you are just refurbishing them, the standards are still from the 1960's, 1970's, therefore allowing the loophole of the current standards from 2008 for Tier 4 to not have to be taken into consideration.

Senator PADILLA. Great. That is very important for this committee to understand, something that we should absolutely try to address.

I also have, Mr. Chair, questions about our low-carbon fuel standards. California's low-carbon fuel standard is helping advance a wide range of clean fuels while at the same time keeping consumer costs down. California is probably the fifth largest economy in the world, on our way to becoming the fourth largest economy in the world, and in so doing, proving that it is possible to both grow our economy and reduce emissions. They are not mutually exclusive.

California's tech-neutral approach, greater long-term predictability, and cost containment mechanisms have provided both certainty and flexibility. Now, this program has been so successful that jurisdictions are joining California as you can see in the Pacific Coast Collaborative, a regional agreement between California, Oregon, Washington, and British Columbia, to strategically align policies to reduce greenhouse gas emissions and promote clean energy.

Mr. Jefferies, it is my understanding that the majority of the rail industry's use of low-carbon fuels, such as renewable diesel, is in California. What role does California's low-carbon fuel standard play in driving the use of low-carbon fuels in the rail industry on the west coast?

Mr. JEFFERIES. Well, certainly the use of low-carbon fuels, whether it is renewable diesel, whether it is biodiesel, is in heavy use in California. Of course, not exclusively in California. Something we are proud of across the Country, and something we are working to do more of.

I can tell you this, that we absolutely support a mechanism at the Federal level that holds all modes equal when it comes to reducing the cost and increasing availability of low-carbon fuels. We absolutely think there is a big role to play there as we transition into the true next generation power sources.

Senator PADILLA. I think we just identified an area of agreement.

Mr. JEFFERIES. That is why we are here.

Senator PADILLA. As you work to increase the use of low-carbon fuels across the rail industry, do you believe it would be helpful to have a national low-carbon fuel standard? I imagine you would agree, this would also reduce emissions in the rail industry, if we applied it nationally.

Mr. JEFFERIES. Well, we certainly support programs that, again, reduce the cost of renewable fuels and increase the availability. We do think it is critical at the Federal level that all modes be held equal.

Senator PADILLA. That we will call a Federal standard.

Mr. JEFFERIES. As far as across different modes, the promotion, the incentives, et cetera, that will increase the use, that again, every mode is held harmless, held equal, and so that all, all modes can take advantage of this, and that the availabilities there add a price that incentivizes increased use.

I think we use different terms, but we are trying to get at the same end game.

Senator PADILLA. I appreciate that. Again, with California's experience as a model, setting the standard, technology neutral, and you can achieve both reduced emissions and economic growth, which I imagine you would agree with that as well.

I emphasize this, Mr. Chair, because what I am hearing is that thanks to California's leadership in advancing a low-carbon fuel standard, the rail industry in California is moving to lower carbon fuels that result in these lower emissions.

The written testimony Mr. Jefferies provided says "Policymakers should avoid imposing prescriptive means for reducing emissions in the rail industry." I think the lesson here is that thanks to California's standard, the rail industry can and will reduce emissions. Without California's standard, industry would have just kept doing what it has always done in the past.

It is not too far of a leap to suggest the same can be accomplished nationally with tighter EPA emissions standards. Without the new standards, industry will just continue to behave like the status quo.

Based on this committee's previous hearings on the low-carbon fuel standard and the testimony we have heard today, I see a clear need for a national low-carbon fuel standard. I hope, Mr. Chairman, that we can produce a bill in this committee to that effect.

Also, just the need for EPA to get moving on updated emissions standards.

Last but not least, Mr. Chair, I know my time is expired, I want to thank you for Kike returning to the Dodgers.

[Laughter.]

Senator MARKEY. On top of that, you are welcome for having Mookie Betts already be there to greet him from Massachusetts. We just hope it is the end of our generosity to L.A. It is hard to bear sometimes, watching those games.

We thank the Senator from Los Angeles, and you know, Senator, congressional expert is an oxymoron. There really is no such thing, it is like jumbo shrimp, oxymoron, Salt Lake City night life, no such thing.

[Laughter.]

Senator MARKEY. I am now going to recognize a man who was elected to Congress 40 years ago and he has taken the train every single day. I give you an expert, Senator Carper, the Chairman of the committee.

Senator CARPER. Thanks so much. I have shared this story with some of my colleagues before. When my sister and I, we were born in West Virginia, a coal mining town, Beckley, and even after we moved away we would go back and spend our summers and visit our grandparents, our cousins and all.

One of our grandparents, my dad's parents, lived along a railroad track. We would almost faithfully every morning, when we were staying with those grandparent, about 10 o'clock in the morning, a freight train would come through. Probably not even as far as from here to that wall back there. My sister and I would stand at a fence that separated the rail track and my grandparents' house. We would stand at that fence, and as the train got closer and closer, we would try to get the attention of the engineer by jumping up and down and pumping our arms, so that he might blow his whistle and recognize that we were alive.

One particular day this happened, and not only did he blow his whistle, but he stopped right in front of the house, I mean like right in front of the house. Off the train comes my grandfather, our

grandfather, opens the gate and takes us by the hand, both of us, puts us up on the train, and we take off. It seemed like for about 500 miles, it was about 50 feet, maybe 500 feet.

The train stopped, and my grandfather helped us get off the train and said, run back to the house, do not tell your grandmother.

[Laughter.]

Senator CARPER. We ran back to the house, Grandma, Grandma, you will never guess what Grandpa did. She said, oh, no he didn't do that, he'll go to jail. If he did it today, he would go to jail. We might go with him.

Anyway, my involvement with trains started at an early age, and my interest continues to this day. I rode down this morning in Amtrak to get here.

I want to thank our chairman for holding the hearing today. Rail continues to be a key component of our U.S. transportation infrastructure and is the most fuel-efficient mode of surface land transportation that I think we have. I have used it for years.

To ship by rail a ton of freight from Washington, DC. to Boston, Massachusetts, it takes about a gallon of diesel fuel. That is pretty good for the economics. I am told by the barge people that sending stuff on barges can be even more fuel efficient, so they probably have something to say there.

In everything we do, I think we ought to try to do better. The same is true for reducing emissions from all kinds of vehicles, including trains in our Country. Rail yards in particular often have a much higher density of local emissions. Reducing emissions at yards seems like low-hanging fruit when it comes to improving public health and climate outcomes.

I have a question for Ms. Torres that relates to this, and them maybe one for Mr. Rosen as well. Ms. Torres, where are you?

Ms. TORRES. I am here, in San Bernardino, California.

Senator CARPER. You are in California?

Ms. TORRES. San Bernardino, California, yes.

Senator CARPER. Good. Thanks for joining us. Could you briefly elaborate for us on the disproportionate health and economic burdens that are faced by communities near rail yards? Go ahead and then I have a second half.

Ms. TORRES. Thank you for that question. Yes, for communities living by rail, kind of as you, you were growing up by a rail line, thank you for sharing that story, there is at least more than 90 percent of diesel exhaust, what I talked about earlier, particulate matter that is coming into our communities, not only from the rail line or rail yards, but what we like to call cumulative impacts as well.

When we talk about the locomotives that are coming and are idling for more than 30 minutes, that is 30 minutes of direct exposure of diesel particulate matter that community is suffering with. That is leading to cancer, cardiovascular—

Senator CARPER. I am sorry, I am being summoned to come to another hearing. The Finance Committee is meeting right now, we are having a live vote and a business meeting and they need my presence to come and vote with respect to pharmacy benefit managers. It is a big issue and I have to go.

I am going to ask you to respond to the question for the record. Mr. Chairman, I have a couple of other questions for Mr. Rosen, and I apologize profusely. I have been here for a long time and still have not learned how to be in two places at once.

[Laughter.]

Senator CARPER. Thank you all. This is really important stuff, and I am grateful that you are holding this hearing.

Senator MARKEY. He is not ubiquitous, but he is omniscient.

[Laughter.]

Senator MARKEY. Now we will go back to the non-expert part of the hearing. I recognize Senator Ricketts for another round of questions.

Senator RICKETTS. Thank you very much, Chair Markey.

What I would like to do is for the record submit this letter from the diesel folks.

Senator MARKEY. Without objection, so ordered.

[The referenced information follows:]

Senator RICKETTS. Thank you very much.

I would actually like to talk a little bit more about what my colleague from California was talking about with regard to the renewable fuels, and just hit upon again how I think this is an area of common agreement that using more renewables is something that will help us reduce emissions, whether we are talking about biodiesel or renewable diesel, and the failure of the EPA to actually establish the renewable volume obligations at a level that we actually already produce in the industry today.

What that does is it discourages more investment. In Nebraska, we have a soybean crush plant that is being invested in North Fork, and another one in David City. The industry was making those investments. Now I am told with these renewable volume obligations that the EPA is failing to show that it even actually lives up to what we are doing already, we are going to see a curtailment of the types of investments like we see in North Fork and David City.

If we want to see more renewable diesel and more biodiesel, we are going to have to have the EPA collaborate on renewable volume obligations so the industry will continue to invest and be able to make sure that we have more available to be able to use. I think that is one of the things, as the Senator was talking about, we do find agreement, we may not agree exactly on how to implement it, but we certainly agree that encouraging more renewable fuels is something that is going to be important.

One of the things I would like to hit upon, and Ms. Torres, I didn't get a chance to ask you, but if you knew, on that whole electrification, the catenary system, are you aware of anybody who has done some work, some pencil and paper work, on what it would take to be able to power that if we were to going to go down that path?

Ms. TORRES. For the United States, not the exact numbers. We do have numbers that show it would be transitional, very feasible. That is in my written testimony.

Senator RICKETTS. OK, great. Thank you very much. I appreciate it.

Now, one of the things that I wanted to hit upon is, when you are talking about your members considering the purchase of a new locomotive, Mr. Jefferies, can you give us some insights on some of the specifications that they are considering when they think about, OK, it is time to buy a new locomotive? What is the process? What do they consider? How do they do that investment?

Mr. JEFFERIES. Well, first and foremost, demand. You have to have something to move with that locomotive. The market has to drive those investment decisions. I am certainly not going to represent myself as having any sort of authority or expertise on the individual investment decisions that each of the railroads makes. Obviously, that is their prerogative.

You need to look at one, capability, does the locomotive have the ability to haul heavy freight long distances? What is the role of the locomotive, is it to be used in yard, is it to be used locally, is it to be used out on the national network for long freight? Do you have the ability to charge it, to power it appropriately?

Really, we are looking at 40-year assets. It is just like when we engage in infrastructure investment on the network. If you are taking a single track and you are double tracking that, that is an investment that has to be, the return on that occurs over decades and decades and decades.

These are very significant investments for very long periods of time. As we sit here today, railroads are investing upwards of over a billion dollars. I know one railroad, retrofitting, modernizing 600 locomotives, many of which I believe are being done by the company that Mr. Rosen's works at. That is over a billion-dollar endeavor. That is going to result in lower emissions of all kinds.

Senator RICKETTS. You mentioned, though, that somebody had ordered the battery electric locomotive and only was able to get half as many as they ordered. Can you talk more about what is the cause of why they could want to order batter electrics and not get them delivered?

Mr. JEFFERIES. I think it was due to battery availability that one of the OEMs was running into challenges with. Again, that is kind of how the process works at the outset.

The encouraging thing is, I think we do see a future there. One of my railroads had a long-term project that had a battery electric working with diesel out in revenue service, a proof of concept. The results were favorable. The progress continues, and the work continues. I think it is important that we keep an all-of-the-above strategy, whether it is renewable fuels, whether it is battery electric, whether it is hydrogen, whether it is alternate means, that allows us to continue to do R&D to identify what the best long-term prospects are. Again, keeping in mind that it is an interconnected national network where everyone's system needs to be able to function with the others in a seamless manner.

Senator RICKETTS. Thank you. Thank you, Mr. Chairman.

Senator MARKEY. Thank you, Senator.

When I was a boy, I still live in the very same place, but when I was a boy, one block from my house to the left of our house was the electric trolley that went into Boston from Malden, all day, every day. We didn't have air conditioning, so especially in the summer it was like the sounds of the night was hearing those trol-

leys go in and out, electric trolleys, by the way. We had already invented the future and then tore it down and had diesel buses instead take people into Boston from Malden.

On three blocks the other side of my house were the railroad tracks for the freight and the commuter rail to go from Boston to Lawrence and beyond all day long, every single day. The sound of trains on both sides of my house, just so many nights I would just go to sleep listening to those trolley cars.

I think everyone has a train story in their life. It was a big part of my life, that is for sure. The question really is, how quickly can we move to this new era.

I think what I heard was that the industry invests \$23 billion a year in infrastructure. I think that is what I heard you say, Mr. Jefferies. You are proud of that. That would be \$230 billion in investment over a 10-year period.

The new locomotive engines cost \$4 million, not billion, \$4 million, and a \$230 billion investment over a 10-year period. That is investment that you are already making.

A reprioritization would clearly get a big payoff in terms of reduced emissions and this transition to the new technology. That is what is kind of hard to understand, the funding is clearly there. I guess when I look at that very simple arithmetic, it is not calculus, it is not trigonometry, it is just \$4 million for an engine, and \$230 billion that you are going to invest otherwise.

What percentage of that could be dedicated to this new mission?

Mr. Rosen, again, why does not the railway industry want to make this transition? What is their problem?

Mr. ROSEN. I will add another piece of simple math I have just done in my head while sitting here, having heard earlier that the lifespan of a locomotive is up to 40 years. That means that 2.5 percent of the fleet has to be replaced every year. There has been 8 years since the new standard.

Senator MARKEY. Good point.

Mr. ROSEN. Eight years times two and a half is 20 percent right there. What they have been doing is upgrading very old locomotives which allows them to keep them at much lower standards, as you heard Ms. Torres explain, rather than moving to the newer ones. It is a simple reason, it is greed. It is a little cheaper, at least in the short run, at least in what they can show on their quarterly statements, than buying the new locomotives which will actually make a real difference in people's lives in this Country and will for a long time to come.

Senator MARKEY. According to my, I do not even call it math, it is just arithmetic, the industry makes about \$20 million a day in net profit, \$20 million in a day. If you just took 1 day's, that is five new trains, five new electric engines. Take 2 days, you get 10. Is that asking for too much out of the profit of an industry that they move in that direction?

What you are saying is, it is not benign neglect, that Senator Moynihan used to talk about when he was in the Senate, this is more designed neglect. They have a plan not to do this, not to upgrade, even though the technology is there, even though the rest of the world is moving rapidly technologically on all fronts. The railway industry is stuck back in this ancient era.

I love the sounds of the trains from my youth. I can not believe that those same trains are still running on the tracks, and that 2.5 percent every year have to get replaced, and they are saying, we are not going to replace them.

Again, you just come back, I guess it is a profit motive, is that all it is, Mr. Rosen?

Mr. ROSEN. I believe the railroads are in business to make profit, not to move transport. They move transport in order to make profit. This is a fundamental issue. It is the way our economy is structured. If we are going to have an economy structured that way, the government has to intercede in order to make sure they do what is needed by the greater society. They are not structured to worry about the society.

Senator MARKEY. The society, of course, does suffer. We know that there are higher asthma, cancers, the closer you are to anything that is emitting these greenhouse gases.

A fact sheet published by the Association of American Railroads states that the cost of converting half of the existing locomotive fleet to catenary rail would be \$100 billion. Martin Oberman, who is the chair of the Surface Transportation Board, in a speech to the North American Rail Shippers Association in 2021, said Class One railroads have taken home an astounding \$183 billion in buybacks and dividends since 2010.

That is money not spent on safety, not spent on workers, not seen as cost savings to consumers. That is just money that goes back to the shareholders.

Again, Mr. Rosen, why can not that money be used to invest in electrification? I will ask you, Mr. Jefferies, why can not a certain percentage of that money be used for electrification? Mr. Rosen?

Mr. ROSEN. We would certainly say that it not only can be, it should be. If the railroads want to maintain themselves as private profit-making businesses, then they have to get a lot more responsible and have to stop standing in the way of what the society needs. If not, maybe we do need to look at the alternatives that have developed in many other countries, where because it is long-term investments involved, it has been decided it is going to have to be done on a national basis, and there has been nationalization of the railroads and other industries.

I do not think that is what the railroads want to see. If they do not start acting responsibly, I think it is what the people of this Country are going to demand.

Senator MARKEY. Again, Mr. Jefferies, I have a nostalgia for the past, but at a certain point in time it has to be replaced with a vision for the future. That vision has to be articulated by every American industry, knowing how serious climate change is and what the response is going to be. Especially if there are non-greenhouse gas emitting engines that are available and can be manufactured.

My question to you is, that is a lot of dough. That is a lot of dividends. From my perspective, why can not that money be used to invest in electrification, Mr. Jefferies?

Mr. JEFFERIES. To go back to the beginning, it is average \$25 billion a year in private investments, so you are right, over 10 years, \$250 billion, and the result of that is the Nation's highest-rated in-

frastructure of any type. If my colleague wants to nationalize the rail network, I would just say take a look at the American Society of Civil Engineers' grades of publicly owned infrastructure, which pales in comparison to the grade it gives the Nation's freight railroads.

Senator MARKEY. I do not want to get into a debate about nationalization. I want to get into a debate about why can not a much higher percentage of that \$250 billion go over to \$4 million locomotives that are all ready? Why can not that happen? Why can not the industry just say, we are going to make a commitment to doing that because we want to pay our fair share in reducing the danger that greenhouse gases play, and especially the other emissions that go into the neighborhoods where the trains go by?

Mr. JEFFERIES. Forty percent of long-haul freight, less than 2 percent of transportation related emissions. Again, we are not saying that is good enough. There is more work to do. That is why we have railroads investing over a billion dollar in new locomotive technology. That is why we are deploying and exercising battery electric out in revenue service. That is why we are putting battery electric switcher locomotives in yards. That is why we are using zero-emissions cranes.

Is it going to happen overnight? Absolutely not. Even if we could flip a switch, the production capacity is not there.

To suggest that there is some sort of willful negligence, I think is frankly irresponsible, when you look at the environmental profile of the industry and the investments that are made compared to practically every other industry as a percentage of revenue.

To be clear, I think we all have the same goals here.

Senator MARKEY. I am just saying, every other industry is moving and they can articulate the plan. Electric has to be our future. By the way, electric is the industry's past. It is not like you do not know how to do this if you want to do this. It is just that you are kind of stuck in neutral on this.

Mr. JEFFERIES. Every one of my railroads has emissions reductions initiatives, science-based target initiatives, including net zero emissions within the coming decades. The commitment is there, the effort is there.

Senator MARKEY. The commitment to electric trains is not there. That is the future. It will be the future of the world. We have workers ready to make them right now, and the engines are there ready to be—

Mr. JEFFERIES. I think we would respectfully say that it needs to be a multi-pronged approach.

Senator MARKEY. Oh, I get it. We do not want to take out your other prongs. We just want you to add this prong. We do not know why you are taking out the electric prong.

Mr. JEFFERIES. I think our testimony reflects that it is absolutely part of the strategy. Maybe we are not buying—

Senator MARKEY. No, you are not.

Mr. JEFFERIES [continuing]. more than you would like, the production capacity has to be there, it has to make sense, it has to work, it has to move freight, we have to be able to serve customers, we have to be able to serve communities.

Senator MARKEY. It is just a technologically retrograde industry. It is not moving to the future of technology. You are doing OK, but that is not what this era calls for. The ocean off of Miami Beach is 100 degrees right now.

Mr. JEFFERIES. They should be moving more by freight rail.

Senator MARKEY. Canada is on fire. Greece is on fire. It has been above 110 degrees in Phoenix for the last 4 weeks. Everyone else is paying attention to it. We just want the board of directors of your association to pay attention to it, too, and say, let's go back at the table, let's look at these engines, they are there, workers are ready to go, technology is ready to go, and we are just going to up our share of commitment to it. You just seem to be saying, no, we are not going to.

Mr. JEFFERIES. That is absolutely not what I am saying. The commitment is there.

Senator MARKEY. A commitment to a much higher share of all-electric trains? Is that what you are saying, the commitment is there?

Mr. JEFFERIES. I am saying, look at the investments, read my testimony.

Senator MARKEY. You are not saying that. You are saying that, we have a multi-pronged approach to avoid the central question of this era, which is electric, are we moving there, are we going to do it. Here, it is not like we are waiting for Elon Musk to show up, it is already there ready to go. It is an existing technology.

The Senator from Wyoming, I apologize for going on.

Senator LUMMIS. Thank you, Mr. Chairman.

Mr. Jefferies, can you explain to me what the current commercial readiness is of zero emission locomotives?

Mr. JEFFERIES. I will say we put battery electric out into revenue service with R&D with support of diesel locomotives. We have been pleased with the returns on that R&D demonstration programs. We have deployed and purchased battery electrics, waiting on those to be delivered. Some have gotten into yards. Absolutely see promise there.

Widescale production to replace thousands of locomotives is not a capability.

Senator LUMMIS. How long would it take, reasonably based on today's current commercial readiness, how long would it take to replace all diesel locomotives with electric? How many decades?

Mr. JEFFERIES. I would venture multiple decades. If you could flip a switch and the capability was there, yes.

Senator LUMMIS. Have you done cost-benefit analysis, knowing that your emissions from rail collectively are about 1.7 percent of all transportation related emissions of greenhouse gases, have you done a cost-benefit analysis for comparing rail to automobile to airlines in terms of the benefit compared to the cost of doing these kinds of conversions to electric?

Mr. JEFFERIES. I opened the hearing by saying, and I think you hit the nail on the head, that 40 percent of long-distance freight, less than 2 percent of transportation emissions. You want to reduce emissions right now, move more goods by freight rail.

Senator LUMMIS. Regarding California's Air Resource Board's move toward a regulation that would ban freight rail industry from

operating a large portion of their locomotives in California based on its age unless the locomotive is zero emissions, how would that regulation impact the functioning of the national network and short line railroads?

Mr. JEFFERIES. Well, national rail network is the key. It is an interconnected national network that operates in interstate commerce, not strictly within the bounds of one State. That is why our regulations and the rules which we operate under are done at the Federal level. States do not have jurisdiction to determine the fate of our industry in interstate commerce.

With that, you also need to have the capability of doing, back to your first question, of a conversion. If you are going to require a zero emissions locomotive right now, you have to have the capability to produce that at scale. That does not exist. We need to get there.

I think we are all collectively working toward this goal, while it may not sound like it today. Again, we are proud of our environmental profile. We have more work to do, and that is why we are committed to doing that work and making the related investments.

Senator LUMMIS. Do we have enough solar and wind related electricity to handle an entire fleet of locomotives that are zero emission, run on electricity?

Mr. JEFFERIES. I certainly can not begin to answer that question. I know that the additional capacity required would be fairly dramatic.

Senator LUMMIS. We have learned recently that the greenhouse gases that are emitted just in order to manufacture solar energy is three times more than the United Nations originally thought. Do you think that should be factored into the total emissions of greenhouse gases and the sources of them?

Mr. JEFFERIES. Senator, I can only focus on my industry, and our efforts to reduce emissions. I think you are hitting on a broader question that is for folks to debate who are bigger experts than I by every stretch of the imagination. Certainly, we need to be aware of the broader impacts of policy decisions and not have on blinders.

Senator LUMMIS. Mr. Rosen, in your written testimony you noted that over 75 percent of Class One railroad fleet was a Tier 2 locomotive, or an earlier model. With those locomotives being ineligible to operate in California soon, won't that result in a shift away from rail and to other modes? How would we get from the Long Beach Port to unload goods, how would we get that to the border of California and Nevada without rail?

Mr. ROSEN. Well, we won't. What you will see is that the locomotive manufacturers in this Country will actually start generating locomotives again. Right now, they are not being ordered.

The facility my union represents in Erie, Pennsylvania has a capacity, without any expansion, they have done this in past years, of 1,000 locomotives a year. We are probably a little over half of the total capacity in the Country right now. It is a little hard to tell, because everybody else is just flat on their back because the railroads have not been ordering new locomotives. They have not been ordering Tier 4 locomotives, which is why the numbers are so low.

It is an outrage. That could be done. They could have been doing it all these past years, as we have been discussing here. When there is demand, you get supply. The same will be true in terms of being able to move over to, to the extent there is a holdup on battery locomotives because of batteries, I think you are seeing that enveloped in a number of industries. You are also seeing huge investments going on right now in part through programs that Congress funded, and you are going to see a tremendous expansion of capacity for producing batteries over the next couple of years.

Senator LUMMIS. Well, I will tell you, being from Wyoming, I do not mind admitting that I am getting a little resentful of California not wanting to look at industrial-scale wind farms, because it destroys their viewshed. They are perfectly willing to destroy the Wyoming viewshed with as many industrial scale windfarms as we can get transmission lines from Wyoming to California.

It is interesting that the people who demand wind and solar energy do not want the industrial-scale energy produced in their State. They want it produced in my State. I am getting to the point where I am a little sick of it.

That is it. Thank you, Mr. Chairman. I yield back.

Senator MARKEY. Thank you, Senator.

One argument against strengthening rail standards is that it will push more goods to be transported by trucks. However, we are strengthening the standards for our heavy-duty vehicles at the same time. It stands to reason that railroads shouldn't be left to lead the race to the bottom. Everyone else is increasing their standards, we are promulgating regulations for everybody else. California is doing that as well. The railway industry wants to be on the side.

Ms. Torres, the rail industry claiming that moving freight by rail is more efficient than move freight by truck, is that going to remain true in California, especially considering the recent agreement between the State and truck manufacturers to create a path to achieve 100 percent zero emission truck sales?

Ms. TORRES. As of this year, it will be cleaner and healthier for communities to transport by trucks. Unfortunately, rail is falling behind, its negligence to invest in zero emissions technology that is already here.

We are not against rail or the freight system. We just want to electrify it to have some relief to our communities that are exposed to these carcinogenic diesels.

Senator MARKEY. You believe, Ms. Torres, that it is possible to address emissions from both heavy-duty trucks and from locomotives at the same time?

Ms. TORRES. Yes, it is. It is very possible and very needed to address both of those measures, not just looking at the greenhouse gases, but the health aspect, too, of what we call air pollutants.

Senator MARKEY. Absolutely.

Mr. Rosen, are the railroads buying green locomotives at a rate that is maxing out your production?

Mr. ROSEN. We are in the single digits, when we could be producing 1,000 of Tier 4 and some mix within that of green locomotives that are not being completely non-emitting. Again, replacing the worst that is out there right now with Tier 4 as a stopgap

while we make the bigger transition is well worth doing. They need to make up for lost time by doing that. We could be starting to get a lot of the green locomotives out the door, and the orders are not there.

Senator MARKEY. Ms. Torres, could you briefly elaborate on the disproportionate health and economic burdens faced by communities near rail yards? Ms. Torres, could you hear my question?

Ms. TORRES. Yes, sorry, the hardware world, my apologies. Communities of color and low-income communities are the ones who deal with the diesel emissions at higher rates, both particulate matter and NOx. It is not just the diesel coming from the locomotives, but diesel coming from switchers that are as old, older than us in the room.

The equipment that is being used in the rail intermodal facilities in the port, I know folks have mentioned that there is work to get those into low emissions. The technology has been there for a lot of that here to be zero emissions. That could be something that eases a lot of that burden on communities. Not only are we seeing those impacts, like I mentioned, there is the noise, the light.

Many of you all know, living by rail lines and rails that are still not looked into, a lot of our community grows vegetables and fruits. We do not know what is being contaminated by the diesel over the years going through their yards, if there is water pollution or soil pollution. Unfortunately, if the data is out there, we do not see it. We do not see data from the rail yards.

As of now, what is known is the air quality impacts, because we have done that research. I would love to see the rails' research on all the other impacts.

Senator MARKEY. Yes. We know it is real. When I was a boy, I grew up in Ward Two in Walden. Every city has an environmental sacrifice ward. I grew up in that Ward. Trains were on one block this side, three blocks the other side. The Malden River was three blocks, and the train rode right next to the Malden River.

Right next to the Malden River was also the coal company, the chemical company, every Converse All-Star was made right along the Malden River. There was always a big cloud over Ward Two with all the factories spewing toxics going up into the air.

When you are 10 years old and your mother says, Eddie, whatever you do, do not swim in the Malden River, it made a lot of sense when you looked at it, because it was black with a pre-Jimi Hendrix purple haze over it.

I knew I wasn't Tom Sawyer on the Mississippi. I knew that. I also knew that I lived in that Ward. Ward Three wasn't like that, Ward Five wasn't like that. There were nice, tree-lined streets. Ward Two, we had a different life. Trains, polluted river, factories.

Obviously, the health consequences were run by people who lived in Ward Two, not Ward Three, not Ward Five, Ward Seven. It was right there in Ward Two. We all know this now, in retrospect, how obvious that was. We can not use a river as a dumping ground for all this stuff. You can not use the air. You can not use the land to do it.

I guess, Mr. Jefferies, that is all we are really saying to your industry. You just have to move with the times, you have to move with them. Electric is the future. We have to move much more sub-

stantially toward the mitigation of the harms which are run by those people who live in the environmental sacrifice zones. That is where your trains are, that is where the diesel trucks are. Across the board, we are trying to solve that problem, because we know that there are higher levels of asthma and cancers that people suffer from.

While we know you have to have a bottom line and returns to shareholders, there is also a responsibility to deal with the consequences of the way in which you move your trains around the Country. This is just going to be a spotlight that is going to increase in its intensity on your industry, Mr. Jefferies. That is all I want to tell you. It is not going away. Everyone else realizes that the time has come, the jig is up, we have to do something here to protect those people who live in those areas.

Increasingly, even in Ward Two, they are now more Black, they are more Brown, they have replaced the families that have already moved on to Ward Three and Ward Five and Ward Seven. That is really the challenge, these people who get left behind and suffer the consequences of it. We shouldn't accept that.

We just hope your industry will go back and reevaluate this obstinate, obdurate opposition that you have, and denialism that you are bringing in terms of your goals. There is so much more than you could do and do it in a cost-effective way.

Let me turn to you, Senator Ricketts.

Senator RICKETTS. Thank you very much, Mr. Chairman.

Mr. Jefferies, it was referenced about the \$25 billion that your industry invests on an annual basis, or the \$250 billion over 10 years. Is that investment entirely locomotives?

Mr. JEFFERIES. No, it is throughout the network, the infrastructure, equipment, et cetera.

Senator RICKETTS. What are some of the other things that you have to invest in to run a railroad?

Mr. JEFFERIES. A hundred and forty thousand miles of rail, ballast, ties, tunnels, bridges, technology.

Senator RICKETTS. You are saying there is other infrastructure there, like, let's just take the rails. That seems like it is a pretty big job to invest in the rails to try to keep it as safe as possible, right? I know the railroads invest in additional technology to try and find defects in the rails, is that right?

Mr. JEFFERIES. Absolutely.

Senator RICKETTS. You have to replace parts of the rails all the time, right?

Mr. JEFFERIES. Absolutely. There is core maintenance and there is CapEx expansion.

Senator RICKETTS. That is a significant part of that investment we are talking about, is that fair?

Mr. JEFFERIES. One hundred percent. We are one of the most capital intensive industries out there.

Senator RICKETTS. The same thing for the rolling stock, not just the locomotives, but you have to have the cars to go along with it, is that right?

Mr. JEFFERIES. Certainly, absolutely.

Senator RICKETTS. You are investigating new technology to try and make those safer all the time, again, looking at and fixing

wheels and things like that, and that all costs money as well, that is part of that investment? Is that right?

Mr. JEFFERIES. Of course, yes. Absolutely.

Senator RICKETTS. It is not just into locomotives that you are investing in, that is fair. It is just part of the overall mix of all the things it takes.

Mr. JEFFERIES. It is part of the portfolio, absolutely.

Senator RICKETTS. We also talked about the investment returns going on here, do you happen to know off the top of your head how much, we are talking about all the, we have publicly traded companies, Union Pacific, BNSF, how much of that stock is in the hands of everyday Americans through pension plans and 401(k)'s and stuff like that? Do you know?

Mr. JEFFERIES. I would venture the vast majority.

Senator RICKETTS. When we are talking about your providing shareholder returns, that is actually helping middle-income Americans retire, right?

Mr. JEFFERIES. Absolutely.

Senator RICKETTS. That is part of what we are talking about. Mr. Rosen, when you are talking about nationalizing railroads, I just looked at the example of Amtrak. I do not think that is a very successful standard, or you can look at it on bigger scales, like the Soviet Union, and I do not think that is necessary a solution, getting back to Mr. Jefferies' point about the quality of the infrastructure there.

Mr. Jefferies, also when we are talking about like this battery technology, to your knowledge, has anybody done the estimate of how much we will need to have, how many batteries we will need to have if we were going to totally electrify, use all battery electric?

Mr. JEFFERIES. I have not seen that.

Senator RICKETTS. Nobody has looked at it to see how much lithium, cobalt, graphite, anything like that?

Mr. JEFFERIES. I would say it is a substantial amount.

Senator RICKETTS. It would be a substantial amount. Do you know where those things are primarily mined and processed?

Mr. JEFFERIES. Well, I know a lot of it comes from countries that may or may not have our best interests at heart.

Senator RICKETTS. Absolutely. The People's Republic of China, specifically, I believe the number has about, for example, lithium has about 50 percent of it, mines and processes 50 percent and processes about 60 percent. I know that other rare earth elements it is an even higher percentage than that.

That would make us dependent on our chief adversary in the world. We spent a lot of research and time and so forth with the shale revolution that made us not dependent on OPEC, and now we are talking about putting us, making us dependent on our chief adversary in the world which we know is trying to replace us as the global power by 2049. Xi Jinping has said that, I think we ought to take him seriously on it.

Now we are talking about national security issues if we are going to make ourselves more dependent. Wouldn't it seem reasonable that if people would demand that we go to batteries that we actually have, I do not know, say some sort of inventory of where these

rare earth elements are? Do you know, has anybody done that sort of thing?

Mr. JEFFERIES. I do not, but I absolutely agree. Look, I support battery electric, let's be clear. I also support opportunities to make sure we are acquiring necessary minerals and feedstocks from allies if not domestically. We have the strongest environmental laws of any country; we have the safest worker protection laws of any country on the globe. I do not understand why we wouldn't embrace the opportunity to get those resources from home or from allied countries or friendly countries.

Senator RICKETTS. I just had a meeting today with the Clean Freight Coalition, which actually had many of your competitors and partners in it, talking about some of these standards. One of the things they related to me was that California actually has the oldest trucking fleet in the Nation, because of the standards that they are doing.

You may say that all the new trucks that are going to be sold are going to be zero emission or whatever, but what that, at least in California, the trucking industry has demonstrated, according to the Clean Freight folks that I was talking to today, that they actually, they do not buy the new ones, they actually keep the older ones running around. Maybe for some of the reasons you talked about, you just can not buy enough of them.

I know that talking to some of the trucking companies that it is not feasible right now to run long-haul trucks across the road using battery because it just is not devoted to the charging.

I think your concerns are well founded that we think about how is this all going to happen. If we do want to have a bigger overall plan to address these things, whether it is going to be through electrification or battery electric or whatever it is going to be, somebody actually has to think about this to say, how feasible is this over what period of time before we drive regulations that are going to have unintended consequences, such as maybe what we are seeing here in California with the trucking industry.

With that, Chairman Markey, I yield back.

Senator MARKEY. We are going to conclude the hearing. We are going to give each of our witnesses 1 minute to tell us what you want us to remember about your testimony here today. Then I will turn to the Ranking Member for his concluding statement, and I will make mine.

We will begin with you, Mr. Jefferies, we will begin in reverse order of the opening.

Mr. JEFFERIES. This is a new one for me, at the end of a hearing, to talk.

I think contrary to an observer of this hearing might think from today, I absolutely think we have the same goals. We all want the same outcomes here. I think it is a matter of how we get there and the paths by which we take.

Certainly, I am proud of our environmental profile, I will say it one more time, 40 percent of long-haul freight, less than 2 percent of transportation related emissions. Work continues to drive that down, including other types of emissions as well. We can debate, and we have debated, whether or not our approach is the most desirable approach amongst all stakeholders.

We feel strongly about where we are going. We have made strong commitments and we are going to live up to those commitments and continue to make the investments necessary to meet those commitments. At the end of the day, it is all about making sure we can serve the customers and communities that we operate and we support. We are going to continue to work to do that.

Thank you for the opportunity to be here today.

Senator MARKEY. Mr. Rosen, you have 1 minute.

Mr. ROSEN. Thank you very much, and thank you for holding this hearing today. I think it has been very useful for the American people.

I would say there is a point of agreement here that all modes do need to be cleaned up. Trucks are being cleaned up. There are new regulations coming for heavy trucks, et cetera. We need to have this for rail also.

I also would agree we want to move more off of the roads and onto rail, absolutely. Both passenger and freight needs to be done. It needs to be done with an understanding that rails are going to be as clean as possible.

We just do not see that is going to happen, given the structure of the rail industry, without Federal and State governments taking steps to ensure that it happens. We are in favor of the EPA allowing States to set higher standards. We would really love to see the EPA set higher standards at the Federal level, and we would love to see Congress take action on this overall, and to assist in making sure this happens.

Last, I will say, I am apparently a lot more optimistic, as somebody who has actually spent my life around manufacturing, in the know-how of American companies to build the things that need to be built. I have heard a lot of excuses here as to why things just can not get done. We have good old American know-how. Everything that needs to be done has already been shown it can be done or will be in production very shortly. We should be looking ahead and making sure those get into place.

Senator MARKEY. Ms. Torres, you have the final word.

Ms. TORRES. Thank you all for today. I hope we are committed to working together as Congress, as community members, as the Class One rails, as workers, to move the EPA toward the Tier 5 emissions standards all across the Nation.

We heard it by several folks that it can not just be a State entity doing it. I would also urge EPA and for Congress to urge EPA to allow our [inaudible] in California and to follow that for the rest of our communities in the network and across the 13 million that are working and living, dealing with cancer risk. Up to 22 years of their lives being taken out because we continue to run, again, zero, one and two rail in this Country.

We are not against the rail or the freight system. We are made from that system. We just want to be alive to keep sustaining that system in a more cleaner and electric way. It is the future. We can not allow for only trucks and other modes to move toward electric and zero emissions. We need our rail systems, who have hardly any regulations, to move in that direction. Our communities' lives should not be put into a price.

Thank you.

Senator MARKEY. Thank you so much, Ms. Torres. Thank you to all of our witnesses.

I will turn to Senator Ricketts for a closing statement.

Senator RICKETTS. Thank you very much, Chairman Markey, for holding this important hearing to talk about what the rail industry is doing with regard to innovation and reducing emissions.

I do think it is important that as we think about the regulations that we do not do things that are going to have unintended consequences. While I am very confident in American know-how and ingenuity, we have to be able to plan. The reason we are successful is because we plan to be successful, not because we throw out things and see if it can happen.

In fact, when you talk about the heavy trucks, in my conversations with Michael Regan at the EPA and Joseph Goffman, there has not been done any planning to figure out how we are going to address some of the issues, like two 8,000-pound batteries in a truck that is hauling freight which cuts its freight capacity in half, which means then you need to have twice as many trucks and twice as many truck drivers, when we have a shortage of truck drivers as it is.

I think there are issues that have to think through and be reasonable about what kind of timeframe we can actually expect. I think that is one of the things we found for the rail industry here today, is that while we all broadly have the same goal, reducing emissions, how we go about it and what kind of regulations are put in place to do that will have unintended consequences that could have adverse effects that need to be thought through and planned out.

With that, Mr. Chairman, I will turn it back over to you.

Senator MARKEY. Thank you, Senator.

I am just going to followup for a second on what Mr. Rosen commented on earlier. This is a very, very profitable industry. Very profitable. Rail has a 41 percent operating margin, 41 percent operating margin. Incredible. Seven billion dollars in net profit per year. Great business to be in 2023. It costs \$ million per new electric train.

A profit is really only what you have after you have already made all your necessary expenditures. Then what is left over is your profit.

If you decide to not invest in non-polluting electric trains, if you decide to just stick with those trains that are polluting, that is a decision. Therefore, your profits are higher.

On the other hand, if instead of \$7 billion a year, incredibly profitable industry, the industry only made \$6 billion a year but took \$1 billion, put it into electric trains every year, that would be 250 new engines every year, 2,500 over 10 years. Just \$1 billion less in profits per year. Then the industry would be saying, well, that is the cost of doing business, then we take our profits after that.

It is a conscious decision which the industry has to make. I understand that there is going to be decisions that are made that are just totally, let's max out in terms of our own financial benefit, we who are the owners of the company, we who are running the company, we who are the principal beneficiaries of the wealth that is created by the company.

There are other responsibilities as well. A responsible industry would say, yes, we know we have to do something about this, we are part of the community as well. We can still get incredibly rich and reduce the harm that is caused to other people who live nearby.

I am a technological optimist. I believe we can do this. I believe that it is all there for America to be the lead. I believe in American innovation. I believe in American ingenuity. I believe in the American workers. I believe they can get this done for us.

I think that today we not only illustrated the problem, but illuminated the path forward. We need to modernize our emissions standards for locomotives to clean up our air, to protect the health of rail workers and communities and to revitalize American manufacturing and good union jobs.

I ask unanimous consent to enter into the record additional materials submitted by our witnesses and stakeholders and other Senators that relate to today's hearing.

Without objection, so ordered.

[The referenced information follows:]



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**Railroad Employees National Health and Welfare  
Plan and  
National Railway Carriers and United  
Transportation Union Health and Welfare Plan**

**Marketplace and Actuarial Assessment  
Unions' Proposal  
vs.  
National Carriers' Conference  
Committee's Proposal**

**Produced by Cheiron  
July 2022**

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***Letter of Transmittal***

July 20, 2022

Presidential Emergency Board 250  
1301 K Street NW, # 250E  
Washington, DC 20005

***Re: Marketplace and Actuarial Assessment of the Unions' Proposal vs. the National Carriers' Conference Committee's Proposal***

Dear Presidential Emergency Board 250 Members:

This report presents our analysis of the health and welfare sections of the Unions' proposed changes vs. the National Carriers' Conference Committee's proposed changes for the Railroad Employees National Health and Welfare Plan, GA-23000 ("National Plan") and the National Railway Carriers and United Transportation Union ("UTU") Health and Welfare Plan, GA-690100 ("NRC/UTU Plan").

This report is organized in the following sections:

- Section 1 provides a summary of all our analyses followed by four sections that provide the details of our analyses.
- Section 2 reviews the historical trends of the Railroad Employees National Health and Welfare Plan (the National Plan) and the National Railway Carriers and United Transportation Union Health and Welfare Plan (the NRC/UTU Plan), together we refer to them as the "RR Plans."
- Section 3 compares the RR Plans to other health and welfare plans in the rail and transportation industry.
- Section 4 explains how railroad work is not mainstream work, and the working conditions contribute significantly to higher health care costs.
- Section 5 provides our in-depth analysis of the Unions' modest health and welfare proposal vs. the NCCC's proposed significant modifications to the RR Plans. This section further explains from an actuarial perspective the financial risks for both the Carriers' and the Unions' proposals.

***Uses and Disclosures***

This report was prepared exclusively for the Presidential Emergency Board 250 Members for the purpose of resolving the dispute between certain railroads represented by the National Carriers' Conference Committee of the National Railway Labor Conference and their workers represented by certain labor organizations. Other users of this information are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

In preparing our report, we relied on information (some oral and some written) supplied by the National Plan and the NRC/UTU Plan and their Business Partners. This information includes, but is not limited to, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.



Presidential Emergency Committee  
July 20, 2022  
Page ii

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this letter. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

Sincerely,  
Cheiron

  
Karen Mallett, FSA, MAAA  
Vice President and Principal Consulting Actuary

  
Gaelle Gravot, FSA, MAAA  
Principal Consulting Actuary

  
Christopher Ludwiczak, FSA, MAAA  
Consulting Actuary

  
Amul Shah, M.D.  
Clinical Researcher and Senior Actuarial Analyst

**SECTION 1: EXECUTIVE SUMMARY**

Based upon extensive research and analysis of benefits and costs associated with health care coverage in the Freight Rail industry, we find that the current benefits in effect since 2019 and during the pandemic with modest enhancements will continue to offer competitive coverage that is critical to the ongoing health status of the Railroad workers. In turn, such coverage is critical in serving and supporting the quality service mission of the Carriers for freight rail service in the United States.

Further, the current plan design with minor enhancements as proposed by the Unions will support the regular care requirements of the workers and their covered dependents without disrupting the utilization patterns, in particular as the country recovers from the pandemic. Introducing large barriers to care with large increases in worker cost sharing as proposed by the NCCC will compound the already fragile recovery from the pandemic in terms of Railroad workers further deferring critical care that will increase the RR Plans' costs. Having stable, non-confusing changes to the RR Plans supports utilization of important medical and physician services to detect and treat early health conditions so prevalent in this workforce.



Strong health care coverage promotes strong health and a strong workforce, a critical asset in the rail freight industry, which is a mutually beneficial result for both the Carriers and the Union workers and their families.

***Highlights***

Below we summarize key observations from each section of this report.

- As context for evaluating the NCCC's proposal to markedly increase workers' cost share of health benefits, we studied the Carriers' historical costs, which in fact have been decreasing for many years, as summarized below.
- The Carriers' 2021 cost (without adjusting for inflation) was 4.7% lower than their 2015 cost seven years ago. [See purple line in Chart 2.10]
- If we adjust for inflation (i.e., CPI-U), the Carriers' cost decreased 7.3% over the last 21 years. [See Chart 2.5]
- If we adjust for medical inflation (i.e., CPI-M), the Carriers' cost decreased 24.3% over the last 21 years. [See Chart 2.5]

**SECTION 1: EXECUTIVE SUMMARY**

- These lower costs are largely driven by workforce reductions resulting in 36.7% fewer Qualified Employees (i.e., active workers) in 2022 than in 2001, or an average decrease of 5.6% per year since 2015 [See Chart 2.4].

In **comparing to other plans**, we maintain that these two RR Plans offered to Railroad workers represented by the 12 Unions are truly the benchmark for the RR Freight Industry. If we want to broaden our comparison to other rail and transportation plans, the current RR Plans are in the lower half of benefits value provided by this broader industry. Details reveal:

- In looking at 12 rail and transportation plans for which we could get data, the Plans rank 8<sup>th</sup> in terms of Actuarial Value. (Note: The Carriers use the term actuarial value to mean what United Healthcare refers to as Adequacy of Benefits. For the Carriers' definition, it means if the workers' portion of the cost is subtracted from the Plans' Allowable Charges what amount remains to be paid by the Plan or other payers.)
- When considering how much is paid by "other plans" via coordination of benefits for the RR Plans, we see that the Carriers are really paying less than 85% of the RR Plans' allowable cost. This is far lower than what the NCCC refers to as "mainstream" Actuarial Values.
- In looking at surveys of "mainstream" employers' plan costs, we find that the mainstream employers' costs increased by 207% over the last 20 years, more than double. However, in those same 20 years, the RR Plans have only increased 46%. This means that the "mainstream" plans increased 161 percentage points more than the RR plans in 20 years.

The **working conditions of Railroad workers** include exposure to harmful chemicals, an outdoor environment, varying shift work, and regular overtime, **none of which are mainstream working conditions**. We provide clinical studies that show these working conditions affect the health status of the Railroad workers and contribute to higher-than-average costs per person. In our analysis, we identified the Plans' highest cost drivers and find they are directly correlated to the railroad working conditions. It also explains why health care benefits are so important to all 12 unions and their members.

Finally, we **compare the Unions'** modest coverage improvement health and welfare proposal **to the NCCCs'** significant cost-shifting health and welfare proposal. The Unions are requesting only two modest benefit improvements:

- Hearing benefit to be increased from having a maximum annual plan paid benefit of \$600 to \$2,000. The \$600 limit was put in place in 2003. This modernized benefit will help improve workers' quality of life, work productivity, and safety.
- Add Applied Behavioral Analysis for children with autism and remove the speech therapy age limitation, currently age three. This benefit is considered the clinical standard of practice for treating autism and would likely be required to comply with mental health parity.

**SECTION 1: EXECUTIVE SUMMARY**

The NCCC's proposal is requesting savings from many places including:

- Cost-shifting such that **workers' costs increase over 60% in 2023!**
- Cost-shifting such that the **workers' monthly premiums/contributions increase nearly 28% in 2023!**
- Additional pharmacy rules resulting in workers to either:
  - wait for the pharmacy benefit manager to go through and question the patient's doctor or
  - use a drug their doctor feels is less effective or
  - pay out-of-pocket (if they do this, it is not even considered in the actuarial value)
- The Unions welcome the benefit improvement for dental, vision, and hospice coverages in addition to the requested hearing, ABA, and speech therapy benefits offered by NCCC, but in no way do the improved benefits justify any of the cost-shifting or program changes the NCCC have proposed. To put it in context, all the benefit improvements combined cost just under \$12 million, while the cost-shifting and program changes result in nearly \$280 million in annual expense being transferred to the Railroad workers. [See Table 5.2]

We continue in Section 5 to show that neither the Union's nor the NCCCs' proposal will have a significant impact on the Carriers, but the **NCCCs' proposal will have a devastating impact on many of the railroad workers.**

The Union workforce costs and the benefits programs are essential expenditures, and instead of proposing cuts/savings, the programs ought to be continuously supported as a most essential part of the health and productivity of rail workers and the freight operations they deliver.

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

**Introduction**

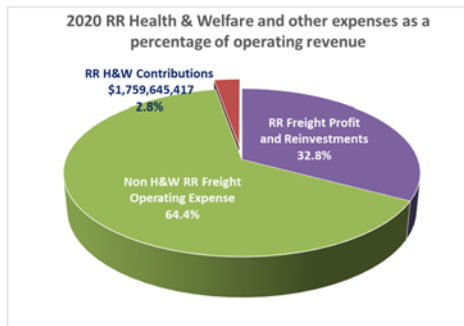
Twelve (12) unions representing approximately 115,000 Railroad workers employed by over 30 railroads operating nationwide are in dispute with the Railroad Freight Carriers over health care benefits and how much of the cost of care ought to be borne by the Carriers or pushed to the workers. Issues include affordability, equity in “splitting” the health charges of the providers, and costs for both parties.

**Table 2.1**  
**List of Unions Representing 115,000 Railroad Workers**

American Train Dispatchers Association	aka ATDA
Brotherhood of Locomotive Engineers and Trainmen – IBT	aka BLET
Brotherhood of Maintenance of Way Employes - IBT	aka BMWE
Brotherhood of Railroad Signalmen	aka BRS
International Association of Machinists	aka IAM
International Brotherhood of Boilermakers	aka IBB
International Brotherhood of Electrical Workers	aka IBEW
National Conference of Firemen & Oilers	aka NCFO
SMART – Mechanical Department	aka SMART-Mechanical
SMART – Transportation Division	aka SMART-TD
Transport Workers Union of America	aka TWU
Transportation Communication Union/IAM	aka TCU/IAM

**Chart 2.2**

Considering magnitude of Carriers' funding, in 2020, the Carriers contributed \$1.76 billion to the funding of the Railroad workers' health and welfare benefits. For context, freight operating revenue was \$63.4 billion, and Carriers' contributions to the RR Plans represent only 2.8% of operating revenues, or if expressed as a percentage of operating expenses, about 4% of total Freight operating expenses. In 2020, considering expenses as a percent of revenue per ton, the RR Plans are only 0.1% of the total \$1.4 trillion dollars the Carriers received. Additionally, the Carriers saw profit and reinvestments to be substantial at 32.8% of operating revenue, despite the challenges of the pandemic.



(Sources: Rate circulars for payment rates, UHC for active worker counts, The Labor Bureau, Inc. for operating revenue and expenses).

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

Within this framework, the Carriers' investment in the health of the Union workforce of only 2.8% of operating revenue is a worthwhile component of their continued effort to support a productive and healthy workforce, which in turn contributes to the quality service that the U.S. Freight Rail system delivers.

Workers also share in the cost of health care plans via two methods:

- **monthly premiums, (contributions)**, to enroll in coverage for the worker and their families and
- **plan design requirements** for paying deductibles, coinsurance, and copays with some protection offered in the form of the out-of-pocket limit.

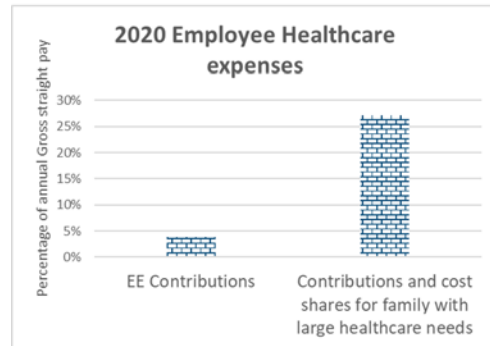
Note that workers typically pay for deductibles, coinsurance, and copays out of their take-home pay, that is, on an after-tax basis. As a result, any increases in deductibles, coinsurance, copay, and maximum out-of-pocket protection are a direct dollar for dollar reduction in take home pay.

To better understand the Union workers' contribution to the funding of the health and welfare benefits, we look at the percentage of regular straight-time pay, in other words, health care costs as a percentage of the workers' "operating revenue."

In 2020, Union workers were spending an average of 4% of their annual gross straight-time pay on health care contributions.

Contributions are the first funding that workers pay. Workers also pay for deductibles,

**Chart 2.3**



coinsurance, and copays within the RR Plans' coverage (or benefit) design. In fact, families with a higher disease burden (two or more family members reaching the out-of-pocket maximums) could spend 27% of the worker's annual gross straight-time pay on health care needs, counting both sources of workers payments.

(Sources: 2020 worker premiums, family Out-of-Pocket maximum, The Labor Bureau, Inc. for average straight-time pay)

The total for this worker is almost a third of their gross straight-time pay, due to this family having higher health care needs, with one or more family members requiring a hospital stay or other

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

treatment. In this report, we study the equity of having workers with "sicker" families spending such a large portion of their pay on health care needs. In other words, the cost of medical and pharmacy services impacts the Carriers' and workers' pockets on drastically different scales.

In this section, after a brief presentation of the health and welfare benefits, we review the historical enrollment and health care cost trends and how they impact both workers and Carriers. Our historical analysis focuses on the following elements:

- 1- the number of active workers participating in the health plans and how it correlates with the Carriers' contributions,
- 2- the participating workers' costs (i.e., what the Union member pays for health benefits):
  - a. toward monthly contributions and
  - b. toward cost shares (i.e., deductible, coinsurance, copay) when utilizing the benefits, and how these compare to workers' pay
- 3- the RR Plan's costs when participants utilize the benefits, and
- 4- the Carriers' contributions to the RR Plan and how these compare to their operating revenue and expenses.

**Scope of Historical Analysis**

Our analysis specifically focuses on health and welfare benefits provided to:

- active workers,
- furloughed workers,
- disabled workers,
- former workers who elected COBRA, and
- former spouses of workers who elected COBRA after the divorce.

Please note that the Carriers provide a limited medical including prescription drugs retiree benefit for workers who are between age 60 and 65 and retiring prior to being Medicare eligible. This retiree benefit is not included in the scope of our analyses.

Medical, mental health, and pharmacy benefits (collectively referred to as "Medical" coverage) are provided to Railroad workers by either:

- the Carriers' owned Hospital Association (HA), i.e., clinics or
- the National Plan and NRC/UTU Plan (the RR Plans).

Only workers are allowed in the HA, so the RR Plans include participating non-Hospital Association (NHA) workers and their dependents, as well as dependents of participating HA workers.

Under the RR Plans, the Managed Medical Care Program (MMCP) is offered in areas where a network of providers is "strong" enough. Workers living in areas that lack a sufficient network of providers can elect the Comprehensive HealthCare Benefit (CHCB). Railroad workers may also enroll in the RR Plans' Dental, Vision, and Life/Accident, Death & Dismemberment (AD&D)

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

programs. The combined Medical, Dental, Vision, Life/AD&D coverages are herein referred to as health and welfare benefits.

**Health Plans Funding Mechanism**

The health and welfare benefits are funded via monthly contributions remitted by the participating Carriers (the "Contributions"). These are assessed based on Qualified Employee (QE) (i.e., active workers) counts for workers who enrolled in the RR Plans and determined annually for the following calendar year. Carriers retain the "Monthly Worker Contribution" (\$228.89) paid by participating QEs and remit the Contributions to the Plan Administrator, UHC.

We define Carriers' Contributions as the Contributions minus Monthly Contributions. We use the terms "Carriers' Contributions" and "Net Railroad Contributions" interchangeably; these represent the Carriers' costs for the health and welfare benefits provided by the RR Plans.

Note that Contributions are paid on the number of QEs, which is typically lower than the number of participating workers which include furloughed workers, participants under COBRA, and disabled workers electing to participate in the RR Plans. However, only QEs and COBRA participants pay monthly Contributions.

In exchange for the Contributions, the Health and Welfare Plans either pay for the "net claim cost," which corresponds to the claim cost balance after the worker's cost share payment and miscellaneous adjustments are made to the covered claim cost (e.g., Coordination of benefits when the RR Plans are secondary payor, provider penalties), or the contractual amount for Life/AD&D coverage. Participating workers and their dependents are responsible for their cost shares (e.g., deductible, coinsurance, copay) when using the health and welfare benefits in addition to their Monthly Contributions.

In this section, we will demonstrate that the Carriers' Contributions have decreased over the last 21 years, mainly due to workforce reduction and shifting costs to the workers. We will also show that health and welfare expenses' impact on the Carriers are insignificant when compared to the size of their revenue and expenses. However, the impact on workers and their families is significant, pushing some into financially precarious territory.

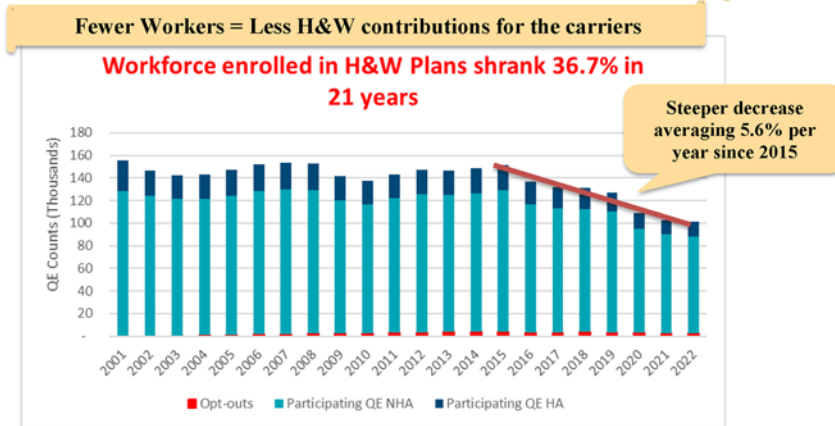
**Workforce reductions spawn reductions in Health and Welfare expenses for the Carriers.**

Carriers pay contributions on active workers, or Qualified Employees (QE) participating in the RR Plan. As shown in Chart 2.4 from 2001 to 2022, in just two decades, the number of QEs enrolled has decreased by 36.7%, from 155,597 (2001) to 98,421 (2022). Therefore, the Carriers' health and welfare related expenses in 2021 are 36.7% lower than they would have been had they kept their workforce at the 2001 level.

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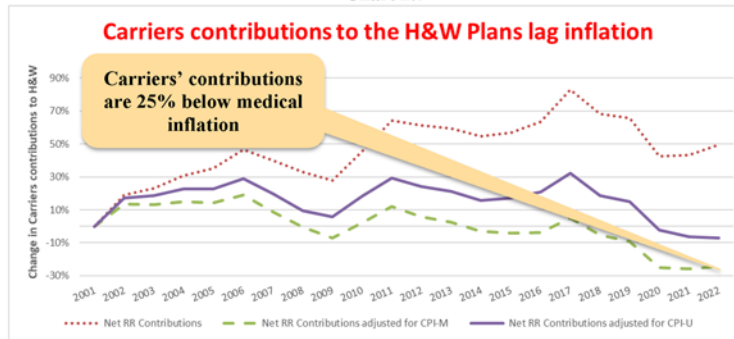
Chart 2.4



Source: 2001 through 2022 (projected) QE Counts and Opt-outs reported by UHC as of 7/8/2022.

This significant decrease, i.e., 5.6% per year over the last seven years, is the primary driver for holding down health care costs for the RR Plans. As shown in Chart 2.5, between the years 2001 and 2022, the Carriers' contributions to the RR Plans decreased 7.3% when adjusted for CPI-U and 24.3% when adjusted for medical inflation (CPI-M).

Chart 2.5



Sources: 2001 through 2022 Rate Circulars and QE Counts for determination of RR Contributions

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

CPI-U: <https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/>

CPI-M: <https://fred.stlouisfed.org>

**Workers have been hammered with health and welfare cost sharing increases for the last 10 years.**

The added costs resulting from previous rounds of bargaining, some of which were imposed on the Unions by prior PEBs, have already drastically increased the amount of money workers must spend towards their deductible, coinsurance, or copays (collectively the “Costs Share”) to receive needed health care treatment. And, certainly, the dramatic increases in what a worker must pay for health care amounts to a dramatic pay cut for those with health care needs, directly reducing a worker’s take-home pay dollar for dollar. We explain further.

Prior to the 2011 PEB 243, the MMCP offered by the RR Plans had no deductible and no coinsurance; participants simply paid their copays when visiting their doctors or filling their prescriptions. Effective July 2012, workers were subject to a \$100/\$200 deductible for single/family and 5% coinsurance when using a preferred (in-network) doctor and/or facility. The Out-of-Pocket Maximum (OOP Max) has quadrupled in seven years to reach \$4,000 for a worker and their family.

Note that when the Carriers contribute to the RR Plans for their workers, those benefits are tax-deductible as expenses. When the Carriers’ cost shifts to the worker, the worker is typically paying for those additional costs from their take-home pay and from their after-tax pay. Let us look at the history to better understand the magnitude of cost shifting to the worker.

The table below shows the increases in deductible (single/family), member coinsurance and Out-of-Pocket Max (single/family) for the in-network MMCP plan. These do not represent an exhaustive list of all the added costs workers and their families have endured in the last 10 years.

**Table 2.6**

Effective Dates	Pre PEB 243	July-12	January-13	January-14	January-18	January-19
<b>Key Plan Provisions:</b>						
Annual Deductible (single/family)	\$0	\$100/\$200	\$150/\$300	\$200/\$400	\$325/\$650	\$350/\$700
Patients						
Coinsurance after Deductible	0%	5%	5%	5%	10%	10%
Out-of-Pocket Maximum (single/family)	N/A	\$500/\$1,000	\$750/\$1,500	\$1,000/\$2,000	\$1,800/\$3,600	\$2,000/\$4,000
<b>Impact on the worker who needs health care services:</b>						
Example: Worker Hank with inpatient stay for a cardiac stent						
Extra taken out-of-pocket for in-network hospital visit	None	\$600	\$800	\$1,200	\$2,125	\$2,350



**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

The chart below compares the workers average spend and maximum spend for 2010 vs. 2015 vs. 2021 benefits levels. It also shows these as a percentage of straight-time pay which we estimate to be about \$70,000 before taxes. In 11 years, the average worker spend has increased 47%, and the maximum a worker may pay has skyrocketed to \$27,847 – a 424% increase.

**Table 2.7**

	2010	2015	2021
Workers annual contributions	\$2,400	\$2,376	\$2,747
Average worker cost share	\$994	\$1,512	\$2,240
Average worker spend (contributions and cost share)	\$3,394	\$3,888	\$4,987
% of Straight pay	6.3%	6.1%	7.1%
Maximum worker cost share	\$4,000	\$17,200	\$25,100
Maximum worker spend (contributions and cost share)	\$6,400	\$19,576	\$27,847
% of Straight pay	11.8%	30.7%	39.7%

Sources: UHC's National Plan and NRC/UTU CES reports for worker counts and worker costs shares, adjusted for mental health and pharmacy estimated spend. The Labor Bureau, Inc. for straight-time pay. Assumes maximum spending is equal to ACA family out-of-pocket maximum + out-of-network's family out-of-pocket maximum. 2010 maximum spending set at \$4,000.

At these pay levels, workers will have to withdraw from savings, arrange for a payment plan, or wait for the collections notice.

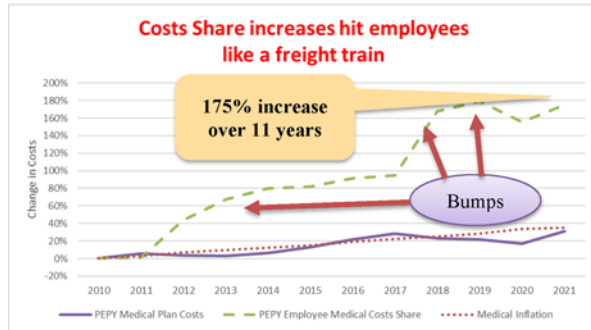
Increasing cost shifting to the workers encourages workers already financially burdened to defer or skip care needed, leading to much more severe, costly health conditions later. Such a cost shifting strategy is not a cost management strategy and leads to unintended higher program costs. This is particularly true with the compounded impact of the pandemic during which workers deferred elective care because the care was not available (doctors closing offices, hospitals overwhelmed with COVID patients, etc.).

**Increasing worker's cost share does not solve plan cost issues, it perpetuates them**

For medical services, excluding Rx, workers' cost share increases far outpace the medical RR Plans cost increases and medical inflation. The **annual worker cost share has increased 175% between 2010 and 2021**. The medical plan cost is four percentage points below medical inflation over the same period.

SECTION 2: DECREASING RAILROAD CARRIERS' COSTS

Chart 2.8



The first bump in the worker cost increase corresponds to the 2011 CBA (PEB 243) when major changes were made to the plan design such as increase in worker cost shares and out-of-pocket maximums for medical. These changes were phased-in, so the increase is smoothed over 2012 through 2014.

The second bump coincides with the added cost effective in 2018, and the third one to the additional increase in deductible and OOP Max effective 2019 (current CBA).

**These increases are not sustainable for the railroad workers and their family**

Sources: 2010 through 2021 UHC Claims Experience Summary Reports for National Plan and NRC/UTU Plan. CPI-M: <https://fred.stlouisfed.org>

In 2020, due to the pandemic, health care services prioritized care for COVID patients in distress and high-risk patients (e.g., cancer patients) and restricted access to others. Unfortunately, the workers who have delayed care may need health care services more than they ever have due to complications such as late detection of cancers or chronic diseases. Further increases to workers' costs will perpetuate and increase the financial burden of health care expenses on Railroad workers and their families. The ones who need the benefits the most could be pushed into financial precarity, which in return will negatively impact their health and their productivity at work.

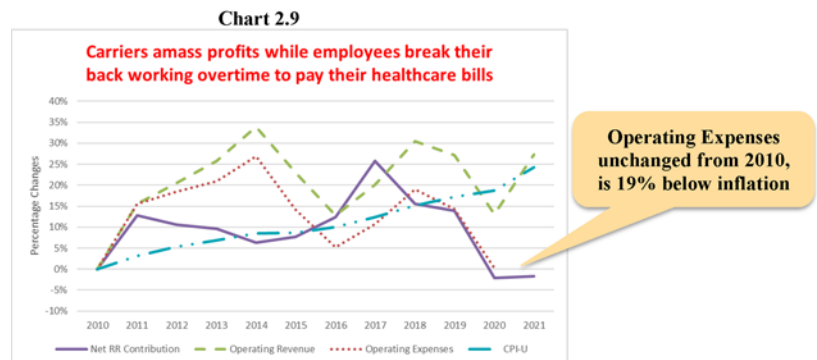
Like any good cars, trains, tracks, and locomotives need maintenance to operate efficiently, workers – regardless of their health status – need access to health care. According to the Association of American Railroads, “the US freight railroads invest an average of well above \$20 billion annually to maintain and modernize their nearly 140,000-mile network.” Providing quality and affordable health care for one’s workers and their family should be a no brainer. The Carriers’ health care proposal does not offer quality and affordable health care. Shifting hundreds of millions in health care expenses onto workers’ backs is not supporting their workers’ health and wellbeing.

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**Carriers' Operating Revenue grew faster than inflation, while contributions to the Health and Welfare Plans declined.**

The Carriers' RR Plans expenses were 2% less in 2021 than in 2010. The Carriers made 27% more in Operating Revenue, exceeding inflation by three percentage points.



Sources: 2010 through 2022 Rate Circulars and QE Counts for determination of RR Contributions  
 CPI-U: <https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/>  
 Operating Revenue and Operating Expenses: The Labor Bureau, Inc.

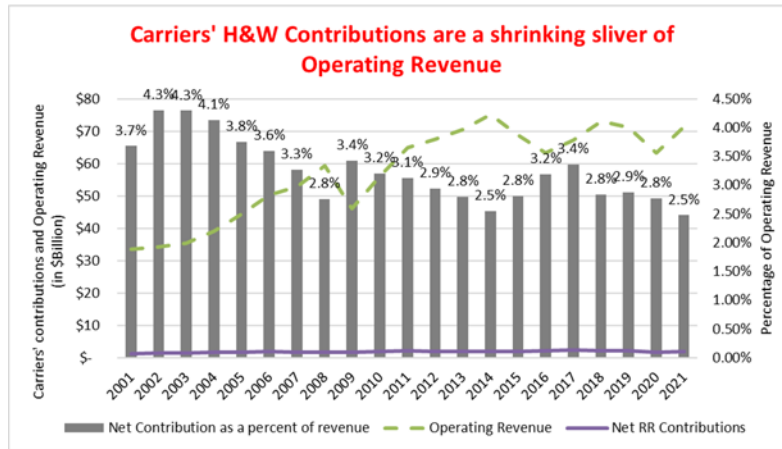
The net Carriers' contributions to the RR Plans are "pocket change" when compared to their Operating Revenue. Over the last 21 years, Carriers' net contributions to the RR Plans have averaged 3.2% of operating revenue. However, that average is less in the more recent years (3% over the 2010-2021 period, and 2.8% for 2018-2021), meaning the impact of the net Railroad contributions to the RR Plans on their Operating Revenue – which was already small – has lessened to 2.5% in 2021.



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Chart 2.10



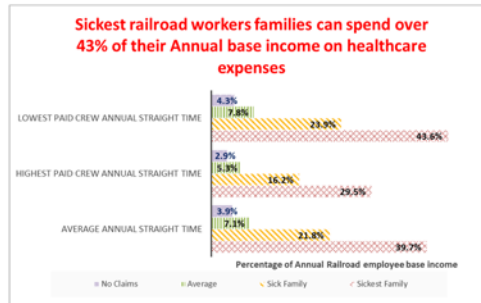
Carriers' contributions as % of operating revenue declined 3% annually since 2002

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

**Worker health and welfare expenses vary significantly from one worker to another.**

In 2021, a participating worker spend on average about 7.1% of their straight-time pay towards health and welfare cost share and contributions. However, the **sickest families** could spend more than \$27,000 on health care in contributions and cost shares – **over 10 times more than a healthy railroad worker with no claims.** (Sources: UHC CES reports, The Labor Bureau, Inc, ACA out-of-pocket limits.)

Chart 2.11



**Carriers' contributions are predictable and virtually the same per active worker, worker's health care expenses are not.**

Carriers' contributions are based on the number of active workers enrolled in the RR Plans and the number of active workers enrolled in the Hospital Association Plans. Contributions are set annually for the following calendar year. For the Carriers, budgeting for health care expenses is easy.

On the other end, workers incur out-of-pocket costs share expenses when utilizing their services (i.e., going to see the doctor, having surgery, buying a new pair of glasses) and these expenses are not easy to budget for due to:

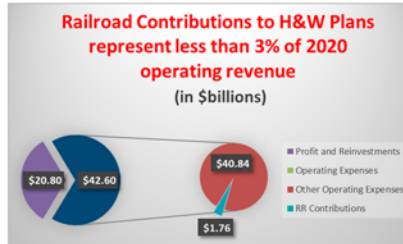
- Unpredictability of an event: Some visits to the doctor or hospital are unplanned and forced due to an emergency such as a visit to the emergency room because of a broken arm or an appendectomy.
- Unknown amount of the cost of service: When a medical service is subject to deductible and/or coinsurance, determining the worker's cost share is not straight forward.
- Unfamiliarity with vendor networks which are always changing and sometimes difficult to verify,
- Predatory practices, such as standalone offices that appear to be urgent care centers, but bill health plans and patients for emergency services.

**SECTION 2: DECREASING RAILROAD CARRIERS' COSTS**

**Health and Welfare Expenses are a drop in the bucket for the Carriers' financials.**

In 2021, the Railroad paid \$1.6 billion in net contributions to the RR Plans and about \$1.5 billion in 2020. The net Carrier contributions represent less than a nickel for every dollar of operating expenses.

**Chart 2.12**

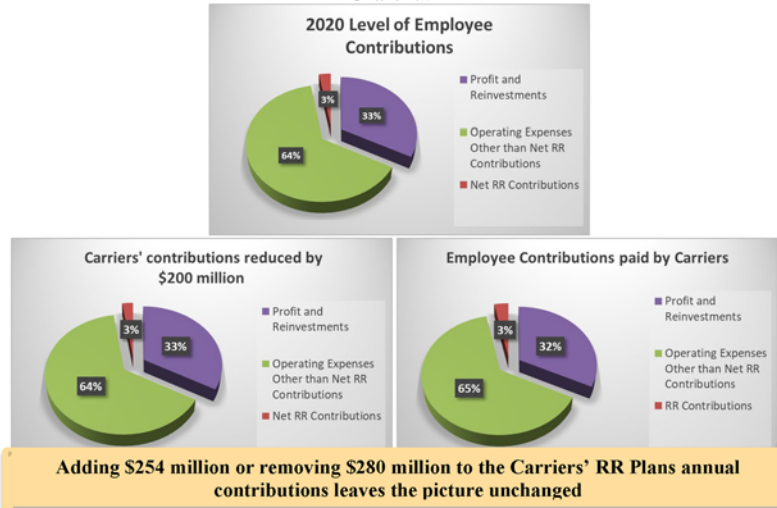


(Sources: The Labor Bureau, Inc., rate circulars, UHC's QE report.)

**Changes to the RR Plans have insignificant impact on Carriers' financials.**

As illustrated below, changing health and welfare benefits has no visible impact on the Carriers' financials. The Carriers could pay the entire Contributions to the Plans (Carriers' and workers' shares) and the changes to the charts would be invisible.

**Chart 2.13**



Sources: The Labor Bureau, Inc., UHC reports for QE counts, Rate circulars.

**SECTION 3: BELOW AVERAGE ACTUARIAL VALUE IN THE RAIL  
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In this section, we compare the current plan benefits to other similar groups. The NCCC is arguing that the current benefits are more generous than the 'mainstream' employee benefits as compared to similar groups and national surveys. In our research and analysis, we find the opposite is occurring including the following observations:

- Benefit levels are by definition "mainstream" for the Freight Rail industry.
- Current benefit levels are less generous than the median benefits offered in the broader rail and transportation industry.
- The NCCC proposal would place the benefits near the bottom of broader rail and transportation industry.
- The Carriers' cost is less than the stated actuarial value.
- The recent broader rail and transportation industry trend has been to maintain status quo for health and welfare benefits.
- Current contribution rates are in line with the broader rail industry contributions.
- Health care is not an "Average" business. There is significant variation in health care coverage across industries.
- Defining "mainstream" benefits as "averages from Employer surveys" is inappropriate and misleading.
- Increasing workers' monthly contributions is not a part of the current mainstream.

We review each of the above in more depth.

**Benefit Levels are by definition "mainstream" for the freight rail industry.**

Putting the group's industry, demographics, and other workplace considerations into proper context is key to obtaining a clear comparison to similar groups. The most appropriate industry comparison would be to other benefits in the Freight Rail industry. The PEB bargaining group of 12 unions spread amongst over 30 rail carriers and representing approximately 115,000 Union members is the freight rail industry in the U.S. Therefore, the benefits are mainstream for this industry because these 12 unions and 30+ rail carriers represent the industry.

**Current Benefit Levels are *LESS GENEROUS* than the median benefits offered in the broader Rail and Transportation Industry.**

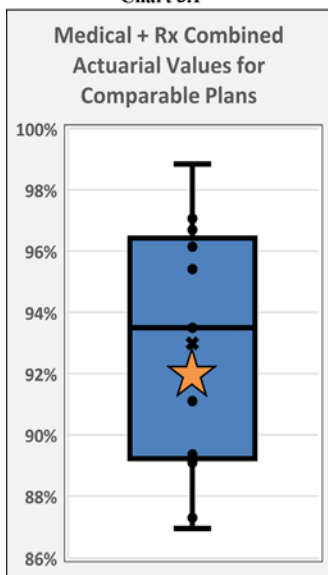
In the charts below, we compare the expected Actuarial Value (AV) – that is, the portion of total Allowable claim costs that is paid by the Plan Sponsor – to similar groups. For the comparison, we focus on 11 Rail and Transportation Systems groups around the country so that the industry, working conditions and workers' demographics are as similar as we can get between the PEB bargaining group and comparable groups. Within each comparable group, we chose roughly the most similar plan (i.e., PPO) to the Current MMCP plan. We note there are several more generous plans offered within some of these Rail and Transportation Systems. The exhibit below details the AV for each group, with the least generous AV at 88%. On the other end, the richest plan shown

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below (LACMTA TCU Kaiser plan) covers roughly 99% of Allowed costs combined for Medical and Drug benefits.

**Chart 3.1**



**Table 3.2**

Comparable Rail Industry Plans Actuarial Value for Medical & Drug Benefits - 2023			
Rail & Transportation System	Medical	Drug	Combined
Los Angeles (LACMTA)	99%	97%	99%
Philadelphia (SEPTA)	97%	96%	97%
New York (NYCTA)	97%	99%	97%
New Jersey Transit	96%	97%	96%
Long Island (LIRR)	96%	93%	95%
AmPlan 1-3 (weighted)	96%	92%	95%
Seattle (King County)	94%	93%	93%
<b>Current RR Plans</b>	<b>92%</b>	<b>91%</b>	<b>92%</b>
Boston (MBTA)	92%	85%	91%
Chicago (CTA)	89%	94%	89%
Louisville (PAL)	89%	89%	89%
San Francisco (SFMTA)	87%	92%	87%
<b>NCCC Proposed RR Plans</b>	<b>87%</b>	<b>89%</b>	<b>87%</b>

**Assumptions:**  
 Actuarial Values (AV) determined using OptumInsight 2021v1.02  
 Census & Geographic location based on 274,414 lives enrolled in RR National Plan  
 Average annual paid medical and Rx trends of 5.8% and 10.3%, respectively  
 Calendar Year 2023; Drug AV is net of 33% rebate assumption  
**Out-of-Network (OON) weights:**  
 5% Inpatient, 8% Outpatient, 5% PCP HMO has no OON weight  
 10% Referrals, 10% Other, 0% Rx  
**MMCP vs CHCB weights for RR Plans:**  
 91% MMCP, 9% CHCB based on Calendar Year 2021 Employee Counts  
**AmPlan weights:**  
 74% AmPlan-1, 20% AmPlan-2, 6% AmPlan-3 based on Dec 2021 Members

The orange star represents the current Railroad plan with an AV of approximately 92% in 2023. The current railroad plan is *less generous than the median* of this comparable group; moreover, the current Railroad plan is less generous than seven of the 11 comparable groups and more generous than the other four comparable groups, placing it firmly within the 'mainstream' for the closest comparable industry.

**The NCCC proposal would place the benefits near the bottom of broader Rail Industry.**

The NCCC proposal lowers the benefits of the Railroad plan to 88% AV. Using the comparison provided above, this would push this group's benefits to the lowest end of this spectrum.

**SECTION 3: BELOW AVERAGE ACTUARIAL VALUE IN THE RAIL  
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**The Carriers' cost is less than the stated actuarial value.**

Chart 3.3 details the current plan Actuarial Values using actual data from 2021 for medical claims and 2022 for Prescription Drug claims. The Combined Medical + Drug AV in 2021 is 91.5% when excluding the amount paid by other insurers through Coordination of Benefits. Chart 3.3 uses actual 2021 medical data from UHC along with Year-to-Date 2022 prescription drug data from ESI.

**Chart 3.3**

National Plan + UTU Combined Active Plans		
	Medical Benefits	Actuarial Value
National Plan and NRC/UTU + Patient + Other Employer Plans	\$ 1,040,541,592	
less patient pay	\$ (92,622,289)	
National Plan and NRC/UTU + Other Employer Plans	\$ 947,919,303	91.1%
<i>2021 actual data from UHC</i>		
	Prescription Drug (Rx) Benefits	Actuarial Value
National Plan and NRC/UTU + Patient + Other Employer Plans	\$ 400,621,595	
less patient pay	\$ (29,377,246)	
National Plan and NRC/UTU + Other Employer Plans	\$ 371,244,349	92.7%
<i>YTD May 2022 annualized data from ESI Includes \$170 mil in Rebates + Performance Guarantees</i>		
COMBINED TOTAL		
	Combined Medical & Rx Benefits	Actuarial Value
National Plan and NRC/UTU + Patient + Other Employer Plans	\$ 1,441,163,187	
less patient pay	\$ (121,999,535)	
National Plan and NRC/UTU + Other Employer Plans	\$ 1,319,163,652	91.5%

However, the actuarial value does not represent the portion of the cost paid by the Carriers. In 2021, approximately 6% of the cost is funded by other insurers through Coordination of Benefits; this leaves the Carriers paying for only 86% of the total Covered costs vs. a reported 91.5% AV.

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**Chart 3.4**

	COMBINED TOTAL	
	Combined Medical &	Portion of Total
	Rx Benefits	Covered Benefits
National Plan and NRC/UTU + Patient + Other Employer Plans	\$ 1,441,163,187	
less patient pay	\$ (121,999,535)	
less amount paid by other insurers	\$ (81,503,570)	
<b>Net Plan Pay</b>	<b>\$ 1,237,660,082</b>	<b>85.9%</b>

**The recent broader rail industry trend has been to maintain *status quo* for health and welfare benefits.**

The list below contains 14 recent bargaining agreements where the Union and employers agreed to maintain the health and welfare benefits at their current levels.

**Table 3.5**

	Property	Agreement Term	Craft	Monthly Cost Share
1	Alaska RR	2022-2025	TCU-Carmen	\$109.95 - \$601.51
2	Delray Connecting	2020-2024	TCU-Clerical	\$230
3	Gary Railway (US Steel)	2020-2024	TCU-Clerical & BMWED	\$230
4	Lake Terminal (US Steel)	2020-2024	TCU-Clerical	\$230
5	Transtar (US Steel)	2020-2024	TCU-Clerical	Min of \$230 or 15%
6	ICTF (UP)	2021-2023	TCU-Clerical	Min of \$175 or 15%
7	LACMTA	2022-2024 2022-2027	TCU-Clerical SMART-TD	\$45 Single, \$65 Fam \$100
8	SEPTA	2022-2023	TCU-Clerical & Carmen	\$20-\$100 (% of income)
9	LIRR	2019-2021	TCU-Clerical	2% of straight-time
10	MTA Metro-North	2019-2023	TCU-Clerical	2% of straight-time
11	Staten Island Rapid Transit	2019-2021	TCU-Clerical	2% of straight-time
12	DM & E	2020-2024	BLET	\$29-\$243 per pay
13	NICTD	2019-2024	ATDA	\$200-\$220
14	Terminal Alabama State Docks	2018-2023	IBEW	\$200

**SECTION 3: BELOW AVERAGE ACTUARIAL VALUE IN THE RAIL  
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With regards to the pattern of recent bargaining agreements, the “mainstream” has been *status quo* for many similar union groups.

**Current contribution rates are in line with the broader rail industry contributions.**

The table above also shows that the current freight Railroad monthly contribution rate of \$228.89 is comfortably in line with other bargained Rail groups. The current Union’s monthly contribution fits squarely into the “mainstream” of the other recent bargained contracts detailed above.

**The NCCC proposal is likely to lead to higher, not lower, health care costs.**

We support that a most vital requirement of a healthy and productive workforce is a health benefits plan that removes barriers to care and strives to be ahead of the very unpredictable stages of health challenges and diseases, many of which are related to long years of service in the rail industry by nature of the type of work needed to deliver such a quality freight transportation system. Introducing barriers to care in the form of increases in the worker costs to visit a doctor and increasing deductibles that require workers to pay first for critically needed care will result in higher costs over the long-term.

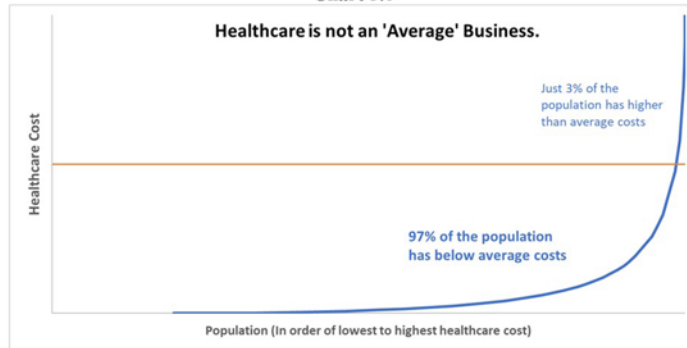
Higher health costs come in the form of workers avoiding care due to the higher out-of-pocket cost. Ultimately, some workers make a health decision to not see a doctor or to not have a test based on how much family income can be spent now or whether they will need to wait until later. The pandemic showed health plans nationwide what deferred care does; larger claims emerge later with serious diagnoses being detected later at more severe stages of the condition. As actuaries, we have observed cancers being detected later (Stage III or IV) merely because the visit to the doctor was skipped or delayed. Cost-shifting to workers, as the country continues to emerge from this pandemic, will put “salt on the health care utilization wound” and cause workers to have less care by trying to rationalize their health care dollars, by skipping or deferring needed care, and will encourage workers to continue the pattern from the pandemic of skipping care.

**Health care is not an “Average” business.**

There is a wide distribution in health care: both in costs and benefits. This also means that a simple average of this wide distribution is not representative of the group. The example below illustrates our point.

**SECTION 3: BELOW AVERAGE ACTUARIAL VALUE IN THE RAIL  
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Chart 3.6



The distribution of claims in health care is not at all linear; some participants have no claims (roughly 20% of the general insured population each year), while the most expensive 10% of participants account for approximately 85% of the total medical plan costs. Taking the average of this population is an incomplete measure of the distribution.

**There is significant variation in health care coverage across industries.**

In health and welfare benefits, there is tremendous variance between “good” plans (with the best plan covering 100% of costs) and ‘bad’ plans (with the worst plan being no offer of health care coverage at all). In practical reality, this manifests in the following statistics about the national health and welfare benefits environment:

- From the Bureau of Labor Statistics Worker Benefits Survey - March 2021 (BLS Survey):
  - Only 70% of all private sector workers have Access to Medical Care coverage, with 67% of those taking up coverage for a combined 47% participation rate in coverage.
  - The 70% offered coverage varies wildly from 95% for Management jobs to 44% in the Service industry. Rates also vary 95% Union vs. 68% Nonunion offered coverage; averaging these groups is not a useful metric.
  - More than 85% of the private sector population and benchmarks are from Nonunion workers. Only a tiny portion of the sample population included in this survey is comparable to private sector Union benefits.
- From the Kaiser Family Foundation 2021 Worker Health Benefits Survey (KFF Survey):
  - **“There is significant variation by industry** in the coverage rate among workers in firms offering health benefits. The average coverage rate is particularly low in the retail industry (40%).” This is half the coverage rate of workers covered in the

**SECTION 3: BELOW AVERAGE ACTUARIAL VALUE IN THE RAIL  
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Transportation/Communication/Utilities industry (80%). The gap between “good” and “bad” health plans skews the mean and median towards “bad.”

- **“There also is variation by firm wage levels.** Among workers in firms offering health benefits, those in firms with a relatively large share of lower-wage workers are less likely to be covered by their own firm than workers in firms with a smaller share of lower-wage workers (47% vs. 64%). A similar pattern exists in firms with a relatively large share of higher-wage workers, with workers in these firms being more likely to be covered by their employer’s health benefits than those in firms with a smaller share of higher-wage workers (71% vs. 55%).”
- **“The likelihood of offering health benefits increase with firm size.** While nearly all large firms (200+ workers) offer health benefits to at least some workers, small firms (3-199 workers) are significantly less likely to do so.” This means that comparing this group of more than 100,000 Union workers to surveys which include very small groups is going to skew the results towards the “bad” plans.

Because of these large variations in health care benefits across multiple group characteristics, basic national averages will provide poor comparisons to a large, experienced private sector union health care plan. This is why our definition of “mainstream” focuses on comparable industries and general national marketplace characteristics (not averages).

**Defining “mainstream” benefits as “averages from Employer surveys” is inappropriate and misleading.**

Defining mainstream benefits as “averages from Employer surveys” does a disservice both to the Unions as well as to the Carriers, both of which earn above-average compensation for above-average performance. Notably, we discuss the BLS Survey, the KFF Survey, and the Willis Towers Watson 2022 Global Benefit Attitudes Survey (WTW Survey).

For example, the BLS Survey includes documentation and limitations of its results. One of the most important notes in the documentation is below:

*Worker benefits in state and local government should not be directly compared to private industry. Differences between these sectors stem from factors such as variation in work activities and occupational structures.*

This excerpt touches upon several key variations that were also noted in the KFF Survey results. Additionally, in the BLS Survey, “Transportation and material moving” (the closest industry to this bargaining group) makes up only 9.8 million (7.4%) of the 133 million total civilian workers in the March 2021 BLS Survey. The remaining 90+% include vastly different industries and vastly different “mainstream” benefits.

**SECTION 3: BELOW AVERAGE ACTUARIAL VALUE IN THE RAIL AND TRANSPORTATION INDUSTRY**

Returning to the KFF Survey, there are many notable pieces of documentation in the Survey which indicate it might not be wise to use national averages as a comparable group.

- Service (42.8%) and Retail (11.4%) Industries make up more than half of the responding Employers. As the BLS Survey notes, these jobs are not comparable to other industries, including the Railroad industry.
- More than half (60%) of responding Employers have less than 5,000 workers and nearly half (45%) of responding Employers have less than 1,000 workers. This is hardly comparable to the group of 115,000 included in this bargaining.
- “Higher-wage earner” is defined in 2021 as earning more than \$66,000 (75<sup>th</sup> percentile from BLS). A large employer is defined as more than 200 workers. Neither of these measures are comparable to this bargaining group of 115,000+ higher-wage earners.

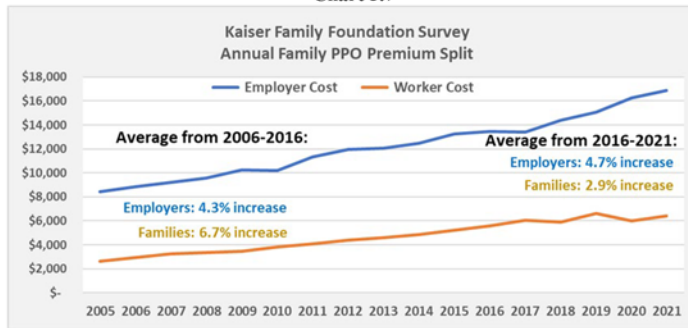
Taking an average using national averages is inappropriate and provides misleading comparisons to the RR Plans.

**Increasing monthly contributions is not a part of the current 'mainstream.'**

According to the KFF Survey, the portion of health care cost paid by families have been *lower* than employers over the past five years; while the Employers have absorbed a 26% increase, families have faced about 15% increase cumulative over the prior five years.

Historically, families have been faced with higher average annual increases in health care spending than employers. Between 2006 and 2016, families shouldered an average 6.7% annual increase compared to 4.3% for the Employers. However, this trend has reversed over the last several years as total health care trends have slowed. From 2017 to 2021, the average family contribution increased less than 3%.

**Chart 3.7**



This is yet another national trend to help us identify and understand the “mainstream” for this PEB bargaining group.

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

This section identifies the non-standard working conditions of the Freight Railroad workers and discusses how these working conditions can cause a variety of illnesses, worsening the health of workers and increasing overall health care costs. We start by identifying the non-standard working conditions for the freight Railroad workers compared to standard working conditions that exist for the majority of workers in what the Carriers reference as “mainstream.” Next, we provide analysis of the studies that show the negative impact on workers health from these non-standard working conditions. Finally, we look at the primary drivers of cost in both the RR Plans and point out how they are related to these non-mainstream working conditions.



**Railroad working conditions are not mainstream.**

Table 4.1 below shows many working conditions by Union entity that indicate the working conditions of various Railroad workers are not mainstream. All the columns in the complete table can be seen in the appendix under Table 6.1 and Table 6.2.

**Table 4.1: Freight Railroad Employees Working Conditions**

	Diesel and/or Chemical Fume Exposure	Lead Exposure	Cadmium & Carbon Dust Exposure	Bird Droppings Exposure	Human Waste and/or Animal Parts / Waste	Carcinogens (including Oil) Exposure	Non-Standard Work Hours	Outdoor Work and/or no AC	Loud Noise (above 85dB) Exposure	Heavy Lifting/ Physical Work	Repetitive movement
1 SMART – TD	Yes	No	Yes	Rarely/ Never	Yes	Yes	Most	Yes	Yes	Yes	Yes
2 BMW - IBT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3 BLET – IBT	Yes	No	Yes	Rarely/ Never	Yes	Yes	Most	Yes	Yes	Yes	Yes
4 TCU/ IAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Most	Most	Yes	Yes
5 BRS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 IAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7 IBEW	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8 NCFO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9 ATDA	Yes	No	No	No	No	No	Yes	No	Yes	No	Yes
10 TWU	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11 SMART – Mech	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 IBB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Labor leaders for each union

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

Chart 4.2 below shows the proportion of firms by industry that KFF included in their survey sample in 2021. Other than state/local government, transportation is in the smallest sector, making up only 3.9% of the total after being combined with communications and utilities. On the other end, the top 3 industries - service jobs, health care, and retail jobs - makes up 66.8% of the sample survey, and many jobs for these industries are indoor jobs without exposure to dangerous chemical fumes and without constant use of strenuous physical exertion.



**Chart 4.2: Select Characteristics of Firms in the KFF Survey Sample, 2021**

INDUSTRY	Sample Size	Sample Distribution After Weighting	Percentage of Total for Weighted Sample
Agriculture/Mining/Construction	111	369,031	11.3%
Manufacturing	164	175,343	5.4
Transportation/Communications/Utilities	95	126,464	3.9
Wholesale	75	160,688	4.9
Retail	113	373,208	11.4
Finance	102	207,793	6.3
Service	638	1,403,893	42.8
State/Local Government	132	48,567	1.5
Health Care	256	411,705	12.6

SOURCE: KFF Employer Health Benefits Survey, 2021

**Non-standard working conditions can cause poor health.**

**Diesel fuel exposure:** Prolonged diesel fuel exposure can increase the risk of cardiovascular disease, cardiopulmonary and respiratory disease, and lung cancer.<sup>1</sup> Diesel fuel contains benzene, which can damage the bone marrow and increase leukemia risk.<sup>2</sup> Freight trains and railroad equipment are powered with diesel fuel, which can result in negative health consequences for those who work around them. Workers in jobs with exposure to diesel fuel have an increased risk of COPD mortality relative to those in unexposed jobs.<sup>3</sup> Their increased risk of COPD mortality is 2.5% for each additional year of work in a diesel-exposed job. This translates for 10-year exposure, for example, to a 25% increased risk of COPD mortality and for 20 years a 50% increased risk.

**Lead exposure:** A 2015 review article summarizing papers from 1970 - 2010 found that the mean blood lead level concentration of railway workers ranged from 28 to 86 µg/dL.<sup>4</sup> As a reference, above 5 µg/dL is considered above normal. Exposure to high levels of lead may cause anemia, weakness, kidney damage, and brain damage.<sup>5</sup>

**Cadmium exposure:** Acute inhalation exposure to high levels of cadmium can result in flu-like symptoms such as chills, fever, and muscle pain, and can damage the lungs.<sup>6</sup> Chronic exposure to low levels of cadmium can result in kidney, bone, and lung disease.

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

**Carbon dust exposure:** Chronic inhalation of carbon dust can cause decreased lung function, heart damage, skin cancer, cough, fatigue, chest pain, and headache.<sup>7</sup> For some information on workers in other industries having exposure to chemical vapors, according to the RAND 2015 American Working Conditions Survey, only 23.5% of all workers are exposed to smoke, fumes, powder, dust, or vapors.<sup>8</sup>



**Bird dropping exposure:** Histoplasmosis is an infection caused by breathing in spores of a fungus often found in bird and bat droppings.<sup>9</sup> Soil contaminated by bird or bat droppings also can spread histoplasmosis. The infection can be mild or severe, acute, or chronic. Some symptoms include fever, chills, headache, muscle aches, dry cough, chest pain, and fatigue. Signs of chronic histoplasmosis can include weight loss and a bloody cough.

**Animal waste exposure:** There are a variety of bacteria, viruses, and parasites that can be found in animal feces, and so exposure to animal feces can result in a variety of infections.<sup>10</sup> Diarrhea and eye pain are some common symptoms.

**Carcinogens exposure:** By definition, a carcinogen is a substance that can cause cancer.

**Non-standard work hours:** Several studies report a significant correlation between non-standard work hours and obesity. A 2010 study found that a 10-hour day shift was associated with higher rates of short sleep duration, a 10-hour night shift was associated with higher rates of obesity and no exercise, and a 10-hour rotating shift was associated with higher rates of no exercise and short sleep duration.<sup>11</sup> Another study linked shift work with cardiovascular disease, including heart attacks, chest pain, and high blood pressure.<sup>12</sup> A 2009 article reported a higher risk for strokes in shift workers.<sup>13</sup> Another 2009 article concluded there is evidence that workers are at higher risk for metabolic disturbances (e.g., high blood sugar) and increases in smoking after starting shift work.<sup>14</sup> Another 2009 article reported decreases in slow-wave sleep result in an increased risk for Type II diabetes.<sup>15</sup> A 2019 meta-analysis that looked at the effect of working overtime on health found that overtime workers were 1.177 times as likely to have physiological health issues (includes medical and physical health conditions), 1.366 times as likely to have mental health issues, 1.1 times as likely to have health behavior issues (well-being activities such as healthy diet and exercise), and 1.465 times as likely to have related health issues (includes sleep disturbances, fatigue, and injuries).<sup>16</sup> For some information on workers in other industries having non-standard work hours, according to the RAND 2015 American Working Conditions Survey, 80.9% of all workers have regular work throughout the year, 9.7% of all workers have unpredictable or irregular work, and 32.3% of all workers have shift work.<sup>8</sup>

**Working outdoors:** Climate change has shown to result in health hazards for outdoor workers.<sup>17,18</sup> This is partly because climate change has resulted in increased heat and solar radiation exposure, poorer air quality, and more temperature extremes. Health consequences of these worsening

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

conditions include cardiovascular diseases, respiratory diseases, mental health and stress-related disorders, infectious diseases, cancers, and chronic kidney disease of non-traditional origin.

**Work with loud noise:** Long-term noise exposure can result in sensorineural deafness, commonly called noise induced hearing loss (NIHL).<sup>19-21</sup> The phantom auditory sensation, tinnitus, can result from noise exposure. The exact cause behind acoustic neuromas is unknown, but occupational exposure to loud noise has been implicated as a risk factor—acoustic neuromas are benign facial tumors that affect one of the cranial nerves and can potentially cause facial paralysis, possibly resulting in Bell's Palsy.<sup>22,23</sup> Hearing loss may occur after exposure to even a single loud noise, so if dispatchers or other personnel are exposed to periodic loud noises (over headsets for example), they could develop hearing loss and tinnitus. While there are treatments that can help manage hearing loss and tinnitus (cochlear implants, hearing aids, etc.), neither condition is currently curable once it develops. For some information on workers in other industries having exposure to loud noise, according to the RAND 2015 American Working Conditions Survey, only 29.9% of all workers are exposed to loud noise.<sup>8</sup>



**Heavy lifting:** A 2019 study showed that heavy lifting at work has a negative effect on both arterial stiffness and nervous system blood pressure regulation, which results in a higher risk for cardiovascular diseases.<sup>24</sup>

**Repetitive movement:** Engaging in repetitive movement can cause a variety of injuries to the involved body part, commonly affecting the fingers, wrists, elbows, arms, shoulders, and knees.<sup>25</sup>



There are a variety of conditions that can result from repetitive strain injuries, including tendinitis, carpal tunnel syndrome, trigger finger, back strain, etc. Common people affected include workers with physically demanding roles and workers who often sit at a desk or use a computer. For some information on workers in other industries having physical work demands, according to the RAND 2015 American Working Conditions Survey, less

than half of all workers have to move heavy loads.<sup>8</sup>

**Non-standard working conditions can increase likelihood of chronic illnesses.**

In addition to all the issues already mentioned, some working conditions can also contribute to a higher likelihood of developing specific chronic illnesses, so working conditions can even contribute to worsening future health of workers and lead to increased health care costs in the present and future. Chart 4.3 below lists some working conditions that have been shown to

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

contribute to a higher likelihood of developing specific chronic illnesses.<sup>11,15-18,24,26</sup> Working outdoors, non-standard work hours, exposure to diesel fumes, and heavy lifting have shown to be risk factors for developing ischemic heart disease. A non-standard work schedule has shown to be a risk factor for developing Type II diabetes. Working outdoors, non-standard work hours, exposure to diesel fumes, and heavy lifting have shown to be risk factors for developing hypertension. Exposure to diesel fumes and heavy lifting have shown to be risk factors for developing hyperlipidemia. Non-standard work hours have shown to be a risk factor for developing obesity. All of these indicate that specific working conditions are contributing to specific illnesses and resulting in increased health care costs as a result.

**Chart 4.3 Working Conditions Contribute to Chronic Illnesses**

Condition	Cause
<b>Chronic renal failure</b>	Working outdoors Exposure to lead
<b>Ischemic heart disease</b>	Working outdoors Non-standard work hours Exposure to diesel fumes Heavy lifting
<b>Diabetes</b>	Non-standard work hours
<b>Hypertension</b>	Working outdoors Non-standard work hours Exposure to diesel fumes Heavy lifting
<b>Hyperlipidemia</b>	Exposure to diesel fumes Heavy lifting
<b>Obesity</b>	Non-standard work hours

Sources: See sources 11, 15, 17, 18, 24, and 26

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

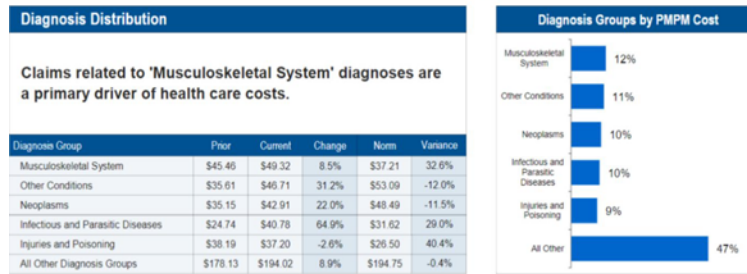
**Freight Plans' Top Cost Drivers are related to the non-standard working conditions.**



According to United Healthcare in Charts 4.4 and 4.5 below, the categories of top health care spending for the railroad workers are musculoskeletal, neoplasms, infectious and parasitic diseases, and injuries/poisoning; claims related to musculoskeletal system diagnoses are noted as being a primary driver of health care costs.<sup>26</sup> Working conditions are a major contributor of some of the top categories of health care spending, musculoskeletal system and

injuries. A 2020 study showed that biomechanical work exposures are associated with neck, lower back, and knee pain.<sup>27</sup> In the same study, whole-body vibration work exposures are associated with neck pain, knee pain, and sciatica. A 2019 study was done comparing average U.S. male workers to maintenance-of-way male workers.<sup>28</sup> After adjusting for age, race, and region, maintenance-of-way male workers were more likely to report: repeated lifting, pushing, pulling, or bending at work (74.6% vs. 46.9%), not enough staff (88.1% vs. 65.2%), and carpal tunnel syndrome (7.9% vs. 3.6%). Maintenance-of-way workers were less likely to report the following: management prioritizing workplace health and safety (59.4% vs. 94.8%), ability to make job decisions on their own (68.4% vs. 87.7%), and supervisor support (60.3% vs. 90.8%). As can be seen in Table 4-1, almost all Railroad workers are subject to the same working conditions as maintenance-of-way workers, so the findings of that study can be applied to most Railroad workers. For some information on workers in other industries having vibration exposures, according to the RAND 2015 American Working Conditions Survey, only 20.2% of all workers are exposed to vibrations from hand tools and machinery.<sup>8</sup>

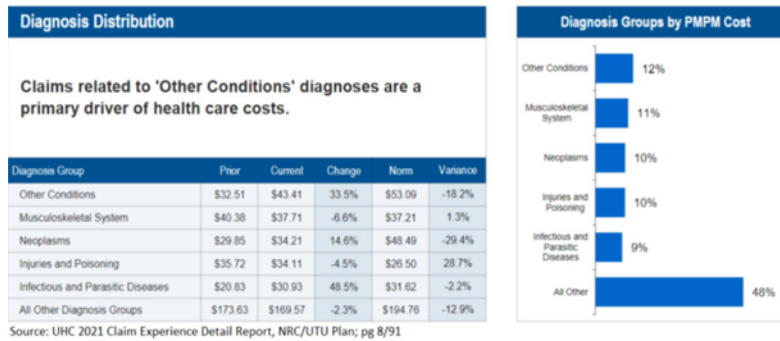
**Chart 4.4: Top Member Conditions by Diagnostic Group, National Plan**



Source: UHC 2021 Claim Experience Detail Report, National Plan; pg 8/91

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

**Chart 4.5: Top Member Conditions by Diagnostic Group, NRC/UTU Plan**



**Delayed care results in worse health outcomes and higher health care costs.**

While not associated with a specific illness, which is what has been discussed so far, another occupational risk factor for poorer health outcomes and increased costs is having on-call assignments. Having to work on short notice makes it difficult for workers to schedule appointments, including appointments for health-related concerns. After missing multiple appointments, doctors' offices will often not be amenable to rescheduling, worsening workers' access to health care. Workers will delay necessary care and out of desperation seek otherwise unneeded emergency room care to obtain health care when they need it, increasing costs and resulting in worse worker health overall.

America's freight railroads operate the safest, most efficient, cost-effective, and environmentally sound freight transportation system in the world. To continue that high quality standard does not mean reducing critically needed health care benefits for the workers and their families; in fact, the health and safety of the workers directly impacts the railroad results.

**SECTION 4: WORKING CONDITIONS ARE NOT MAINSTREAM**

The entire strategy of cost shifting translates to reducing investment in one of the most critical infrastructure components of the railroads – its Union members who perform a variety of tasks, including the following: building and maintaining railroad tracks, bridges, buildings, and related railroad infrastructure; controlling the movement of thousands of trains operating across the nation's rail systems each day; installing and maintaining signal systems designed for the safe operation of train movement; repairing and maintaining all mechanical and electrical equipment on trains; building and maintaining railway and railyard components; etc.



Managing health care costs, if that is the goal, is not effectively achieved by cost shifting to the worker and their family. It has the opposite impact and will increase costs because the worker will be more likely to defer critical care needed and a once manageable health condition evolves into a larger, more complex treatment plan. Increases in copays, deductibles, coinsurance, and total out-of-pocket costs for the worker and their family are all a barrier to care, meaning that they deter the worker from getting the care needed.

**SECTION 5: PROPOSAL COMPARISONS**

In this section, we compare the Unions' vs. the NCCC's health and welfare proposals. First, we recap the highlights from Sections 2 to 4 of this report. Second, we look at the request and financial impact assessed by the Railroad Plan's Business Partners. Then, we review the fiscal impact first on the Carriers and then on the workers.

**Review of Section 2 through Section 4:**

Sections 2 to 4 revealed:

- The health and welfare costs represent less than 5% of the Carriers' operating budget.
- The number of Railroad Freight workers have decreased 36.7% over the last 21 years.
- The Carriers' spend on health and welfare benefits has been less than inflation over the last 20 years and has decreased in the last seven years.
- The Carriers' rate of increase from 2001 to 2021 is about 161 percentage points less than other "mainstream" employers' cost increases, i.e., Carriers' cost increases 46% vs. mainstream employers cost increases of 207%.
- The RR Plans' benefits are not "rich" plans compared to other health plans in the Rail and Transportation industries. In fact, the portion of care paid for by the Carriers vs. the workers and their families puts them in the lower half in the rail and transportation industries.
- The Carriers are currently only paying for around 85% of the total health care cost of coverage for their workers and their families.
- Health care cost when aggregated can be managed, but for an individual, health care is not an "average" business, hence the need for health insurance with adequate pooling features, such as out-of-pocket maximums to protect the worker from higher cost claims (i.e., an average hospital stay).
- The working conditions for Railroad workers are not "mainstream" and have contributed to the higher-than-average cost per worker.
- In fact, clinical research shows the top five conditions driving health care costs have a strong correlation with the nonstandard working conditions in this industry.

**The Unions' Modest Health and Welfare Benefit Improvement Proposal: Less than 0.5% increase in health and welfare cost.**

The Unions are only asking for two modest benefit improvements that will increase the RR Plans' costs by less than 0.5%: one to update a hearing benefit that has not been improved since 2003 and another to provide long overdue autistic related therapies, including speech therapy. These modest requests are despite having copays, deductibles, coinsurance, and out-of-pocket maximums that puts the RR Plans in the bottom half of coverage levels for the rail and transportation industry. The two improvements are shown in Table 5.1 below followed by explanation of each request.

	Estimated CY 2023 Cost / (Savings) in \$ millions	Change in Actuarial Value
1 Increase annual <b>Hearing Benefit</b> maximum coverage from \$600 to \$2,000 per year	\$2.6	
2 Cover <b>Applied Behavioral Analytics</b> for Autism & Remove <b>Speech Therapy Age Limit</b>	\$9.2	
<b>Total Plan Cost</b>	\$11.8	0.1% *

\* Cheiron estimated these actuarial changes



**SECTION 5: PROPOSAL COMPARISONS**

- 1) **Increase annual maximum Hearing Benefit from \$600 to \$2,000.** The current hearing benefit maximum is \$600 for tests and examinations, including those by an audiologist or a hearing aid dispenser, to diagnose and determine the cause of a hearing loss, and for a hearing aid necessary to restore loss, or help impaired hearing. This benefit has not been updated since its inception in 2003.

UHC estimates an annual cost of \$2.6 million for improving that coverage. Assuming everyone hits the maximum cap of \$2,000 (\$1,400 extra is paid for each claimant), United Healthcare (UHC) is estimating approximately 1,850 Railroad workers would use this hearing benefit. That utilization rate is nearly 3.0 times higher than a typically active group. Working conditions are greatly impacting the workers' need for this critical benefit. Hearing aids are also required by the Carriers for certain employees who need them, as they allow workers with partial hearing loss to perform their work duties efficiently and safely.

The NCCC has included this benefit in their proposal as well, but capped coverage at one hearing aid per ear every three years. This will only harm workers who have hearing related expenses on an annual basis and whose hearing aid gets destroyed and somehow voids the typical warranty. We do not recommend this restriction for this group whose work requires such extensive physical labor and hearing damaging environment. The financial impact is insignificant for this group, as the cap only produces a savings of \$0.4 million.

- 2) Cover **Applied Behavioral Analysis (ABA) for autism and remove speech therapy age limit.** Currently ABA is not covered and speech therapy is not covered after age three. As our Counsel has said, many consider these changes necessary to comply with mental health parity regulations. Adding this benefit could improve the quality of life for both the child and the parents, which would likely result in better productivity and lower health costs for the Railroad worker's entire family. Per the CDC, 1 out of every 54 children born have autism (<https://www.cdc.gov/ncbddd/autism/data.html>).

UHC estimates this will cost the Railroad Plans \$9.2 million per year. They expect about 1.04 per 1,000 enrolled lives or 3 per 1,000 children to use the benefit annually. The therapy is typically 25 to 40 hours per week and lasts for about one to three years. UHC estimates their average claim is about \$22,000 per year, and that is with their negotiated discounts.

Since this is not currently a covered benefit, the discounts have not applied, resulting in a typical provider charging \$30,000 to \$50,000 per year to the RR Plans' workers. This out-of-pocket expense is far too much for even the top percentile of Union represented Railroad workers to afford, let alone the relatively young families who are faced with this dilemma. Getting the care, they need helps the child and reduces stress on the parents.

**NCCC's Massive Cost Shift Health and Welfare Proposal: Increase workers' cost share by over 60% AND increases workers' monthly contributions by nearly 30%.**

In this round of bargaining, the Carriers have put together their most aggressive proposal yet to shift costs both to workers and their families via higher monthly contributions! As this Board reviews the NCCC's proposed changes to the Railroad Plans in Table 5.2 below, remember that item 1A alone shifts costs to the workers and their families *on 17 areas of the benefit design alone!*

**SECTION 5: PROPOSAL COMPARISONS**

In addition, the NCCC's proposal would instill numerous management and oversight rules, requiring railroad employees (many of whom work 24/7 and are on call or travel for work) and their families to invest significant amounts of time and effort, and often wait several additional days or even weeks to perform testing and imaging, or receive care. Railroad families with their hectic lifestyles would easily make mistakes and incur significant costs, penalties, or delays in rescheduling appointments, again typically without the advantage of either network discounts or tax advantages.

Most importantly, as this Board examines the chart below, we ask that you keep in mind the Carriers are extremely profitable companies and have tens of billions of dollars to invest in equipment and buy back stock each year. Their proposed savings of \$279 million is less than 0.6% of their 2019 operating budget – and less than 0.02% of their revenue – these changes would not have a material impact on the Carriers but would certainly inflict significant hardship and poorer health outcomes on their workers. After the chart, we go through each item in detail followed by our analysis showing the possible impact on the Carriers and on the workers.

MARKETPLACE AND ACTUARIAL ASSESSMENT: UNIONS' PROPOSAL VS. NATIONAL CARRIERS' CONFERENCE COMMITTEE'S PROPOSAL

SECTION 5: PROPOSAL COMPARISONS

		Estimated CY 2023 Cost (in \$ millions)	Change in Actuarial Value																																																																																																																						
<b>Table 5.2 NCCC Proposed Changes</b>																																																																																																																									
1A Change Actuarial Value to 88% by																																																																																																																									
2023 Medical Savings from the copays, deductibles, OOPMs and coin. changes		(\$95.3)	-5.3%																																																																																																																						
2023 Rx Copay Savings		(\$13.0)	-2.3%																																																																																																																						
	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">Current</th> <th colspan="3">NCCC Proposal – 2023*</th> </tr> <tr> <th>MMCP In-Network</th> <th>MMCP OON</th> <th>CHCB</th> <th>MMCP In-Network</th> <th>MMCP OON</th> <th>CHCB</th> </tr> </thead> <tbody> <tr> <td><b>Medical</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Individual Deductible</td> <td>\$350</td> <td>\$700</td> <td>\$350</td> <td>\$500</td> <td>\$1,000</td> <td>\$500</td> </tr> <tr> <td>Family Deductible</td> <td>\$700</td> <td>\$1,400</td> <td>\$700</td> <td>\$1,000</td> <td>\$2,000</td> <td>\$1,000</td> </tr> <tr> <td>Coinsurance</td> <td>10%</td> <td>30%</td> <td>20%</td> <td>20%</td> <td>40%</td> <td>30%</td> </tr> <tr> <td>Individual OOP Maximum</td> <td>\$2,000</td> <td>\$4,000</td> <td>\$3,000</td> <td>\$3,500</td> <td>\$7,000</td> <td>\$4,500</td> </tr> <tr> <td>Family OOP Maximum</td> <td>\$4,000</td> <td>\$8,000</td> <td>\$6,000</td> <td>\$7,000</td> <td>\$14,000</td> <td>\$9,000</td> </tr> <tr> <td>Convenient Clinic Copay</td> <td>\$10</td> <td>NA</td> <td>NA</td> <td>\$10</td> <td>NA</td> <td>NA</td> </tr> <tr> <td>PCP Copay</td> <td>\$25</td> <td>NA</td> <td>NA</td> <td>\$30</td> <td>NA</td> <td>NA</td> </tr> <tr> <td>Specialist Copay</td> <td>\$40</td> <td>NA</td> <td>NA</td> <td>\$50</td> <td>NA</td> <td>NA</td> </tr> <tr> <td>Urgent Care Copay</td> <td>\$25</td> <td>NA</td> <td>NA</td> <td>\$30</td> <td>NA</td> <td>NA</td> </tr> <tr> <td>Emergency Room Copay</td> <td>\$100</td> <td>NA</td> <td>NA</td> <td>\$200</td> <td>NA</td> <td>NA</td> </tr> <tr> <td>Certain Outpatient Procedures</td> <td>NA</td> <td>NA</td> <td>NA</td> <td>†</td> <td></td> <td></td> </tr> <tr> <td><b>Pharmacy</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Retail<sup>1</sup></td> <td colspan="3">\$10/\$30/\$60</td> <td colspan="3">\$10/\$45/\$90/\$135</td> </tr> <tr> <td>Mail Order<sup>2</sup></td> <td colspan="3">\$10/\$60/\$120</td> <td colspan="3">\$10/\$90/\$180/\$270</td> </tr> </tbody> </table>		Current			NCCC Proposal – 2023*			MMCP In-Network	MMCP OON	CHCB	MMCP In-Network	MMCP OON	CHCB	<b>Medical</b>							Individual Deductible	\$350	\$700	\$350	\$500	\$1,000	\$500	Family Deductible	\$700	\$1,400	\$700	\$1,000	\$2,000	\$1,000	Coinsurance	10%	30%	20%	20%	40%	30%	Individual OOP Maximum	\$2,000	\$4,000	\$3,000	\$3,500	\$7,000	\$4,500	Family OOP Maximum	\$4,000	\$8,000	\$6,000	\$7,000	\$14,000	\$9,000	Convenient Clinic Copay	\$10	NA	NA	\$10	NA	NA	PCP Copay	\$25	NA	NA	\$30	NA	NA	Specialist Copay	\$40	NA	NA	\$50	NA	NA	Urgent Care Copay	\$25	NA	NA	\$30	NA	NA	Emergency Room Copay	\$100	NA	NA	\$200	NA	NA	Certain Outpatient Procedures	NA	NA	NA	†			<b>Pharmacy</b>							Retail <sup>1</sup>	\$10/\$30/\$60			\$10/\$45/\$90/\$135			Mail Order <sup>2</sup>	\$10/\$60/\$120			\$10/\$90/\$180/\$270				
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<sup>1</sup> Generic/Brand Formulary/Brand Non-Formulary copays in current design, Generic/Brand Formulary/Brand Non-Formulary/Specialty (new tier) copays in new designs Annual indexing beyond 2023 achieved by increasing MMCP In-Network Individual Deductible and Out-of-Pocket Maximum by \$50 and \$500 respectively (and also maintaining relationships with other deductibles and OOPs) * The NCCC is open to considering different plan design values (deductibles, coinsurance, copays, etc.) that achieve the same 88% AV target as set out in this Attachment A																																																																																																																									
1B Monthly Cost Sharing Increase to 15% via Spouse Surcharge in 2023		(\$76.2)	N/A																																																																																																																						
1C 2023 Medical Savings from footnote B - site-management penalties		(\$19.0)	-1.0% *																																																																																																																						
2023 Medical Savings from footnote A - UHC has many questions and cannot implement by 1/1/2023																																																																																																																									
† Outpatient surgery, radiology, and pathology services will be changed as follows: A - Prior Authorization will apply (administered by the medical vendors) B - Copays in addition to applicable deductible and coinsurance amounts will apply if member elects to have procedure performed in outpatient hospital setting rather than a free-standing facility or office setting as follows: \$300 surgery copay, \$200 high-tech radiology copay, \$25 pathology copay Note that this additional copay provision will not apply to inpatient or emergency room procedures and will not apply if member does not have reasonable access to a free-standing facility or office setting (exception process will be available)																																																																																																																									
2A Rx: Implement Advanced Utilization Management		(\$54.7)																																																																																																																							
2B Rx: Implement Advanced Opioid Management		\$0.6																																																																																																																							
2C Rx: Implement Specialty Copay Assistance		(\$36.4)																																																																																																																							
Rx: Implement PBM Recommendations		?																																																																																																																							
<sup>3</sup> Let Governing Co-Chair select Vendors																																																																																																																									
4A Increase annual max dental benefit per person from \$1,500 to \$2,000		\$1.5																																																																																																																							
4B Increase lifetime orthodontia max dental benefit per person from \$1,500 to \$2,000		\$2.7																																																																																																																							
5A Increase vision frame allowance from \$115 to \$150		\$0.3																																																																																																																							
5B Increase vision contact allowance from \$105 to \$150		\$0.2																																																																																																																							
6A Increase maximum hospice benefit from \$3,000 to \$6,000		\$0.0																																																																																																																							
6B Increase maximum bereavement with social worker or pastor from \$1,000 to \$2,000		\$0.2																																																																																																																							
7 Increase annual Hearing Aid Cap from \$600 to \$2,000 per ear; every 3 years per ear		\$2.2	0.02% *																																																																																																																						
8 Cover Applied Behavioral Analytics for Autism & Remove Speech Therapy Age Limit		\$9.2	0.1% *																																																																																																																						
9 Total Plan Savings in millions		(\$277.6)																																																																																																																							
10 Total Benefit Improvements in millions		\$16.3																																																																																																																							
11 Total Plan Savings before Benefit Improvements in millions		(\$293.9)																																																																																																																							
* Cheiron estimated these actuarial changes																																																																																																																									
12 Class I RR Operating Budget in millions in 2019		\$48,563																																																																																																																							
13 NCCC Pre-Tax Savings		-0.6%																																																																																																																							



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- 1A) Increase worker cost share to achieve an **88% actuarial value**. To achieve this, the NCCC has proposed increasing 17 of the copays, deductibles, coinsurance, and/or out-of-pocket maximums for 2023 followed by six every year after that.

In the worker impact section below, we show how these changes can have a devastating financial impact on the workers and their families. UHC estimates these changes will shift \$95 million in medical expenses to the workers and their families, lowering the actuarial value by 5.3%: **“These changes would result in an estimated AOB (medical) change of -5.3% (90.6% to 85.3%) with an associated projected savings of ~\$95M. This estimate is based on actual-simulated RR data and does not assume an impact to account for member utilization changes.”** ESI estimates that the prescription drug copay increases will shift \$13 million in prescription drug costs to the workers and their families. That is an average of nearly \$1,100 per worker, but in our section on worker impact, we show some will pay much more than others.

Table A.2 in Appendix A highlights the copay, deductible, coinsurance, and out-of-pocket coinsurance maximum.

- 1B) NCCC’s proposal adds a spouse surcharge of \$98.11 per month or nearly \$1,200 a year for each worker whose spouse is covered. They further increase each qualified worker’s rate from about \$9 to \$25 per month for 2024 and 2025, as shown by our calculations using the trend assumptions in UHC’s monthly funding report.

**Table 5.3**

<b>Estimated Monthly Contributions</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
<b>Employee with Spouse</b>	<b>\$228.89</b>	<b>\$237.36</b>	<b>\$253.95</b>
<b>Employee with Spouse</b>	<b>\$321.00</b>	<b>\$332.87</b>	<b>\$356.14</b>

- 1C) NCCC has proposed two **medical management changes** that impose penalties if workers use a place of service that the NCCC thinks is too costly. Specifically, the first change the worker will be charged is:

- \$300 for any surgery not done in an office or ambulatory surgical center
- \$200 for any high-tech radiology not done in a non-hospital including outpatient facility
- \$25 for any pathology, i.e., lab, sent to the wrong lab

Notably these proposed programs will waive the above penalties if the procedure is done in an emergency room. Given the hectic and unpredictable lifestyle of a typical railroad family and considering the fact that many of those families live in rural locations, these programs would cause an extreme amount of disruption and added costs. The Unions believe that adopting such changes would result in higher overall costs, as it discourages workers from attempting to understand and comply with complicated rules, and it encourages them to utilize their emergency room benefits whenever they expect lab work or imaging may be required.

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It also can shift the burden of medical management from the health care provider contract with the medical network onto the worker. This is because the medical networks require many of their physicians to get prior authorization or take provider write-offs. Adding a prior authorization provision for workers sometimes takes the burden off the provider and places it directly on the worker. UHC provided cautions in pricing these changes:

- The second pricing estimate is applicable to implementing the outpatient copays shown in the footnote B of the table provided. This is separate and does NOT include the plan design change savings estimates that are shown above.  
**An estimated savings of 1.2% or ~\$19M. This projection is based on UHC Book-of-Business information.**  
Please note the following on site of care tiered benefits and Prior Authorization (PA):
  - a.) To add PA, Core Medical Necessity would then need to be included and the SPD language would also need to be changed. **There would be significant lead-time required to implement this program.** (Please note that the Railroad plans already have a **Notification** process in place which starts with either the provider or member depending on plan (MMCP or CHCB) and whether the provider is INN or OON).
  - b.) Other considerations:
    - **Need to develop an exception process around the rural RR population who do not have access to free-standing facilities or provider offices and any related vendor staffing to administer this.**
    - **How are INN providers who do not have admitting privileges to an ASC handled?**
    - **New copays (for these tiered benefits) would need to be included on member ID Cards per CAA leg**
    - **Mental Health Parity testing would be required with tiering of medical benefits to ensure compliance.**

- 2A) **Advance Utilization Management** program, per Express Scripts, Inc. (ESI), the RR Plans' Pharmacy Benefit Manager (PBM) consists of:
- Step Therapy: **\$5,999,341**
  - Prior Authorizations: **\$45,573,850**
  - Drug Quantity Management: **\$6,267,783**

The Unions oppose these programs because they put the worker in the middle between their doctor and the PBM. Step Therapy, in particular, makes the patient try other drugs in hopes of finding a cheaper drug that will mostly work for their condition. The Unions are not against all such programs, as they already have several in place. But to get these types of savings often requires trying less effective medication(s) or going through periods of time with no medication at all.

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ESI has done studies that show the primary reason (85% of the time) for “gaps” in care or patients not taking their medication is because the drugs are not working effectively for them, or the side effects are too severe. Patients rely on their doctors to prescribe the most effective medication for them and having a PBM decline coverage until a patient has attempted another medication or cleared an additional hurdle, often results in the patient leaving the pharmacy without *any* medication and resulting in a worsening of their condition.

- 2B) **Advanced Opioid Management** program, ESI's program is not cost-effective. Per ESI, **The approximate fee for the Advanced Opioid Management (AOM) program is \$1,307,252 annually. There are some savings from the Utilization Management (UM) rules at point of sale, which do not overlap with the AUM program. These savings are approximately \$682,196.**

This makes the program a net cost of \$625,000. The American Medical Association, along with state and local laws, have put in tremendous effort to solve the opioid crisis. The potential for additional savings – as shown by ESI's own estimates – is minimal. Therefore, making workers jump through hoops to get their medication to increase the profits of ESI and increase the cost to the Carriers does not make sense.

- 2C) **Copay Assistance** is where some specialty drugs can be funded by pharmaceutical manufacturers and other organizations. However, this does not apply to all specialty drugs. We are not completely certain of how this program works, our current understanding is that to achieve this savings, the specialty drug copay needs to increase 450% or \$135 vs. \$30 for retail and \$270 vs. \$60 for mail order. While this could save the Railroad Plans \$36.4 million, it will cost the workers whose specialty drugs are not eligible for copay assistance a tremendous amount more.

The NCCC also wants to allow the Railroad Plans which they administer to be able to implement any program the for-profit PBM recommends. This is not a good idea as evidenced by the desire to implement a costly opioid management program. The Unions strongly oppose allowing the NCCC or the PBM to be able to unilaterally implement Rx management programs.

- 3) Allowing governing co-chairs to **select vendors** or initiate the process of going out to bid for any service. The Unions feel vendor selection is critical to the membership because it is their members that need access to high-quality health care providers and useful customer service representatives. As such, they believe this should remain with the bargaining parties. The Unions' counsel can further explain their position.
- 4) Increase **dental** annual maximum from \$1,500 to \$2,000 per person and lifetime maximum from \$1,000 to \$2,000. This would cost the RR Plans about \$2 million per year. While the Unions agree that their members deserve these benefit improvements, the NCCC is proposing this as a trade-off to the increase in medical out-of-pocket maximums. However, the Union members would rather keep their annual medical out-of-pocket maximum at

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\$2,000 instead of increasing it to \$3,500, than increase their annual dental benefit by \$500 and their lifetime orthodontia benefit by \$1,000.

- 5) The Unions agree raising the **vision** benefits by the \$35 for frames and \$45 for contacts would normally be a welcome and long overdue improvement. However, again the NCCC is proposing this as an offset to the increase in medical copays, and this is nowhere a fair trade or a welcomed exchange. The figures in the chart above are place holders as we are still waiting for EyeMed to provide us their estimated costs since we do not have any data on this benefit.
- 6) For the **hospice** benefit, this change is cost-effective and should not require any offsetting benefit or pay reductions. *Specific to a course of care at a Hospice setting, increasing the dollar allowance to \$6,000 would have a minimal financial impact to the Plan of an estimated +\$1.6M annually, which would then be more than offset due to the member's care being moved from an IP-facility setting and/or change in treatment plan.* In other words, the savings from getting a patient out of the hospital would more than offset the hospice spend, and therefore, most plans have no caps on hospice.
- 7) Increase maximum annual **hearing benefit** from \$600 to \$2,000, but limit the hearing aids coverage to one hearing aid per hearing-impaired ear every three years. The Unions agree this is a critical benefit that needs to be improved. The one hearing aid per hearing-impaired ear every three years cap will only harm workers whose hearing aid gets destroyed and somehow damaged so that their warranty is voided. We do not recommend this restriction for this group whose work requires such extensive physical labor in a normally hearing damaging environment. The financial difference for the restriction of one every three years is insignificant for this group.
- 8) Benefits for children with **autism**. The Unions agree this is a critical coverage that needs to be added for the membership and to more than likely ensure compliance with mental health parity rules.

As explained above, the NCCC is asking for a tremendous amount of cost-shifting from the Railroad Plans to the membership. The last two sections will discuss how this will have negligible impact on the NCCC but a significant impact on the Railroad workers and their families.

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**Proposals Financial Impact on the Carriers.**

The Unions' complete proposal increases annual costs less than \$11.8 million per year while providing coverage to make the Plan compliant with mental health parity law and providing critical medical equipment to help keep their workers safe on and off the job, as well as a better quality of life. This increase is less than the 0.6% of the annual revenue received, less than 0.25% of the Carriers' operating revenues, and less than 0.000076% of the Carriers' annual per-ton revenue.



In addition, because the Plan is so large, the likelihood of significant deviation from the projections is relatively small. Based on UHC's June 2022 projections for 2023 and weighted trend analysis of 6.7%, along with the historical National Plan medical calculated standard deviation of 7%, we estimate a 95% confidence level that the Carriers' contributions will fall within +/- 13% within two years and +/-17% within three years as shown in the chart below.

Table 5.4 (in \$millions)	2023	2024	2025	2026	2027
Best Est. RR Plans + Patient Costs	\$2,097	\$2,223	\$2,379	\$2,545	\$2,722
95% Percentile		\$2,471	\$2,745	\$3,034	\$3,320
5% Percentile		\$1,988	\$2,021	\$2,098	\$2,148
Best Estimate Carriers' Costs	\$1,827	\$1,953	\$2,109	\$2,275	\$2,452
95% Percentile		\$2,201	\$2,475	\$2,764	\$3,050
5% Percentile		\$1,718	\$1,751	\$1,828	\$1,878
Negative Variance		\$248	\$366	\$490	\$598
Positive Variance		(\$235)	(\$358)	(\$447)	(\$574)
% Different from Average Negative Variance		13%	17%		
% Different from Average Positive Variance		-12%	-17%		

The possible deviations are less than the NCCC's requested coverage level and program change impacts, as such, the Carriers should have very little concerns about variance from their projected budgets.

Given the increased costs from prior rounds of bargaining, the Carriers' all-time record-breaking profit levels, the recent retaining and hiring difficulties, and the stability of these Railroad Plans, we are not understanding the need to make any benefit cuts, let alone the drastic benefit cuts that the NCCC is proposing.

**NCCC Proposals Increase worker and family Costs by 61% and worker contributions by 28%.**



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However, for the Railroad workers, we are seeing a compelling need to not endure further increases to their health care costs. Table 5.5 below shows the impact the copay, deductible, coinsurance, and out-of-pocket and monthly premiums/contributions could have on the average workers. As you can see, the worker cost is expected to increase 61.1% in addition to the 27.8% increase in monthly contributions.

**Table 5.5 Member Perspective**

1 Current Amount Patients Pay of Total Covered Benefits in 2021	-8.6%	
2 Reduction in Actuarial Value, i.e., ADDED portion of doctor bill for patient to pay, is at least	-5.2%	<b>PEPM:</b>
3 NCCC Proposal Shifts Cost to Patients on Average by	<b>61.1%</b>	<b>\$98.18</b>
4 NCCC Proposal Increases Average Monthly Qualified Employee Contribution by	<b>27.8%</b>	<b>\$64.56</b>
5 Number of Qualified Employees (QE) were <b>98,354</b> in Q1 2022		
6 Average EXTRA Cost Per Qualified Employee per Month (PEPM)		\$162.74
7 Average EXTRA Cost Per Qualified Employee per Year (PEYM)		\$1,953
8 But Health Care is Not Average Business; so a QE's extra cost in 2023 could be \$0 or it could be more than (only \$1,177.22 of the extra cost for health care in 2023 would be paid on a pre-tax basis)		<b>\$15,000</b>
9 Average Gross Household Income		\$70,000
10 Average Gross Household Income After Taxes		\$52,500
11 Average Increase (not Total) to Members is 6.1 times greater impact than to Carriers		<b>3.7%</b>
12 Increase (not Total) in Medical Spend could be more than 30 times greater than to Carriers		<b>28.6%</b>

When we start to look at the distribution of the potential impact, Table 5.6 shows the percent changes range from 60% below average to 141% above average or a far larger range than the +/- 17% we were seeing for the Carriers.

**Table 5.6 Estimated 2023 Annual Cost per Railroad Family**

Cumulative Percent	% Families Impacted	Current Plan	Union Proposal	NCCC Proposal	NCCC % Increase	NCCC \$ Increase	% Difference from Average
6%	6%	\$2,747	\$2,747	\$3,519	28%	\$772	-60.4%
36%	29%	\$3,144	\$3,144	\$4,160	32%	\$1,015	-48.0%
64%	28%	\$4,151	\$4,151	\$5,781	39%	\$1,630	-16.5%
91%	27%	\$5,833	\$5,833	\$8,491	46%	\$2,658	36.1%
100%	9%	\$9,188	\$9,188	\$13,896	51%	\$4,708	141.1%
	<b>Average</b>	<b>\$4,679</b>	<b>\$4,679</b>	<b>\$6,631</b>	<b>42%</b>	<b>\$1,953</b>	0.0%

Note: Furloughed and Opt Outs do not pay the monthly contribution rates

Source: Based on 2018 Railroad Employees National Health and Welfare Plan claims data trended to 2023 at 3%. Hospital Association, dental, and vision member cost are not represented in the above chart.

The example below better explains how painful these changes can be to the Railroad workers. The following example is of a loyal (fictional) worker of the Railroad Carriers, Armstrong, who has been working long hours under strenuous outdoor conditions for decades.

Armstrong lives with his wife Mary and two kids, Jack (8) and Lucy (3), in Wyoming. The entire family has always enjoyed the great outdoors and their favorite activity is to go camping in the woods.



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- Besides a bad knee, high blood pressure, and an allergy to binding agents used in most generic medications, Armstrong considers himself a healthy person. He takes his high blood pressure medication every day and tries to control his cholesterol without medication. Armstrong feels guilty about the stress and responsibilities that rest on Mary, his wife's, shoulders especially after Jack became ill. He went to see his primary care physician (PCP) who prescribed some anti-anxiety medications. His PCP noticed Armstrong was limping badly. He sent Armstrong to see an orthopedic surgeon who did an MRI and told him he needed a hip replacement. Armstrong, like many of his coworkers, is suffering from musculoskeletal issues. Armstrong heard from some of his coworkers there was a type of hip surgery that would cut his recovery time in half, but very few surgeons can perform it. The only one he knew of was an out-of-network provider. Post-surgery, Armstrong is discharged with a pain killer prescription for the first 10 days, then brand NSAIDS for six months.
- Mary worked as a 4<sup>th</sup> grade teacher until she gave birth to Lucy three years ago. After Lucy's birth, Mary started experiencing signs of post-partem depression. She consulted her primary care provider who sent her to a psychiatrist and psychologist. Mary is currently under three brand name medications to treat her depression and help alleviate her stress and anxiety. Mary dedicates her time and energy to caring for Lucy and Jack, especially when Armstrong is gone for days at a time for work.
- Three months-ago Jack started experiencing fatigue, severe headaches, neck stiffness, and facial palsy. Armstrong and Jack went to see three specialists before Jack was diagnosed with Lyme disease. Jack was prescribed two rounds of anti-inflammatory treatments before he got the four-week antibiotic treatment he needed. He was also prescribed physical therapy three times a week for six weeks to help with the stiffness in his joints. Six weeks after, Jack and Armstrong returned to the specialist for a follow-up visit. Jack was on the mend but not out of the woods. The specialist prescribed another brand name anti-inflammatory and another brand name medication to help with the persistent episodes of dizziness.
- Lucy has cystic fibrosis and an endocrine disorder. She is treated for both conditions with two specialty drugs and two brand name drugs.

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NATIONAL CARRIERS' CONFERENCE COMMITTEE'S PROPOSAL

**SECTION 5: PROPOSAL COMPARISONS**

**Table 5.7a Illustrated Medical Care for a Family of 4**

	Armstrong	Mary	Jack (8)	Lucy (3)
1	1 PCP Visit	1 OB/GYN Visit	1 Pediatrician Visit	4 Pediatrician Visits
2	2 Surgeons Visits 1 INN & 1 OON	12 Therapy Sessions	5 Specialist Visits	12 Specialist Visits
3	1 MRI	36 Rx Brand	6 Rx Brand	24 Rx Specialty
4	1 hip replacement surgery	12 Rx Generic Birth Control	3 Rx Generic (anti-inflammatory)	24 Rx Brand
5	24 Physical Therapy sessions		18 Physical Therapy Sessions	
6	4 Rx Generic			
7	12 Rx Blood Pressure			
8	7 Rx Brand anxiety			

Now let us look at what this family's cost would be. The chart below shows the out-of-pocket cost for each of the service listed in the chart on the prior page by family member. For example, Armstrong would need to pay a \$10 copay for his primary care provider visit on line 1.

**Table 5.7b Worker's Cost Share for Illustrated Family of 4**

Line	Armstrong		Mary		Jack (8)		Lucy (3)	
	Unions	NCCC	Unions	NCCC	Unions	NCCC	Unions	NCCC
1	\$ 25	\$ 30	\$ 25	\$ 30	\$ 25	\$ 30	\$ 100	\$ 120
2	\$ 40 *	\$ 50 *	\$ 480	\$ 600	\$ 200	\$ 250	\$ 480	\$ 600
3	\$ 150	\$ 300	\$ 720	\$ 1,080	\$ 30	\$ 30	\$ 720	\$ 3,240
4	\$4,700	\$8,000	\$ 40	\$ 40	\$ 180	\$ 360	\$ 720	\$ 1,080
5	\$2,350	\$4,000						
6	OOP Max Reached							
7	\$ 40	\$ 40						
8	\$ 150	\$ 225						
<b>Total Worker's Cost</b>	<b>\$ 7,455</b>	<b>\$12,645</b>	<b>\$1,260</b>	<b>\$ 1,750</b>	<b>\$ 435</b>	<b>\$ 670</b>	<b>\$ 2,020</b>	<b>\$ 5,040</b>
<b>Increase from NCCC Proposal</b>		<b>\$ 5,190</b>		<b>\$ 490</b>		<b>\$ 235</b>		<b>\$3,020</b>

\* The out-of-network visit is covered by the out-of-network out-of-pocket maximum.

Adding up each family member's cost share, the family pays under:

- Unions' Proposal: \$ 7,455 + \$1,260 + \$435 + \$2,020 = \$11,170
- NCCC's Proposal: \$12,645 + \$1,750 + \$670 + \$5,040 = \$20,105

**SECTION 5: PROPOSAL COMPARISONS**

- **NCCC's proposal would cost Armstrong's Family \$8,935 more (an increase of 80%) from their take-home pay,**

The current plan after the last two rounds already costs Armstrong more than he could afford at \$11,170 on straight-time pay earnings of only \$70,000 a year. The additional \$8,935 is more than he, or almost any worker for that matter, can bear. Unfortunately, this not a worst-case scenario.

MARKETPLACE AND ACTUARIAL ASSESSMENT: UNIONS' PROPOSAL VS. NATIONAL CARRIERS' CONFERENCE COMMITTEE'S PROPOSAL

APPENDIX A: CURRENT AND PROPOSED BENEFIT SUMMARY CHARTS

Table A.1 Railroad Employees National Health and Welfare Plan and National Railway Carriers (NRC) and United Transportation Union Health and Welfare Plan  
Current Plans

	2022			2022		
	MMCP	CHCB	2022 Total Actives	ERMA A	ERMA B	ERMA C
Number of Qualified Employees on Q1 2022	85,454	12,552	98,006			
Number of Family Units in January 2022	92,115	13,530	105,645			
Number of Covered Lives in January 2022	310,517	45,611	330,377			
Employee Monthly Contribution	\$228.89	\$228.89	\$228.89			
Employees' with Spouses Monthly Contribution	\$0.00	\$0.00	\$0.00			
Percent of Total Cost	11.9%	11.9%	11.9%			
Entire Plan Actuarial Value	92.1%	90.0%	92.0%	0.0%	0.0%	0.0%
Actual Actuarial Value 2021 UHC only Medical	91.6%	89.1%	91.4%			
Actual Actuarial Value Medical In-Network	91.9%	89.3%	91.8%			
Deductible - Single	\$350	\$350		\$1,000	\$750	\$500
Deductible - Family	\$700	\$700		N/A	N/A	N/A
Patient Coinsurance (Coin.)	10%	15%		50%	40%	30%
Out-of-Pocket Maximum (OOP Max) Employee						
Medical Copays, Deductible, and Coin. - ACA MOOP	\$8,700	\$8,700		N/A	N/A	N/A
Medical Coin. Only OOP Max	\$2,000	\$3,000		\$15,000	\$10,000	\$7,500
Out-of-Pocket Maximum (Family)						
Medical Copays, Deductibles, and Coin. - ACA	\$15,800	\$17,400		N/A	N/A	N/A
Medical Coin. Only OOP Max	\$4,000	\$6,000		N/A	N/A	N/A
Primary Care Visit	\$25	DC*		DC	DC	DC
Specialist Care Visit	\$40	DC		DC	DC	DC
Telemedicine	\$10	DC		DC	DC	DC
Convenient Care	\$10	DC		DC	DC	DC
Urgent Care	\$25	DC		DC	DC	DC
Emergency Room	\$100	DC		DC	DC	DC
Out-of-Network	90.6%	Above	90.5%			
Deductible - Single	\$700					
Deductible - Family	\$1,400					
Patient Coinsurance	30%					
Medical Coin. Only OOP Max Employee Only	\$4,000	Combined with In-Network		Combined with In-Network	Combined with In-Network	Combined with In-Network
Medical Coin. Only OOP Max Family	\$8,000					
Primary Care Visit	DC					
Specialist Care Visit	DC					
Emergency Room	\$100					
Urgent Care	DC					
Other Benefit Changes						
ABA for Autism	Excluded	Excluded				
Speech Therapy Covered to Age	3	3				
Hearing Aids Maximum Covered	\$600	\$600				
Hospice per course Maximum Covered	\$3,000	\$3,000				
Hospice for counseling Maximum Covered	\$1,000	\$1,000				
Prescription Drugs	92.6%	92.3%	92.6%			
Rx OOP Max - Single - ACA	Included with Medical	Included with Medical		N/A	N/A	N/A
Rx OOP Max - Family - ACA						
Retail - Generic	\$10	\$10		N/A	N/A	N/A
Retail - Brand Formulary	\$30	\$30		N/A	N/A	N/A
Retail - Brand Non-Formulary	\$60	\$60		N/A	N/A	N/A
Retail - Specialty Drugs	\$30	\$30				
Mail - Generic	\$10	\$10		N/A	N/A	N/A
Mail - Brand Formulary	\$60	\$60		N/A	N/A	N/A
Mail - Brand Non-Formulary	\$120	\$120		N/A	N/A	N/A
Mail - Specialty Drugs	\$60	\$60				
Lifetime Maximum	Unlimited	Unlimited		\$500,000	\$500,000	\$500,000
Dental Annual Maximum	\$1,500	\$1,500		N/A	N/A	N/A
Dental Lifetime Orthodontic Maximum	\$1,000	\$1,000		N/A	N/A	N/A
Vision Glass Frame Reimbursement Up To	\$115	\$115		N/A	N/A	N/A
Vision Contacts Reimbursement Up To	\$105	\$105				

Notes:DC means Deductible and Coinsurance apply. N/A mean not applicable.



MARKETPLACE AND ACTUARIAL ASSESSMENT: UNIONS' PROPOSAL VS. NATIONAL CARRIERS' CONFERENCE COMMITTEE'S PROPOSAL

APPENDIX A: CURRENT AND PROPOSED BENEFIT SUMMARY CHARTS

**Table A.2 Railroad Employees National Health and Welfare Plan and National Railway Carriers (NRC) and United Transportation Union Health and Welfare Plan**

	2023		2023		2024		2024		2025		2025	
	Unions' Proposal		NCCC's Proposal		Unions' Proposal		NCCC's Proposal		Unions' Proposal		NCCC's Proposal	
	MMCP	CHCB	MMCP	CHCB	MMCP	CHCB	MMCP	CHCB	MMCP	CHCB	MMCP	CHCB
Number of Qualified Employees on Q1 2022	85,454	12,552	85,454	12,552	85,454	12,552	85,454	12,552	85,454	12,552	85,454	12,552
Number of Family Units in January 2022	92,115	13,530	92,115	13,530	92,115	13,530	92,115	13,530	92,115	13,530	92,115	13,530
Number of Covered Lives in January 2022	310,517	45,611	310,517	45,611	310,517	45,611	310,517	45,611	310,517	45,611	310,517	45,611
Employee Monthly Contribution	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89	\$228.89
Employees' with Spouses Monthly Contribution	\$0.00	\$0.00	\$321.00	\$321.00	\$0.00	\$0.00	\$332.87	\$332.87	\$0.00	\$0.00	\$356.14	\$356.14
Percent of Total Cost	11.1%	11.1%	14.8%	14.8%	10.3%	10.3%	15.0%	15.0%	9.7%	9.7%	15%	15%
Entire Plan Actuarial Value	92.2%	90.6%	87.9%	86.2%	92.7%	91.1%	88.5%	86.7%	93.1%	91.5%	88.9%	87.1%
Actual Actuarial Value 2021 UHC only Medical	92.1%	89.9%	87.1%	84.9%	92.4%	90.2%	87.6%	85.7%	92.7%	90.5%	87.9%	85.5%
Actuarial Value Medical	92.2%	90.6%	87.2%	84.9%	92.5%	90.2%	87.6%	85.7%	92.8%	90.5%	87.8%	85.5%
In-Network												
Deductible - Single	\$350	\$350	\$500	\$500	\$350	\$350	\$500	\$500	\$350	\$350	\$600	\$600
Deductible - Family	\$700	\$700	\$1,000	\$1,000	\$700	\$700	\$1,100	\$1,100	\$700	\$700	\$1,200	\$1,200
Patient Coinsurance (Coin.)	10%	15%	20%	30%	10%	15%	20%	30%	10%	15%	20%	30%
Out-of-Pocket Maximum (OOP Max) Employee	\$9,100	\$9,100	\$9,100	\$9,100	\$9,500	\$9,500	\$9,500	\$9,500	\$9,800	\$9,800	\$9,900	\$9,900
Medical Copay, Deductible, and Coin. - ACA MOOP	\$2,000	\$3,000	\$3,500	\$4,500	\$2,000	\$3,000	\$4,000	\$5,000	\$2,000	\$3,000	\$4,500	\$5,500
Out-of-Pocket Maximum (Family)												
Medical Copay, Deductible, and Coin. - ACA	\$18,200	\$18,200	\$18,200	\$18,200	\$19,000	\$19,000	\$19,000	\$19,000	\$19,800	\$19,800	\$19,800	\$19,800
Medical Coin. Only OOP Max	\$4,000	\$6,000	\$7,000	\$9,000	\$4,000	\$6,000	\$8,000	\$10,000	\$4,000	\$6,000	\$9,000	\$11,000
Primary Care Visit	\$25	DC	\$30	DC	\$25	DC	\$30	DC	\$25	DC	\$30	DC
Specialist Care Visit	\$40	DC	\$50	DC	\$40	DC	\$50	DC	\$40	DC	\$50	DC
Telemedicine	\$10	DC	\$10	DC	\$10	DC	\$10	DC	\$10	DC	\$10	DC
Convenient Care	\$10	DC	\$10	DC	\$10	DC	\$10	DC	\$10	DC	\$10	DC
Urgent Care	\$25	DC	\$30	DC	\$25	DC	\$30	DC	\$25	DC	\$30	DC
Emergency Room	\$100	DC	\$200	DC	\$100	DC	\$200	DC	\$100	DC	\$200	DC
Out-of-Network	80.0%	Above	85.0%	Above	82.0%	Above	83.0%	Above	81.0%	Above	83.5%	Above
Deductible - Single	\$700	\$1,000	\$700	\$1,000	\$700	\$1,000	\$700	\$1,000	\$700	\$1,000	\$1,000	\$1,000
Deductible - Family	\$1,400	\$2,000	\$1,400	\$2,000	\$1,400	\$2,000	\$1,400	\$2,000	\$1,400	\$2,000	\$1,400	\$2,000
Patient Coinsurance	30%	40%	30%	40%	30%	40%	30%	40%	30%	40%	30%	40%
Medical Coin. Only OOP Max Employee Only	\$4,000	Combined with In-Network	\$7,000	Combined with In-Network	\$4,000	Combined with In-Network	\$7,000	Combined with In-Network	\$4,000	Combined with In-Network	\$7,000	Combined with In-Network
Medical Coin. Only OOP Max Family	\$8,000	Combined with In-Network	\$14,000	Combined with In-Network	\$8,000	Combined with In-Network	\$14,000	Combined with In-Network	\$8,000	Combined with In-Network	\$14,000	Combined with In-Network
Primary Care Visit	DC	Network	DC	Network	DC	Network	DC	Network	DC	Network	DC	Network
Specialist Care Visit	DC	Network	DC	Network	DC	Network	DC	Network	DC	Network	DC	Network
Emergency Room	\$100	Network	\$200	Network	\$100	Network	\$200	Network	\$100	Network	\$200	Network
Urgent Care	DC	Network	DC	Network	DC	Network	DC	Network	DC	Network	DC	Network
Other Benefit Changes												
ABA for Autism	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered
Speech Therapy Covered to Age	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit
Hearing Aids Maximum Covered	\$3,000	\$3,000	\$3,000*	\$3,000	\$3,000	\$3,000	\$3,000*	\$3,000	\$3,000	\$3,000	\$3,000*	\$3,000
Hospice per course Maximum Covered	\$3,000	\$3,000	\$6,000	\$6,000	\$3,000	\$3,000	\$6,000	\$6,000	\$3,000	\$3,000	\$6,000	\$6,000
Hospice for counseling Maximum Covered	\$1,000	\$1,000	\$2,000	\$2,000	\$1,000	\$1,000	\$2,000	\$2,000	\$1,000	\$1,000	\$2,000	\$2,000
Prescription Drugs	72.0%	72.0%	68.0%	68.0%	72.0%	72.0%	71.5%	71.5%	72.0%	72.0%	72.5%	72.5%
In OOP Max - Single - ACA	Included	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical
In OOP Max - Family - ACA	Included	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical	Included with Medical
Retail - Generic	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10
Retail - Brand Formulary	\$30	\$30	\$45	\$45	\$30	\$30	\$45	\$45	\$30	\$30	\$45	\$45
Retail - Brand Non-Formulary	\$60	\$60	\$90	\$90	\$60	\$60	\$90	\$90	\$60	\$60	\$90	\$90
Retail - Specialty Drugs	\$60	\$60	\$135	\$135	\$60	\$60	\$135	\$135	\$60	\$60	\$135	\$135
Mail - Generic	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10
Mail - Brand Formulary	\$60	\$60	\$90	\$90	\$60	\$60	\$90	\$90	\$60	\$60	\$90	\$90
Mail - Brand Non-Formulary	\$120	\$120	\$180	\$180	\$120	\$120	\$180	\$180	\$120	\$120	\$180	\$180
Mail - Specialty Drugs	\$60	\$60	\$270	\$270	\$60	\$60	\$270	\$270	\$60	\$60	\$270	\$270
Lifetime Maximum	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Rental Annual Maximum	\$1,500	\$1,500	\$2,000	\$2,000	\$1,500	\$1,500	\$2,000	\$2,000	\$1,500	\$1,500	\$2,000	\$2,000
Dental Lifetime Orthodontic Maximum	\$1,000	\$1,000	\$2,000	\$2,000	\$1,000	\$1,000	\$2,000	\$2,000	\$1,000	\$1,000	\$2,000	\$2,000
Vision Glass Frame Reimbursement Up To	\$115	\$115	\$150	\$150	\$115	\$115	\$150	\$150	\$115	\$115	\$150	\$150
Vision Contacts Reimbursement Up To	\$105	\$105	\$150	\$150	\$105	\$105	\$150	\$150	\$105	\$105	\$150	\$150

Notes: DC means Deductible and Coinsurance apply. N/A means not applicable. \* Each ear covered only 1 x per 3 years



MARKETPLACE AND ACTUARIAL ASSESSMENT: UNIONS' PROPOSAL VS.  
NATIONAL CARRIERS' CONFERENCE COMMITTEE'S PROPOSAL

**APPENDIX B: BENEFIT COMPARISON DETAILS  
OF RAIL AND TRANSPORTATION PLANS**

Table B.1a

Rail & Transportation Groups -- Benefit Summary Comparison						
	Los Angeles (LACMTA)	Philadelphia (SEPTA)	New York (NYCTA)	New Jersey Transit	Long Island (LIRR)	AmPlan 1 (74% weight)
<b>Plan Name</b>	Kaiser Traditional Plan	Personal Choice Health Benefits Program	Aetha Choice POS II Plus Option	Horizon Direct Access PPO	The Empire Plan (NY SHIP)	Amtrak AmPlan I
<b>Bargaining Unit</b>	TCU	TCU	ATU, TVU	TCU	Multiple	Multiple
<b>2023 Actuarial Value - Medical</b>	99%	97%	97%	96%	96%	97%
<b>2023 Actuarial Value - Drug</b>	97%	96%	99%	97%	93%	92%
<b>2023 Actuarial Value - Combined</b>	99%	97%	97%	96%	95%	96%
<b>In-Network Benefits</b>						
<b>Deductible</b>						
Single	none	none	none	\$250	none	none
Family	none	none	none	\$500	none	none
<b>Coinsurance</b>						
	0%	0%	0%	0%	0%	0%
<b>Out-of-Pocket Max</b>						
Single	\$1,500	\$2,000	\$1,500	ACA Max	\$5,000	\$6,050
Family	\$3,000	\$4,000	\$3,000	ACA Max	\$15,000	\$12,100
<b>Medical Copays</b>						
Primary Care	\$5	\$15	\$5	\$10	\$25	\$10
Specialist	\$5	\$30	\$5	\$20	\$25	\$35
Urgent Care	\$5	\$70	\$35	\$20	\$30	\$20
Emergency Room	\$35	\$100	\$100	\$100	\$100	\$125
<b>Prescription Drug Benefits</b>						
<b>Drug Copays (retail/mail)</b>						
Generic	\$5 / \$5	\$5 / \$5	\$0 / \$0	\$3 / \$0	\$5 / \$5	\$10 / \$20
Brand Formulary	\$5 / \$5	\$10 / \$10	\$10 / \$20	\$10 / \$15	\$30 / \$55	\$20 / \$30
Brand Non-Formulary	\$5 / \$5	\$20 / \$20	\$15 / \$30	\$10 / \$15	\$60 / \$110	\$30 / \$60
Specialty	\$5 / \$5	\$10 / \$10	\$10 / \$20	\$10 / \$15	\$30 / \$55	\$20 / \$30
<b>Out-of-Network Benefits</b>						
<b>Deductible</b>						
Single	No Benefits					
Family	\$300	\$1,000	\$500	\$1,000	\$500	\$1,000
<b>Coinsurance</b>						
	30%	30%	40%	30%	25%	25%
<b>Out-of-Pocket Max</b>						
Single	\$2,000	\$10,000	\$12,700	\$10,000	\$3,000	\$3,000
Family	\$4,000	\$30,000	\$31,750	\$30,000	\$6,000	\$6,000



MARKETPLACE AND ACTUARIAL ASSESSMENT: UNIONS' PROPOSAL VS. NATIONAL CARRIERS' CONFERENCE COMMITTEE'S PROPOSAL

**APPENDIX B: BENEFIT COMPARISON DETAILS OF RAIL AND TRANSPORTATION PLANS**

Table B.1b

Rail & Transportation Groups -- Benefit Summary Comparison							
	AmPlan 2 (20% weight)	AmPlan 3 (6% weight)	Seattle (King County)	Boston (MBTA)	Chicago (CTA)	Louisville (PAL)	San Francisco (SFMTA)
Plan Name	Antrak	Antrak	KingCare Select (Regence):	Tufts Health Plan		Anthem PPO	Blue Shield of
Bargaining Unit	AmPlan I	AmPlan I	Eastside Health	Navigator POS	PPO Option B	Plan II	CA PPO -
2023 Actuarial Value - Medical	Multiple	Multiple	ATU	Multiple	ATU	Multiple	Accolade
2023 Actuarial Value - Drug	94%	91%	94%	92%	89%	89%	87%
2023 Actuarial Value - Combined	94%	88%	93%	85%	94%	89%	92%
	94%	90%	93%	91%	89%	89%	87%
<b>In-Network Benefits</b>							
<b>Deductible</b>							
Single	\$200	\$250	\$200	\$500	\$500	\$600	\$250
Family	\$400	\$500	\$600	\$1,000	\$1,000	\$1,200	\$750
<b>Coinsurance</b>							
	5%	10%	10%	0%	30%	20%	15%
<b>Out-of-Pocket Max</b>							
Single	\$1,000	\$2,500	\$1,100	\$5,000	\$2,500	\$2,400	\$3,750
Family	\$2,000	\$5,000	\$2,400	\$10,000	\$5,000	\$4,800	\$7,500
<b>Medical Copays</b>							
Primary Care	\$10	\$10	\$20	\$10	Ded + Coins	Ded + Coins	Ded + Coins
Specialist	\$35	\$35	\$20	\$30	Ded + Coins	Ded + Coins	Ded + Coins
Urgent Care	\$20	\$20	\$20	\$20	Ded + Coins	Ded + Coins	Ded + Coins
Emergency Room	\$125	\$125	\$200	\$100	\$100	Ded + Coins	Ded + Coins
<b>Prescription Drug Benefits</b>							
<b>Drug Copays (retail/mail)</b>							
Generic	\$5 / \$5	\$10 / \$20	\$5 / \$10	\$10 / \$25	\$10 / \$20	\$25 / \$40	\$10 / \$20
Brand Formulary	\$25 / \$50	\$20 / \$30	\$25 / \$50	\$30 / \$75	\$25 / \$50	\$35 / \$60	\$25 / \$50
Brand Non-Formulary	\$45 / \$90	50%	\$75 / \$150	\$65 / \$165	\$45 / \$90	\$45 / \$80	\$50 / \$100
Specialty	\$25 / \$50	\$20 / \$30	\$25 / \$50	\$30 / \$75	\$0 / \$0	\$35 / \$60	\$50 / \$50
<b>Out-of-Network Benefits</b>							
<b>Deductible</b>							
Single	\$500		\$500	\$500	\$1,500	\$1,200	\$500
Family	\$1,000		\$1,500	\$1,000	\$3,000	\$2,400	\$1,500
<b>Coinsurance</b>							
	25%		40%	20%	50%	40%	50%
<b>Out-of-Pocket Max</b>							
Single	\$3,000		\$2,500	\$5,000	\$4,500	\$4,200	\$7,500
Family	\$6,000		\$5,500	\$10,000	\$9,000	\$8,400	none



**APPENDIX C: FREIGHT RAILROAD WORKING CONDITIONS  
SOURCES AND DETAILS**

Sources for Section 4: Railroad Work is NOT Mainstream

1. OSHA/MHSA Hazard Alert on Diesel Exhaust (DE) and Diesel Particulate Matter (DPM)  
<https://www.osha.gov/Publications/OSHA-3590.pdf>
2. Leukemia and Benzene <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3447593/>
3. Chronic obstructive pulmonary disease mortality in railroad workers  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2658724/>
4. Lead exposure in US worksites: A literature review and development of an occupational lead exposure database from the published literature  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4711746/>
5. Health Problems Caused by Lead <https://www.cdc.gov/niosh/topics/lead/health.html>
6. OSHA Cadmium Health Effects <https://www.osha.gov/cadmium/health-effects>
7. Occupational Safety and Health Guideline for Carbon Black Potential Human Carcinogen  
<https://www.cdc.gov/niosh/docs/81-123/pdfs/0102.pdf>
8. RAND 2015 American Working Conditions Survey  
[https://www.rand.org/pubs/research\\_reports/RR2014.html](https://www.rand.org/pubs/research_reports/RR2014.html)
9. Histoplasmosis <https://www.mayoclinic.org/diseases-conditions/histoplasmosis/symptoms-causes/syc-20373495>
10. Exposure to Animal Feces and Human Health: A Systematic Review and Proposed Research Priorities <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5647569/>
11. Work Schedules and Health Behavior Outcomes at a Large Manufacturer  
[https://www.jstage.jst.go.jp/article/indhealth/48/4/48\\_MSSW-03/pdf](https://www.jstage.jst.go.jp/article/indhealth/48/4/48_MSSW-03/pdf)
12. Shift work and cardiovascular disease - pathways from circadian stress to morbidity  
<https://pubmed.ncbi.nlm.nih.gov/20087536/>
13. Rotating night shift work and the risk of ischemic stroke  
<https://pubmed.ncbi.nlm.nih.gov/19357324/>
14. Shift work and the risk of ischemic heart disease - a systematic review of the epidemiologic evidence <https://pubmed.ncbi.nlm.nih.gov/19387517/>
15. Effects of poor and short sleep on glucose metabolism and obesity risk  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4457292>
16. The Effect of Long Working Hours and Overtime on Occupational Health: A Meta-Analysis of Evidence from 1998 to 2018 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6617405/>
17. Worker health and safety and climate change in the Americas: issues and research needs  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5176103/>
18. Risk factors for chronic kidney disease of non-traditional causes: a systematic review  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6461065/>
19. Noise Induced Hearing Loss and Tinnitus—New Research Developments and Remaining Gaps in Disease Assessment, Treatment, and Prevention.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7602100/>
20. How Does Loud Noise Cause Hearing Loss?  
[https://www.cdc.gov/nceh/hearing\\_loss/how\\_does\\_loud\\_noise\\_cause\\_hearing\\_loss.html](https://www.cdc.gov/nceh/hearing_loss/how_does_loud_noise_cause_hearing_loss.html)
21. Noise-Induced Hearing Loss <https://www.nidcd.nih.gov/health/noise-induced-hearing-loss>
22. Acoustic Neuroma <https://rare-diseases.org/rare-diseases/acoustic-neuroma/>

**APPENDIX C: FREIGHT RAILROAD WORKING CONDITIONS SOURCES AND DETAILS**

- 23. *Exposure to loud noise and risk of acoustic neuroma*  
<https://pubmed.ncbi.nlm.nih.gov/16357108/>
- 24. *Association between occupational, sport and leisure related physical activity and baroreflex sensitivity. The Paris Prospective Study III.* <https://eprints.utas.edu.au/33900/2/137560%20-%20Association%20between%20occupational%20-%20Final%20author%20version.pdf>
- 25. *Repetitive Strain Injury* <https://my.clevelandclinic.org/health/diseases/17424-repetitive-strain-injury>
- 26. *Negative Impacts of Shiftwork and Long Work Hours*  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4629843/>
- 27. *UHC 2021 Claim Detail report, page 8 of 91*
- 28. *Occupational risk factors for musculoskeletal disorders among railroad maintenance-of-way workers.* <https://pubmed.ncbi.nlm.nih.gov/32144807/>
- 29. *Work Exposures and Musculoskeletal Disorders Among Railroad Maintenance-of-Way Workers.* <https://pubmed.ncbi.nlm.nih.gov/31022101/>

Tables 6.1a and 6.1b below show many working conditions by Union that indicate the working conditions of various railroad workers are not mainstream. These tables are the full version of Table 4.1 referenced in Section 4. The information was provided by labor leaders for each union. Union abbreviations are listed in Appendix E for the full union names.

**Table C.1a: Freight Railroad Employees Working Conditions Part 1 of 2**

	Asbestos Exposure	Diesel Fumes Exposure	Lead Exposure	Chemical Fumes Exposure	Away (3+ days / week)	Work or available 7+ days in a row	10+ Hour Shifts	Night Shifts	Outdoor Work	No AC in work-place	Loud noise (above 85dB)
1 SMART – TD	Yes	Yes	No	Yes	Most	Most	Most	Most	Yes	Most	Yes
2 BMW - IBT	Yes	Yes	Yes	Yes	Half	Yes	Most	Most	Yes	Most	Yes
3 BLET – IBT	Yes	Yes	No	Yes	Most	Most	Most	Most	Yes	Most	Yes
4 TCU/IA M	Yes	Yes	Yes	Yes	No	Yes	Most	Most	Most	Most	Most
5 BRS	Yes	Yes	Yes	Yes	Most	Yes	Most	Most	Yes	Most	Yes
6 IAM	Yes	Yes	Yes	Yes	No	Yes	Most	Most	Yes	Most	Yes
7 IBEW	Yes	Yes	Yes	Yes	A Few	Yes	Most	Most	Yes	Most	Yes
8 NCFO	Yes	Yes	Yes	Yes	No	Yes	Most	Most	Yes	Most	Yes
9 ATDA	Some	Yes	No	No	No	Yes	Some	Most	No	No	Yes
10 TWU	No	Yes	No	Yes	No	Yes	Most	Most	Yes	Most	Yes
11 SMART – Mech	Yes	Yes	Yes	Yes	Some	Yes	Most	Most	Yes	Most	Yes
12 IBB	Yes	Yes	Yes	Yes	No	Yes	Most	Most	Yes	Most	Yes

Source: Labor leaders for each union



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**APPENDIX C: FREIGHT RAILROAD WORKING CONDITIONS  
SOURCES AND DETAILS**

**Table C.1b: Freight Railroad Employees Working Conditions Part 2 of 2**

	Heavy lifting	Skip lunch break	Hazardous walking conditions	Near heavy equipment	Ladder and raised platform work	Repetitive movement	Cadmium & Carbon dust Exposure	Bird droppings exposure	Human and animal waste exposure	Oil-covered walking surfaces	Carcinogen exposure
1 SMART - TD	Yes	Most	Yes	Yes	Yes	Yes	Yes	Rarely/Never	Yes	Yes	Yes
2 BMW - IBT	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3 BLET - IBT	Yes	Most	Yes	Yes	Yes	Yes	Yes	Rarely/Never	Yes	Yes	Yes
4 TCU/IAM	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5 BRS	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6 IAM	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7 IBEW	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8 NCFO	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9 ATDA	No	Most	No	No	No	Yes	No	No	No	A Few	No
10 TWU	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11 SMART - Mech	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 IBB	Yes	Most	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**APPENDIX D: DATA, ASSUMPTIONS, AND METHODS****Table 2.1**

Table 2.1 is a list of unions and their abbreviations.

**Chart 2.2**

Chart 2.2 uses data provided by The Labor Bureau, Inc. (the freight operating revenue and total freight service expenses). Carriers' contributions are determined the same way for any Charts and years. 2020 Carriers' contributions are determined by multiplying the 2020 participating Qualified Employee (reported by United Healthcare) by the 2020 health payment rates and subtracting the employee contributions (\$228.89 per QE per month). The health payments rates included in the Carriers' contributions are:

- Payment rates for Other than On-Duty Injury Coverage and Employee On-Duty Injury Coverage for Non-Hospital Association participants, including the NRLC administrative fee,
- Payment rates for Other than On-Duty Injury Coverage and Employee On-Duty Injury Coverage for Hospital Association participants, including the NRLC administrative fee,
- Dental payment rates for NHA and HA participants, including the NRLC administrative fee,
- Vision payment rates for NHA and HA participants including the NRLC administrative fee,
- Life/AD&D payment rates for NHA and HA participants employees.

2020 health payments rates are based on the 2020 Rate Circulars published November 12, 2019. Employee contributions are determined by multiplying the 2020 participating Qualified Employee (NHA and HA) by the employee contribution rate.

**Chart 2.3**

Chart 2.3 assumes family with large health care needs spend \$16,300 in medical out-of-pocket expenses (based on 2020 ACA in-network OOP Max of \$8,150/\$16,300 for individuals/families). Employee contributions are 12 months at \$228.89. ACA affordability threshold is 9.78% for 2020 as published by the Internal Revenue Services.

**Chart 2.4**

Chart 2.4 is based on average QE enrollment (NHA, NA, and opt-outs) provided by UHC for 2000 through (projected) 2022.

**Chart 2.5**

Chart 2.5 uses payment rates from 2000 through 2022 Rate Circulars, and 2000 through (projected) 2022 average QE enrollment (NHA and HA) provided by UHC. For each year Carriers contributions are determined using the same method as described for Chart 2.2. Employee contributions are based on the QE enrollment and the monthly rates listed below. CPI-M is determined using average monthly price index per year for 2001 through 2021 and the average of the January through May 2022 monthly price index for 2022. All CPI-M values are extracted from <https://fred.stlouisfed.org>. CPI-U is determined using the average monthly price index per year for 2001 through 2021 and the average of the January through April 2022 monthly price index for 2022. All CPI-U values are extracted from

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**APPENDIX D: DATA, ASSUMPTIONS, AND METHODS**

<https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/>

Year	Employee Contributions
2007	\$ 146.62
2008	\$ 166.25
2009	\$ 170.96
2010	\$ 200.00
2011	\$ 200.00
2012	\$ 198.00
2013	\$ 198.00
2014	\$ 198.00
2015	\$ 198.00
2016 - First half	\$ 198.00
2016 - Second half	\$ 228.89
2017	\$ 228.89
2018	\$ 228.89
2019	\$ 228.89
2020	\$ 228.89
2021	\$ 228.89
2022	\$ 228.89

**Table 2.6**

Table 2.6 shows key In-network plan provisions for MMCP, and their effective dates. All information from past contracts or summary plan descriptions.

**Table 2.7**

Table 2.7 uses historical employee contribution information (see Chart 2.5 description), and historical average straight-time pay information provided by the Labor Bureau, Inc. Max spend is the sum of employee contributions and max costs shares. Max costs shares are assumed to be equal to \$4,000 in 2010, \$17,200 in 2015 (2015 ACA family OOP Max + MMCP out-of-network OOP Max), and \$25,100 in 2021 (2021 ACA family OOP Max + MMCP out-of-network OOP Max). Employee average spend is equal to employee contributions + average costs shares. The average costs shares are determined using the UHC Claims Experience Summary (CES) reports for the Plans. Then, grossed up for mental health and Rx using the 2022, 2016, and 2015 Overall Funding Report trend weights (e.g., 71.9% for medical, 3.2% for Mental Health, 24.9% for Rx in 2022 Overall Funding Report) and the Adequacy of Benefits (AoB) listed below. For 2015, actual worker cost reported by ESI was used instead of grossing up for Rx.

	Assumed benefit ratio		
	2010	2015	2021
Medical	92.4%	92.9%	91.1%



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Mental Health	92.4%	92.9%	91.1%
Rx	92.4%	92.9%	92.8%

**Chart 2.8**

Chart 2.8 uses UHC’s National Plan and NRC/UTU CES reports for employee counts, employee cost shares, and medical plan costs. CPI-M is determined using average monthly price index per year for 2001 through 2021 and the average of the January through May 2022 monthly price index for 2022. All CPI-M values are extracted from <https://fred.stlouisfed.org>.

**Chart 2.9**

Chart 2.9 uses 2000 through 2022 Rate Circulars and QE enrollment (provided by UHC). Carriers’ contributions are determined as described above for Chart 2.2 and Chart 2.5. Historical operating revenue and operating expenses were provided by the Labor Bureau, Inc. Source for CPI-U is <https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/>. See description of Chart 2.5 for determination of CPI-U.

**Chart 2.10**

Chart 2.10 uses data historical operating revenue and operating expenses provided by the Labor Bureau, Inc. Carriers’ contributions are determined as described above for Chart 2.2. and Chart 2.5.

**Chart 2.11**

Chart 2.11 uses average and crew specific current straight-time pay information provided by the Labor Bureau, Inc. “No Claims” employees only pay their monthly contributions. “Average” and “Sickest family” are the same as the 2021 Employee average spend and max spend in Table 2.7. “Sick family” are assumed to have half of the “Sickest family” out-of-pocket expenses.

**Chart 2.12**

Chart 2.12 uses the same data as Chart 2.2.

**Chart 2.13**

Chart 2.13 uses the same data as Chart 2.2.

**Chart 3.1**

Chart 3.1 shows actuarial values determined using Optum Insight 2021 v1.02 Comprehensive Pricing Model. Cheiron utilized the Optum Comprehensive Benefit Pricing Model [2021, Version 1.02], which is software leased from OptumInsight, to provide manual rates, benefit pricing, and benchmark calculations. For this report, the Model was used to determine the actuarial values of the different Rail Industry plans for benchmarking purposes.

Census is based on 274,417 National Plan covered lives (2015 individual enrollment provided by UHC). The geographic distribution is based on the above census by Metropolitan Statistical Area (MSA). Medical and pharmacy trend assumptions are shown in the tables below. We assume Rx



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rebates equal 33% of Rx allowed. The Out-of-Network weights are 5% inpatient, 8% outpatient, 5% PCP, 10% referrals, 10% other, and 0% Rx. The MMCP vs CHCB weights for RR plans are 91% MMCP and 9% CHCB based on Calendar Year 2021 Employee Counts. The AmPlan weights are 74% AmPlan-1, 20% AmPlan-2, and 6% AmPlan-3 based on Dec 2021 members.

Medical trends	Util	Cost	Pharmacy trends	Util	Cost
Inpatient	0.3%	4.2%	Generic	0.0%	4.9%
Outpatient	2.0%	4.6%	Brand	0.0%	4.9%
Physician	1.6%	2.5%	Non-Form.	0.0%	4.9%
			Specialty	5.0%	7.5%

**Table 3.2**

Table 3.2 uses the same information as Chart 3.1, displayed as a table.

**Chart 3.3**

Chart 3.3 uses actual 2021 medical data from UHC along with Year-to-Date 2022 prescription drug data from ESI.

**Chart 3.4**

Chart 3.4 uses **same source as 3.3.**

**Table 3.5**

Table 3.5 uses information from each property's most recent bargaining agreement.

**Chart 3.6**

Chart 3.6 uses cumulative distribution data from Optum Insight 2021 v1.02.

**Chart 3.7**

Chart 3.7 uses information from the 2005 through 2021 Kaiser Family Foundation Surveys.

**Tables and Charts in Section IV**

See Appendix C

**Table 5.1**

Table 5.1 uses UHC provided savings estimates.

**Table 5.2**

Table 5.2 uses **the same source as 5.1.**

**Table 5.3**

Table 5.3 uses the 2023 NHA contract rate in the June 2022 H&W Monthly Funding Letter. Contract rate is trended to 2025 at 6.7%.



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Dental, Vision, and Available Funds rates are based on the 2022 Rate Circulars report. The rates are trended to 2025 at 2%, 2%, and 0% separately.

NCCC proposal benefit changes in Table 5.2 are included. Impacted cost/saving are trended to 2025 at 5.4% for Medical, 9.0% for MHSA, 10.3% for Rx, 2.0% for Dental, and 2.0% for Vision.

NRLC Admin and Supplemental Sickness are excluded.

**Table 5.4**

Table 5.4 uses the 2023 NHA contract rate in the June 2022 H&W Monthly Funding Letter. Contract rate is trended to 2025 at 6.7% with standard deviation of 0.07.

Dental, Vision, NRLC Admin, Supplemental Sickness, Available Funds rates are based on the 2022 Rate Circulars Report. The rates are trended to 2025 at 2%, 2%, 2%, 0% and 0% separately.

**Table 5.5**

Table 5.5 uses **the same source as 5.1.**

**Table 5.6**

Table 5.6 uses the incurred CY 2018 Railroad Employees National Health and Welfare Plan patient paid data trend to 2023 at 3%. Data included the MMCP and CHCB plans from UHC, Highmark, Aetna, MHSA, and ESI database, paid thru 12/31/2019. Hospital Association, dental, and vision member cost are not represented in the chart. Assumed 161% member cost increases by the NCCC Proposal.

**Table A.1**

Table A.1 is the benefits grid based on the Summary of Plan Description

**Table A.2**

Table A.2 uses benefit design proposal information for 2022 through 2025 from NCCC and the Unions.

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**APPENDIX E: ABBREVIATION LIST**

ACA - Affordable Care Act  
 Adj - Adjust  
 AoB - Adequacy of Benefits  
 AV - Actuarial Value  
 CHCB - Comprehensive Health Care Benefits  
 COB - Coordination of Benefits  
 CoE - Centers of Excellence  
 CTA - Chicago Transit Authority  
 CY - Calendar Year  
 DC - Deductible and Coinsurance Apply  
 EE - Worker, Eligible Union Member, COBRA Contract, Retiree, Surviving Spouse (not dependent)  
 ER - Emergency Room  
 Geo - Geographic  
 HA - Hospital Association  
 HMO - Health Maintenance Organization  
 INN - In Network  
 KFF - Kaiser Family Foundation  
 LACMTA - Los Angeles County Metropolitan Transit Authority  
 LIRR & Metro No. - Long Island Railroad & Metro North  
 MBCR - Massachusetts Bay Commuter Rail  
 MBTA - Massachusetts Bay Transportation Authority  
 Med - Medical  
 Mgmt - Management  
 MMCP - Managed Medical Care Program  
 NA - Not Available  
 N/A - Not Applicable  
 National Plan - Railroad Employees National Health and Welfare Plan  
 NCCC - National Carriers Conference Committee  
 NHA - Non-Hospital Association  
 NJ Transit - New Jersey Transit Authority  
 NRC / UTU - National Rail Conference / United Transportation Union 25  
 NYCTA - New York City Transit Authority  
 OON - Out of Network  
 PAL - Paducah & Louisville Railway, Inc.  
 PBM - Pharmacy Benefit Manager  
 PCP - Primary Care Provider  
 POS - Point of Service  
 PPPM - Per Person Per Month - a person includes both workers and their dependents  
 PPO - Preferred Provider Organization  
 PQEPM - Per Qualified Employee Per Month



**APPENDIX E: ABBREVIATION LIST**

PRG - Pharmacy Risk Grouper  
QE - Qualified Employee  
RV - Relative Value  
Rx - Prescription Drugs  
SEPTA - Southeastern Pennsylvania Transportation Authority  
SFMTA - San Francisco Municipal Transportation Agency  
SPD - Summary Plan Description  
TDS - Total Decision Support  
TW - Towers Watson  
UHC - UnitedHealthcare  
UTU - United Transportation Union  
VSP - Vision Service Provider  
w/ - With

**Statement for the Record by Robert E. Green, Founder and CEO, American Solar Rail  
Before the Senate Committee on Environment and Public Works  
Subcommittee on Clean Air, Climate, and Nuclear Safety  
Hearing on “Cleaner Trains: Opportunities for Reducing Emissions from America’s Rail  
Network.”  
August 9, 2023**

American Solar Rail (ASR) appreciates the Senate Environment & Public Works’ Subcommittee on Clean Air, Climate, and Nuclear Safety holding its hearing titled “Cleaner Trains: Opportunities for Reducing Emissions from America’s Rail Network.”

ASR has spent a decade researching a solar-powered version of a high-speed train – powered by electric battery, not an overhead catenary. Our goal has been to enable a national template for CO2 free transportation super-corridors along interstate and highways that support both rail and electric vehicle (EV) travel and enable Americans the ability to significantly reduce their carbon footprint. That is ASR. With the help of the rail engineering experts at AAR’s MxV Rail, ASR has made major strides in bringing high-speed intercity passenger rail (HSIPR) to reality.

***INTRODUCTION TO AMERICAN SOLAR RAIL***

***Energy as an Asset – Significantly Cuts Operating Costs***

In the US, trains have long been fueled by diesel, but each gallon of diesel burned creates 22.4 pounds of carbon. Our solar-charged, battery powered trains are designed to operate on 100 percent renewable energy. Solar electricity provides almost three times the workforce power than diesel and will travel almost three times the distance at lower cost. For example, one gallon of diesel can move 1 ton of freight 500 miles, whereas the equivalent amount of energy from solar can move 1 ton of passengers 1400 miles. Diesel can never overcome that advantage. In addition, we anticipate our solar rail network can be built to have the capacity to provide surplus electricity back to the power grid. Therefore, ASR has flipped the script on rail operations turning one of traditional rail’s largest operating expenses into an asset. ASR trains are a primary tool to expedite decarbonization, and with our competition, ignite an industrial race to decarbonize our transportation sector faster and cheaper.

*Capitalizing on Excess Energy Capacity*

We have cited ASR's model of "energy as an asset." Here is how we put that asset to work beyond passenger rail systems. Existing interstate rail corridor compacts pave the way for clean energy-transmission corridors, as large quantities of clean electricity can be delivered through networks of solar farms along existing and new rail corridors. Clean energy-transportation corridors are the new transmission lines that can address high-priority national interstate transmission needs and offer significant distributed energy generation alternatives to improve reliability and resilience of the power system. The corridor's distribution of its generation can also alleviate transmission congestion on an annual basis and during real-time operations, mitigate power transfer capacity limits between neighboring regions, and deliver cost-effective generation while meeting projected electricity demands and reliability requirements. At the same time, corridors fueled with clean energy can alleviate greenhouse gas (GHG) emissions and traffic congestion by taking cars and trucks off the road.

For example, the extension of the Southeast High-Speed Rail corridor from Charlotte, North Carolina, to Atlanta, Georgia, will develop an integrated passenger rail transportation solution for the Southeast, including high-speed rail from Washington, D.C. through Richmond, Virginia, Charlotte, and Raleigh, North Carolina, and from Charlotte to Atlanta.. ASR is poised to service these corridors and develop the power to operate its trains from a transmission grid of networked solar farms along transportation corridors that will also provide low-cost clean energy to communities and disadvantaged communities located hundreds of miles along the corridor. In addition, the existence of these interstate transmission lines can serve as a backup to the existing power grid in cases of extreme weather.

*High-Speed Operations on Existing Rail Infrastructure – Dramatically Cuts Capital Costs*

One issue that has always plagued high-speed rail in the U.S. is aging rail infrastructure that cannot support high-speed trains without expensive new investments. But, ASR solar-charged battery powered trains and a unique rail car can operate this 21<sup>st</sup> century technology on most existing 20<sup>th</sup> century rail infrastructure. In fact, since ASR's electric trains are not reliant on catenary systems, they can operate on 99.5 percent of the worlds existing rail lines, ensuring true global interoperability.

Rail is already one of America's most efficient forms of powered transportation, and our solar technologies will help expand the availability of intercity rail nationwide and create thousands of jobs in the process. As ASR trains have extremely low fuel costs, they are capable of providing low-cost and efficient rail service to cities across the country.

ASR's innovation extends beyond small-scale intercity rail service and could provide a template for zero-emissions service throughout the United States. A ton of freight can travel 500 miles on one gallon of fuel, but the average freight train carried 4,089 tons of cargo in 2022. As a result, a 500-mile trip will burn 4,089 gallons of fuel – not 1. That means each 500-mile trip on diesel will release 94,047 pounds of carbon emissions in our atmosphere. Outside of the Northeast Corridor, the story is similar with passenger rail, where trains must rely on diesel locomotives to transport passengers over long distances which lack electric rail infrastructure. ASR has a zero-emissions solution to national rail needs outside the Northeast Corridor and other intercity rail corridors. Our solar-charged, battery powered trains would release 0 pounds of carbon and are capable of scaling up to meet the needs of long-distance high-speed service beyond the East Coast.

***Reliable, High-Speed Trip Times – Key to Supporting Robust Ridership***

At present, passenger rail emissions are roughly one-fifth of those emitted by airplanes.<sup>1</sup> ASR and other innovators can ensure an even better ratio. With our technologies, we can eliminate emissions while increasing efficiency and helping drive a mode-shift that removes cars from congested roads and competes directly with air travel in terms of trip times and ticket prices. By providing high-speed, efficient rail to more destinations nationwide, ASR is the solution that America needs to enter an emissions-free transportation future. Ultimately, the best way to deal with an energy liability is not to generate it in the first place.

**Unprecedented Growth in the US Railcar Market**

The total passenger and freight rail market is almost \$100 billion, and federal investment from the Infrastructure Investment and Jobs Act (IIJA) is expected to increase that significantly, with \$42.5 billion

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<sup>1</sup> "Overview of Rail." International Energy Agency. <https://www.iea.org/energy-system/transport/rail>

in federal funds for passenger rail through FY 2026. House Transportation and Infrastructure Committee Ranking Member Rick Larsen (D-WA) stated that “For the first time, this mode of transportation has guaranteed funding for multiple years. The value of this certainty is not to be understated. This is akin to the beginning of the interstate highway system.” This is not just at the federal level. Regional, state, and local entities are hugely supportive of new rail service identified via the corridor identification and development program. In addition, Americans are increasingly looking for alternatives to vehicle travel. We know from places like Virginia, where intercity service is expanding, that ridership has reached historic highs – reflecting an ever-growing demand for high-frequency rail service in the U.S. beyond just the Northeast Corridor.

***THE DEVELOPMENT OF AMERICAN SOLAR RAIL'S EMDI CAR***

ASR was created in 2020 to advance a new option for access and egress of passengers and light freight from a moving train, creating new performance dynamics that had not existed in any railroad. The operational efficiency will enable ASR trains to travel at 125 – 135 mph top speed while still maintaining similar average speed – and thus the same trip time – as trains with 180 mph top speed using conventional passenger exchange. We knew this would change passenger rail construction and operation costs significantly.

We knew the last technology box to be checked to enable ASR was a battery capable of driving the rail system by solar charged battery systems, freeing the railcars from any catenary system. Current-day battery technology is more than adequate for ASR's needs.

Impervious to weather and traffic congestion, HSIPR rail trips inside 300-350 miles can provide affordable and effective service to more intercity depots with far more flexible capability, if the rail service adopts a unique operational method. Very few guessed a Continuous Railway System (CRS) like ASR's, an idea tested over 100 years ago but then lost in history, still remains the unmatched choice for HSIPR. When speeds exceed ~120 -140 mph, more speed is not necessarily the best operational answer. Up until 2020, the past 60 years has only been about more speed and costs for passenger rail worldwide. No other solutions, such as CRS, were tested. ASR's purpose was to deploy the synergy created by

merging solar energy and CRS into creating America's most potent tool to halt unnecessary atmospheric carbonization in the transportation and electric generation industries while delivering some of the most profitable, effective high-speed, intercity passenger and light freight systems.

ASR's analyses rewound rail history and found that CRS could, without increasing top speeds, almost duplicate the average speed of trains traveling about 20 - 30% faster by using a new rail car, the EMDI, (EMbarkation/DIsembarkation). The battery driven EMDI enables continuous movement of the train by providing in-transit coupling and decoupling capability to allow passengers to access and egress without stopping the main train. Furthermore, by constantly being able to recharge the EMDI from local solar fields every time it goes into the depot to pick up passengers, it can continuously recharge the main locomotive's battery bank, making the trains continuous operation feasible. The EMDI solves traditional HSIPR's start-and-stop inefficiency and significantly lowers construction and operational costs. Analysis further showed ASR's most CO2-free design to be the most financially profitable, operationally efficient, and energetically powerful version, *i.e.*, carbon free was paying for itself.

The environmental analyses now displayed "amplification of decarbonization." This was the impact of a system that removes multiple sources of CO2 emissions (passenger's ICE cars) using the same kWh's. When that system operates on renewable energy, the decarbonization becomes multiplied. Solar driven passenger rail is what America needs to start lowering our emissions. Starting in June 2021 the Association of American Railroads' engineering lab (the Transportation Technology Center, now called MxV Rail), spent nearly two years conducting feasibility studies of ASR's research and ideas to assess any engineering hurdles to bringing the EMDI to production. MxV Rail's Final Report supports our decision that it is time to bring the EMDI to the Federal Railroad Administration to address safety and certification standards needed before building the prototype. The EMDI is the only piece of unique equipment necessary to build the CRS. Everything else can be purchased off the shelf.

Other railroads have come to the same conclusion we have on the value of solar-generated electric powered trains. In June, Forbes magazine ran a story describing how California's \$100 billion high-speed train will be fully solar powered. More good news emerged in the story: Brightline West, the

proposed high-speed railway connecting Las Vegas to suburban L.A., also intends to rely on carbon-free electricity. Brightline West intends to purchase power from operators of large desert solar fields and touts its system as “100% electrified. It will use renewable power. It will literally be, not an embellishment, the greenest train in the world.”<sup>2</sup> The commitment of two of America’s high-speed passenger rail system to solar-generated power is an achievement we should all cheer.

Battery technology is in high gear. Diesel imposes much higher financial and environmental costs as a fuel. Battery systems will soon provide higher operational performance and CO<sub>2</sub>-free energy without the expense and operational challenges of catenary systems. Battery driven rail might soon deliver heavy freight’s needs well into the distant future. The better choice for now is to not compel Tier 1 rail operators to purchase new Tier 4 diesel locomotives when locomotives may be replaced by battery electric ones. EPA’s mandates for Tier 4 locomotives are being surpassed by less expensive, more powerful, and – very soon – abundant renewable energy-charged batteries.

A better plan may be to provide new incentives from Rail Renewable Energy Credits (RRECs) to incentivize Tier 1 Operators to order battery electric locomotives. Let them earn RREC’s for CO<sub>2</sub> that will never be emitted.

As for ASR and our goal for battery driven passenger/light freight trains, we will also require our version of high-speed battery driven locomotives and the flexible, battery driven EMDI rail car for in-transit passenger on/off-boarding at stations. American Solar Rail is expected to be built as “all-American” as soon as possible. ASR is here to inspire, then enable, people to begin a forever energy transition.

Renewable electricity is a more powerful and less expensive way to turn automotive and rail wheels. It is a more financially profitable, operationally efficient, energetically powerful, and CO<sub>2</sub> free substitute for diesel. We need to leave the finite oil and gas resources for the tasks to which there is little

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<sup>2</sup> “California’s \$100 billion Electric Bullet Train will be Fully Solar Powered.  
<https://www.forbes.com/sites/alanojnsman/2023/06/12/californias-100-billion-electric-bullet-train-will-be-fully-solar-powered/?sh=29a36cc86796>

substitute and transition now to solar-generated electricity in cases like ASR's where lower costs and higher efficiencies readily support the change.

ASR thanks the Subcommittee for the opportunity to submit written testimony following the Subcommittee's hearing and welcomes further engagement on these important topics. As the United States continues to decarbonize our economy and restore our infrastructure, ASR hopes Congress will continue to recognize cutting-edge rail technologies as a solution to our nation's most urgent climate and transportation challenges.

## STATEMENT SUBMITTED FOR THE RECORD

CHUCK BAKER, PRESIDENT, AMERICAN SHORT LINE AND REGIONAL RAILROAD ASSOCIATION (ASLRRRA)  
HEARING ON "CLEANER TRAINS: OPPORTUNITIES FOR REDUCING EMISSIONS FROM AMERICA'S RAIL  
NETWORK"

U.S. SENATE COMMITTEE ON ENVIRONMENT & PUBLIC WORKS  
SUBCOMMITTEE ON CLEAN AIR, CLIMATE, AND NUCLEAR SAFETY

JULY 26, 2023

INTRODUCTION

As president of the American Short Line and Regional Railroad Association (ASLRRRA), the trade association representing the nation's more than 600 small Class II and III freight railroads (commonly known as short line railroads or short lines), and hundreds of industry suppliers, I submit this statement for inclusion in the record of this subcommittee's hearing.

This testimony highlights the serious flaws in recent regulatory actions by the state of California's Air Resources Board (CARB) related to locomotive emissions. Twenty-five small railroads in California will be immediately and severely harmed by the new In-Use Locomotive Regulation. These railroads are likely to be driven out of business by the unfunded costs of this mandate, causing a ripple effect throughout the state and region, due to the interconnected nature of the U.S. freight rail network. The regulation will negatively impact the freight supply chain and will cause significant harm to workers, California shippers and the public. The regulation also conflicts with multiple statutory areas where the federal government has well-established primacy.

THE SHORT LINE FREIGHT RAIL INDUSTRY

**Short line railroads and the national network.** Short lines have been in existence for well over a century and today play a critical role in the country's freight supply chain. Short lines provide first-mile and last-mile freight rail service, touching one in five railcars on the system. They ensure that businesses in small towns and rural communities that would otherwise be cut off from the North American freight rail network have the access they need to the global supply chain.

Short lines are nearly all small, entrepreneurial businesses. The typical short line employs about 30 people, operates about 80 route miles, and earns about \$8 million in revenue per year.

The short line industry as we know it today is the product of the Staggers Act of 1980, which made the sale or long-term lease of light density lines from Class I railroads to local entrepreneurs possible and thankfully avoided the abandonment of those lines and ripping up of the track for scrap. However, those sold-off lines came with high hurdles to continuing business operations – decades of deferred maintenance and few customers along the lines. In other words, these lines were spun off as short lines for a reason. These lines needed significant investment from the moment they became short lines, and

that's still the case today, with these small businesses still using up to a third of their annual revenues for maintenance and improvements, making short line railroading one of the most capital-intensive industries in our nation.



Despite those challenges, the short line industry has emerged as a great American success story. Short lines have not only kept those marginal lines they inherited viable, but they have turned them into small thriving enterprises. The industry now manages one-third of the freight rail network and touches one-fifth of all carloads while still only accounting for 6% of the industry's total revenue. Short lines pride themselves on doing more with less and making it work.

**The country's short line freight rail industry is a vital part of the North American supply chain.** Short line railroads provide first- and last-mile rail service, and they are the face of railroading for thousands of customers who need to move and receive critical goods. Our members ship all commodities, and industries critical to our country's economic health, such as industrial, manufacturing, agricultural, energy, and chemical sectors are particularly reliant on short line service.

**Short lines are economic engines for localities, particularly in small-town and rural America.** Our members are critical links in the nation's freight supply chain and are vital engines of economic activity. Together, our members are tied to 478,000 jobs nationwide, \$26.1 billion in labor income and \$56.2

billion in economic value-add<sup>1</sup> – providing a service that 10,000 businesses nationwide rely upon to get goods and products to market. At the local level, the availability of rail service provided by short lines is often the tipping point for manufacturers and shippers deciding to locate in the area, driving new, well-paying jobs particularly in rural and small-town America.

**We live and work in the communities we serve.** Short lines are owned, managed, and staffed by individuals who are part of the fabric of their local communities. Because short lines run short distances, employees live and work in the communities they serve. Many short lines are family-run businesses — safety and service is personal to them.

**Short lines’ environmental stewardship is strong.** The rail industry is a sustainable, environmentally friendly mode of transportation. U.S. Environmental Protection Agency (EPA) data show freight railroads account for only 0.6% of total U.S. greenhouse gas emissions and only 2.1% of transportation-related sources. On average, U.S. freight railroads move one ton of freight 480 miles on a single gallon of diesel fuel, approximately four times as far as our over-the-road competition. Short line service alone keeps 31.8 million heavy trucks off highways and public roads, preventing costly wear and tear, relieving congestion, and reducing the still horrifying number of deadly motor vehicle crashes.

Short lines are committed to doing their part, by continuously seeking ways to reduce their environmental impact with the implementation of technology and operating practices that reduce emissions. For example, the ASLRRA is currently partnering with the FRA and short line railroads to test locomotive emissions by studying fuel injectors and additives. Products like these that increase fuel economy may also yield emissions benefits. This is a two-year project that will give us a better understanding of how small railroads can utilize cost effective methods for reducing their impact on the environment.

**Short lines are small businesses with limited resources.** Efforts to regulate problems in the rail space can impose outsized burdens and demands on these railroads. It is crucial that any new regulatory requirements be practical, directly relevant to a safety benefit and realistic for a small business to implement.

A longstanding body of law, including the Regulatory Flexibility Act of 1980 (RFA), as modified by the Small Business Regulatory Enforcement and Fairness Act of 1996 (SBREFA), requires that agencies exercise utmost care and discretion in evaluating how regulations they promulgate affect small businesses. Congress should similarly heed the wisdom of these laws before crafting prescriptive updates to the current complex and highly technical regulatory framework. Many small railroads are unable to comply with costly “one size fits all” requirements that are written with larger entities in mind. Each small railroad has a unique operating environment that can differ dramatically from others in terms of scale, market, operating characteristics, capital needs, and price sensitivity of shippers served. Any action by Congress that ignores this fact could inflict extreme duress and economic harm on a critical piece of the supply chain.

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<sup>1</sup> The Section 45G Tax Credit and the Economic Contribution of the Short Line Railroad Industry, prepared by PWC for ASLRRA (2018).

### **CARB AND THE IN-USE LOCOMOTIVE REGULATION**

The California Air Resources Board (CARB) was created in 1967 to unify statewide efforts to address severe air pollution. It is part of the California EPA, is the lead agency for climate change programs, and oversees all air pollution control efforts in California to attain and maintain health-based air quality standards.

#### **CARB's Locomotive Emissions Activities**

CARB has worked to reduce emissions from locomotives operating in the state for over two decades by entering negotiated agreements with railroads. This includes two agreements: the 2005 Statewide Railyard Agreement and the 1998 Locomotive NOx Fleet Average Agreement in the South Coast Air Basin. The two Class I railroads operating in California – BNSF Railway, and the Union Pacific Railroad – were counterparties. In 2017, CARB petitioned<sup>2</sup> the EPA to adopt more stringent emission standards for locomotives through adoption of a new “Tier 5” standard in regulation that would establish lower limits for NOx, PM, HC and GHG emissions from locomotives. In their petition, CARB noted that the federal Clean Air Act (CAA) is “technology forcing” and expressed their sense that Tier 4 locomotive standards no longer reflected the best available technology, citing developments in after-treatments, diesel oxidation catalyst filters, hybrid electric locomotives and zero emission battery and fuel cell electric locomotives. In 2022, EPA responded to CARB’s petition committing to develop regulations to address emissions from the locomotive sector and to “...undertake a rulemaking process to reconsider our existing locomotive preemption regulations to ensure they don’t inappropriately limit California’s and other states’ authorities under the CAA to address their air quality issues.” The EPA response suggested that funding from the Inflation Reduction Act such as the Clean Ports Program, or through the Diesel Emissions Reduction Act, administered by the EPA, could provide resources to “...help accelerate the introduction of cleaner locomotives.” On its website, CARB suggests several potential resources for incentives for locomotive investments including the FRA’s CRISI grant program<sup>3</sup> and the state’s Carl Moyer Memorial Air Quality Standards Attainment Program.

#### **The 2023 In-Use Locomotive Regulation**

On April 27, 2023, CARB approved the In-Use Locomotive Regulation<sup>4</sup>, which it promulgated “...in the absence of federal actions to address harmful emissions from locomotives...” with the objective to “...transition locomotive operations to zero emissions.”

Here are some highlights from the rule.

- Starting in 2024, locomotive operators will be required to set-aside funds based on the emissions created by their locomotives in California. The higher the emissions, the more funds must be set

<sup>2</sup> CARB. Petition For Rulemaking Seeking the Amendment of The Locomotive Emission Standards For Newly Built Locomotives and Locomotive Engines and Lower Emission Standards for Remanufactured Locomotives and Locomotive Engines. April 13, 2017. [https://ww2.arb.ca.gov/sites/default/files/2020-07/final\\_locomotive\\_petition\\_and\\_cover\\_letter\\_4\\_3\\_17.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-07/final_locomotive_petition_and_cover_letter_4_3_17.pdf)

<sup>3</sup> The Consolidated Rail Infrastructure and Safety Improvements (CRISI) Program authorized at 49 U.S.C. 22907

<sup>4</sup> In-Use Locomotive Regulation. Title 13, California Code of Regulations, Chapter 9, Article 8, Sections 2478 through 2478.17. Resolved on April 27, 2023 as R-23-12 and submitted to the California Office of Administrative Law on June 9, 2023. <https://ww2.arb.ca.gov/rulemaking/2022/locomotive>

aside. These “spending accounts” may only be used for: purchase, lease or rent of EPA Tier 4-compliant or zero emissions (ZE) locomotives or to rebuild locomotives to these standards; infrastructure associated with ZE; or, to pilot or demonstrate ZE locomotives or rail equipment technologies.

- Locomotives with automatic shutoff devices will not be permitted to idle for longer than 30 minutes.
- All locomotives operating in the state will be required to register with CARB, and reporting includes an annual administrative payment.
- Locomotive activity, emission levels and idling data will be required to be reported annually.
- Starting in 2030, only locomotives less than 23 years old may be used in California and none that are not Tier 4 compliant or ZE. Switcher locomotives with an original engine build date of 2030 and beyond will be required to operate in a ZE configuration to be lawful in California.

This regulation is severely flawed in numerous respects. It directly conflicts with numerous federal laws. It is impractical and key assumptions made by CARB about economic impacts, current technological capabilities and direction, scale and timing of technology development are unsound. The impact on the short line railroad industry in California would be particularly severe as it mandates relatively massive capital expenditures by small businesses on locomotive fleet replacements in a much shorter timeline than is feasible. The regulatory impact analysis associated with the rule failed to adequately consider the impact on small businesses. Finally, the unintended consequences of implementing this rule are likely to thwart the stated objectives of the regulation.

#### **THE CARB RULE IS UNSOUND FOR MANY CRITICAL REASONS**

##### **1. The regulation is preempted by federal law.**

CARB is rulemaking in an area where it clearly lacks legal authority and is unequivocally preempted from rulemaking by federal law. It is ASLRRRA’s assessment that this regulation violates (at least) three statutes: The Interstate Commerce Commission Termination Act (ICCTA) of 1995, the Clean Air Act, and the Locomotive Inspection Act.

**First, ICCTA.** The ICCTA preempts state or local laws that unreasonably interfere with interstate commerce or unreasonably burden or interfere with rail transportation. The Ninth Circuit has held that ICCTA “plainly” preempts local environmental regulations targeting railroads, such as rules imposing reporting requirements related to emissions and restricting the idling time allowed for locomotives.

**Second, the Clean Air Act.** Congress granted the EPA exclusive authority to regulate emissions from new locomotives under the CAA. This state regulation violates that federal authority. Specifically, the CAA requires EPA to “promulgate regulations containing standards applicable to emissions from new locomotives and new engines used in locomotives.” 42 U.S.C. § 7547(a)(5). § 209(e)(1) of the CAA provides that “[n]o State or any political subdivision thereof shall adopt or attempt to enforce any standard or other requirement relating to the control of emissions from ... [n]ew locomotives or new engines used in locomotives.” 42 U.S.C. § 7543(e)(1). Section 209(e)(2) also requires that a state first

receive an express waiver from EPA before adopting or attempting to enforce “standards and other requirements relating to the control of emissions” from nonroad vehicles or engines, including non-new locomotives or engines operating beyond their useful life.

**Third, the Locomotive Inspection Act.** This law governs the regulation of locomotive equipment. Specifically, the Locomotive Inspection Act provides that “[a] railroad carrier may use or allow to be used a locomotive or tender on its railroad line only when the locomotive or tender and its parts and appurtenances—(1) are in proper condition and safe to operate without unnecessary danger of personal injury; (2) have been inspected as required under this chapter and regulations prescribed by the Secretary of Transportation under this chapter; and (3) can withstand every test prescribed by the Secretary under this chapter.” 49 U.S.C. § 20701. This law has been upheld through challenges including *Law v. Gen. Motors Corp.*, 114 F.3d 908, 910 (9th Cir. 1997); also *Kurns v. R.R. Friction Prods. Corp.*, 565 U.S. 625, 631 (2012) (holding that Congress “occup[ie]d the entire field of regulating locomotive equipment”—a field that “extends to the design, the construction and the material of every part of the locomotive and tender and of all appurtenances”) (quoting *Napier v. Atl. Coast Line R.R. Co.*, 272 U.S. 605, 611 (1926)).

Based on the fundamental conflicts with these three well-established areas of federal statute, ASLRRRA has joined the Association of American Railroads in a federal lawsuit against CARB, filed in the U.S. District Court for the Eastern District of California.

The Committee should consider that the State of California, in coordination with the Administration, has deliberately taken actions that fundamentally challenge the long-established authority of Congress in this important area of interstate commerce. Regulation of railroad locomotive emissions belongs at the federal level, performed within the parameters of federal law, and conducted through a formal federal rulemaking process that carefully weighs the costs and benefits of agency action across stakeholder groups. This process includes protections and consideration under law taken to protect the interests of small businesses, including through the RFA and SBREFA.

**2. The regulation imposes an unfunded and extremely burdensome mandate on small railroads.**

Based on CARB’s own regulatory impact analysis, the cost of implementation of the rule for California’s small railroads could be well over half-a-billion dollars. The regulation does not provide any dedicated resources to assist regulated entities with costs of compliance. Rather, locomotive operators are mandated to place their own monies into a segregated trust fund that may only be used to acquire and upgrade locomotives to the standards set by the regulation. The cost to rebuild a locomotive to Tier 4 standards, or to acquire a new Tier 4 compliant locomotive, is millions of dollars more than the cost to acquire or rebuild to lower tier levels. At short lines and smaller operators, such intermediate EPA tier improvements could result in significant reductions in emissions for these fleets, but these are precluded by the regulation. Class II and III railroads are small entities who have based their long-term financial strategies and planning around the low costs to acquire used motive power and to periodically rebuild these locomotives for very long-term lifespans of more than 50 years. The normal periodic rebuilding of this equipment will generally result in significant emissions reductions, though not to the maximalist levels mandated by the CARB rule. Many short lines will fundamentally be unable to shoulder

the costs of the mandate and will exit the freight railroading business. Their shippers will be forced to divert to truck service or to find a new rail-served location. Others will be forced to defer important regular capital expenditures, including investments in safety and capacity, and attempt to pass the balance of the costs of the rule to shippers. This will increase logistics costs for their shippers as well as drive some portion of their traffic onto trucks on local roads and highways.

**3. The ability of federal and local funding programs to mitigate CA this massive unfunded mandate is unclear.**

CARB has suggested that short lines can simply obtain funding from existing resources like FRA's CRISI, EPA's DERA and California's Carl Moyer grant programs to upgrade or replace the more than 160 short line locomotives in California.

**First, FRA's CRISI program historically has not provided anywhere near the level of resources for locomotives that would be necessary to help address this massive unfunded mandate.** Since 2017 the CRISI program has awarded more than \$1.3 billion in competitive funding for all eligible purposes. Of those awards, only two included funding for motive power rebuilds or acquisitions as elements of projects where most investment was in fixed assets. In 2020, an \$8.5m award for the Henderson (TX) Overton Branch Rail Line Rehab and Train Siding Improvement Project, included funding for at least one locomotive, and, in 2018, an \$8.8 million award to the South Carolina Piedmont Freight Rail Service Improvement Program included funding to acquire three locomotives. If as much as half those award amounts went to motive power purposes, that is less than 0.7% of CRISI awards since the program began.

Congress used the Infrastructure Investment and Jobs Act (IIJA) to emphasize CRISI eligibility for motive power emissions reductions projects, and the FRA has released some additional program guidance on the topic. CRISI is also unique among federal grant programs in that private Class II and III railroads may apply for and receive grants directly without public intermediaries. But history has not shown CRISI to have been a significant source of funding for locomotive emission reductions, nor does it seem that this program can be a relevant source of funding in the immediate future:

- The assumption that CRISI can resolve the resource challenge this regulation presents to California short lines must consider that the applications are highly competitive. Last year's much larger funding amount, over a billion dollars under the first year of the IIJA, has reportedly been oversubscribed by eight times.
- CRISI eligibility is broad. Applications for locomotive projects must compete with many other merit-worthy project types with significant public benefits, including for track and bridge investments, at-grade crossing improvements, signaling and communications, railyards and stations, research and development and workforce training. Both intercity passenger and freight projects are eligible for CRISI funds. It is unrealistic to expect a disproportionate number of short line freight locomotive awards sufficient to address the scale of the challenge, relative to these other project types.
- One of FRA's award objectives is geographic equity. Because of this, a disproportionate number of project awards to the state of California sufficient to address the massive unfunded mandate is unlikely, even over several cycles.

- Applications for funding through CRISI are complicated and often very challenging to prepare for small businesses.
- When short lines do win, awards may not be obligated for as long as 15 months. This means that the lead time to reach a point at which expenditures on locomotive projects may begin can be as long as 30 months from the closing of the previous cycle. FRA intends to combine CRISI resources from FY's 2023 and 2024 into a single competition, so the lag time to expenditure of awards for the subsequent FY 2025 cycle will be even longer.

**Second, California's state funding is woefully inadequate.** Since inception, the Carl Moyer Program has awarded \$93.8 million for projects involving locomotives. This is an average of only \$4 million per year spread across all locomotive types in California: passenger and freight, switching and line haul, and public and privately held equipment. ASLRRRA is aware of some Moyer awards to California short lines, but we do not have a clear picture of the total assistance extended to short lines for locomotive emission improvement projects. We have requested this data from CARB.

**Finally, EPA's DERA program will not help much, if at all.** The funding provided by the DERA program has been suggested as an option for the California short lines subject to this rule. According to award data, California has received \$120 million out of \$661 million of all DERA funding since 2008. But of this, only \$23 million was awarded to all types of locomotive projects, a cash flow of approximately \$1.6 million per year.

Administrators of funding programs must also consider in their guidance and award decision-making the workforce development needs, fleet scaling and equipment sustainment costs likely to be incurred by short lines and small operators being forced to upgrade to Tier 4 compliant locomotives.

**4. The regulation fails to recognize the economics of short line motive power acquisition, operation, and maintenance and the excessive costs that will now be imposed on short lines**

Lower tier locomotives predominate in the fleets of smaller operators not by choice but economic necessity. These are capital-intensive and low margin small businesses. CARB itself noted that an average Class III railroad in the state has yearly revenue of approximately \$1.3 million, with cost of compliance with their new regulation as high as 42% of annual revenue for a short line. A new cost of that magnitude is untenable for a short line – or any business. For more than a decade the spread in cost between an older, lower-tier used locomotive in good condition and a brand-new unit has been dramatic - from a few hundred thousand dollars for used equipment contrasted with over \$4 million for a small-order purchase of a new Tier 4-compliant locomotive. The long-term financial planning of short lines has been constructed around assumptions of a generally low cost of motive power acquisition on the secondary market with periodic rebuilds enabling those locomotives to remain in service indefinitely. The CARB regulation is constructed as a fiscally coercive mechanism with no accompanying provision of resources to support the costs of compliance. It upends core capital and operating budget assumption and plans for the 25 short lines in the state as well as numerous industrial track operations. CARB itself stated that "...it is possible some of these businesses would be eliminated" due to the massive compliance costs. The costs to the public of loss of some or all these important short line links in the freight supply chain and local and regional economies — 33% of California's railroad network —

must be considered more thoroughly before the damage begins to accumulate from implementation of this rule.

CARB has included two provisions in the rule ostensibly to reduce the burden on small businesses: the Alternative Compliance Plan and the Small Business Hardship Extension. Both measures enable regulated railroads to delay compliance with some elements of the rule for periods of time, but they entail substantial reporting burdens. Neither addresses the basic challenge, that under the rule, inevitably, and on approximately the same terminal timeline, short line railroads will be forced to make a massive investment in Tier 4 locomotives – or ZE locomotives, if ever practical and available – that will be many times the motive power investments that would have been expected to need to support their operations under the legal framework prior to the ruling. The costs imposed by the Regulation will remain insurmountable for small businesses, under the Alternative Compliance Plan, and with the Small Business Hardship Extensions, as they would under normal compliance.

**5. The regulation makes unreasonable assumptions about costs and feasibility of implementation and present and future technologies.**

Comments made during the CARB regulatory process by industrial locomotive operators bring to light a very important concern with the requirement to implement the highest-tier locomotives: relative performance. Compliance with each EPA tier introduces mechanical complexity to a locomotive. Maintenance intervals are more frequent, maintenance activities more elaborate, repairs more costly and operators have not observed the expected improvements in reliability as they have moved from lower to higher tiers. The latest Tier 4 compliant locomotives — also the newest on the market — are dramatically more complex machines than the lower tier locomotives commonly found at short lines, in terms of the engines, electronic controls and monitoring systems. The step from Tier 3 to Tier 4 is notable for these impacts. Locomotive maintenance personnel require substantial additional training, more consumables and spares must be kept on hand, and fleets may even have to be sized differently to address lower-than-expected availability levels. CARB does not seem to have fully considered the effect of this dynamic, one that can disproportionately impact smaller operators of locomotives. The CARB approach eliminates the potential for significant evolutionary emissions reductions by small operators through lower-level-tier-to-tier improvements. Rather, it presents one mandate for the use of only the most costly, complex, and newest locomotives.

**6. The regulation will cause environmental harm due to modal diversion from rail to truck and increasing emissions.**

Despite our shared environmental goals, the short line railroad industry strongly disagrees with the means proposed in CARB's Proposed Rule to purportedly achieve a reduction in locomotive emissions. Rather, we expect the rule to be counterproductive in terms of reducing emissions generated by short line railroads serving their shippers. The cost to comply with the proposed regulatory requirements would cripple and threaten to render many short line railroads financially insolvent. Under CARB's rule, much of the freight carried by short line railroads will continue to be shipped through California even as the short lines themselves are forced to cease operations given their inability to meet the financial burdens imposed by the rule. This will inevitably result in a modal shift of freight traffic from rail to its competing mode of truck transportation. This will lead to an increase in road congestion and wear on public highways, micro plastic pollution from shredded tires, and accidents, injuries, and fatalities, to the

detriment of the residents of California. One short line railroad has commented that their efforts to pass through of costs compliance with the rule into freight rail tariffs could put as many as 100,000 trucks on California roads each year, just at their operation. Most small railroads are likely to shut down and all their shippers will be forced to switch to truck transportation. Even in a vision of rapid adoption of electric trucks in California, these vehicles still generate emissions in the form of substantial PM from tire wear, and that is without considering the emissions of the generation mix used by electric power providers in any given scenario, nor the substantial emissions footprint associated with manufacturing of EVs.

**7. The regulation is likely to be copied by other states, having nationally negative impacts to transportation.**

Regulatory actions in California historically have not remained constrained within the borders of the state. The CAA provides a specific exemption for California to preempt federal law for motor vehicle emission standards. Under certain circumstances other states are allowed to adopt California motor vehicle emission standards. The map below illustrates states that have adopted California's criteria pollutant vehicle emissions standards under section 177 of the CAA. The dark shaded states adopted the standards between 1990 and 2023, the light shaded states have committed to do so by 2026.

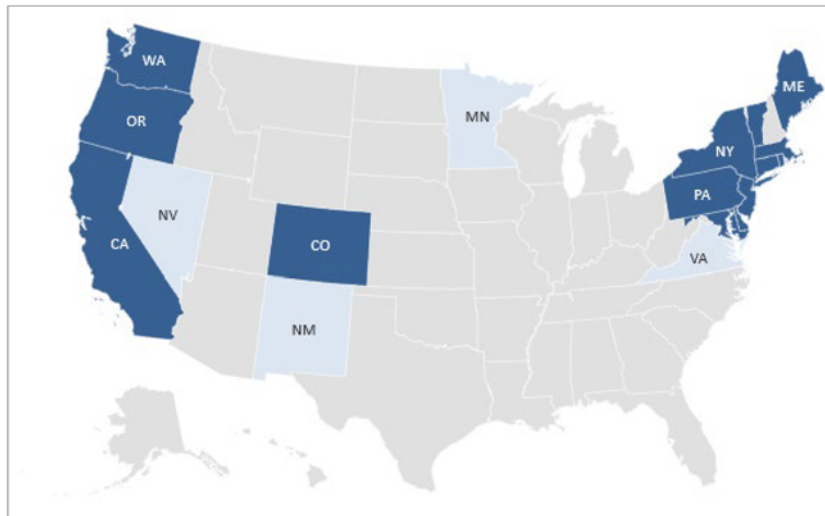


Figure 1: Adoption of California Criteria Pollutant Vehicle Emissions Standards 1990 - 2026

Considering this demonstrated past propagation of California requirements for emissions standards, it is reasonable to expect numerous other states to consider enacting new regulations on locomotive emissions modeled on this CARB rule. California does not consider its regulation to be federally preempted, although we fundamentally disagree. States that are politically favorable to additional

emissions regulation could be willing to take the California defense of this regulation at face value and proceed promptly with adoption of carbon-copy rules following California's lead. EPA has taken steps to create a loophole in federal preemption of locomotive emissions measures to facilitate national propagation of the CARB rule. On April 27<sup>th</sup> the EPA released their notice of proposed rulemaking (NPRM) on Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles. That NPRM seeks to revise agency rules to "...[ensure] that states are not impeded from adopting programs as allowed by the CAA to address the contribution of air pollutant emissions from non-new locomotives and engines to their air quality issues."<sup>5</sup>

The effect of spread of the CARB rule would be to build a disconnected patchwork of state regimes for locomotive emissions that would prevent the movement of locomotives across borders, even when on the same railroad, creating geographically captive fleets, and prevent the common practice of exchanging power motive power between systems when the movement crosses a border with a state regulatory disparity. This would impact Class I railroad operations fundamentally, but also Class II and III railroads as many small railroads also have lines that cross state borders. Such a potential propagation of the CARB rule, following the scale and pattern illustrated above, would dramatically multiply the financial burden projected for California short lines across hundreds of small railroads and thousands of locomotives. This would create chaos in the movement of rail freight around the nation, raise costs for shippers, worsen customer service and supply chain fluidity, likely put a significant number of short lines out of business, and divert hundreds of thousands of rail carloads to truck. A scenario such as this would de facto have seen a handful of states through coordinated action effectively usurp the responsibility and authority of the federal government and Congress.

#### **SHORT LINES AND THE CARB IN-USE LOCOMOTIVE REGULATION: WHAT CONGRESS CAN DO**

##### **Maintain federal primacy and pre-emption on rail regulation.**

State regulation of freight railroading threatens to undermine the efficiency of the world's premier freight rail network. The interconnected nature of the rail network seems to be the most clear and obvious case of interstate commerce that one could imagine – we urge Congress to not let its federal role in rail be usurped by the states, which would create an unworkable and inefficient patchwork of rail regulation and lead to more future supply chain instability. The California locomotive rule for instance would simply ban any locomotive older than 23 years old beginning in 2030 – a completely unworkable proposal for a short line industry that regularly relies on 40- and 50-year-old locomotives to keep our sometimes barely marginal railroads viable. Absent a decision from the courts upholding the federal primacy in this area of law, Congress should act to assert, protect, and preserve the federal government's necessary authority over this sector of the economy.

##### **Assess grant funding resourcing to help small businesses shoulder the financial burden of the regulation.**

Congress, through this committee, and other committees with jurisdiction over locomotive emissions and freight rail, can evaluate the true feasibility of available grant program funding to meaningfully

<sup>5</sup> Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 88 Fed. Reg. 26092. (April 27, 2023) Section X: Preemption of State Standards and Requirements for New Locomotives or New Engines Used in Locomotives.

mitigate the massive burden this regulation imposes on small businesses, including through dialogue with funding agencies and the impacted railroads. This evaluation of practicality and adequacy of resources should consider the massive scale of locomotive acquisitions required under the short CARB timeline, any supply chain challenges in the locomotive manufacturing industry that could hamper production, and the changes in total cost of ownership for the operators of the mandated new locomotive types, including workforce training needs.

#### CONCLUSION

ASLRRRA's short line members are the critical connection between shippers in small towns and rural areas across the country and the Class I railroads. We are an important driver of economic growth in California, as many of the industries that are most reliant on small railroads are critical in California including agriculture, energy, and manufacturing – particularly in California's rural areas. If the California rule spreads to other states, you can expect the same deterioration of small railroad operations and the jobs it supports, a less fluid supply chain, a detrimental impact to the public as freight moves from rail to truck, and a much larger bill for road infrastructure maintenance burdening states and localities. Congress can help us, and the small communities we serve across rural and small-town America, to grow and flourish, or stagnate and fail.

The CARB rule is unlawful, impractical and would impose a terrible burden on small businesses and the shippers they serve. We appreciate the committee's close attention to the items we have noted in our statement, and we welcome future opportunities to work together to craft good public policy around emissions that is measured, reasonable, evolutionary, properly resourced, and that takes into careful account the full measure of potential impacts on all stakeholders. ASLRRRA appreciates the attention of the subcommittee to this issue and looks forward to continuing to build on rail's enormous environmental benefits and work with Congress to advance realistic and reasonable ways to further reduce emissions in the rail sector.

**Testimony of Al Russo**

**Director, Railroad Department**

**International Brotherhood of Electrical Workers**

**Before the**

**Committee on Environment & Public Works**

**Subcommittee on Clean Air, Climate and Nuclear Safety**

**U.S. Senate**

**July 26, 2023**

Chairman Markey, Ranking Member Ricketts and members of the Clean Air, Climate and Nuclear Safety Subcommittee of the Committee on Environment and Public Works, thank you for the opportunity to provide this written testimony.

My name is Al Russo, and I am the director of the Railroad Department. With 820,000 active and retired members across various sectors in the United States, Canada, Puerto Rico and U.S. territories, the International Brotherhood of Electrical Workers (IBEW) — represents approximately 400,000 members who work in construction or are employed by railroads. These members construct, build, maintain or install infrastructure and railroad equipment for our nation's railroad network.

The IBEW supports robust investments in maintaining, modernizing, and diversifying the freight railways and commends this subcommittee for its work on the subject of electrifying this key distribution link in the supply chain.

IBEW railroad members have been maintaining rail systems throughout the U.S. since before the first World War. For more than 100 years, rail unions have bargained for good-paying middle-class jobs directly tied to the railroad, including constructing, operating, and maintaining networks.

Electrifying the freight rail network can offer a cleaner alternative in the pursuit of reduced greenhouse gas emissions. It can provide access to opportunities and vital services for those in rural America that have suffered from deindustrialization and underinvestment.

Locomotives have evolved dramatically since the steam engine was invented in the early 1800s. Although they are more efficient and environmentally responsible today, the fact remains that even maximizing operational and fuel efficiency, diesel locomotive engines are dirty, noisy, and pose environmental dangers to the communities near railyards and the workers exposed to constant fumes and fuel spills. As the public knows all too well from recent high profile derailments, the fallout can be calamitous.

Locomotive battery technology has arrived and carriers should embrace a wholesale transition, which is already underway globally. Electric locomotives consume less oil and diesel fuel, greatly decreasing the risk of carcinogenic exposure to railroad mechanics and operators. A recent health and welfare costs study conducted by Cheiron as requested by Presidential Emergency Board No. 250 illuminates the impact of the work environment on the health of workers (relevant pages of attached report: 24-28.) The health effects of these emissions have been well documented, and are reinforced in this report.

Diesel engines can carry up to 6,000 gallons of diesel fuel and up to 400 gallons of oil. As a result, the health and environmental risks of ground contamination at rail yards is a constant hazard. The explosive potential of that amount of onboard fuel in the event of a derailment is catastrophic. Oil leaks occur due to natural wear-and-tear and engine malfunctions, resulting in oil-covered locomotives and immediate surrounding areas. Oil accumulates in the exhaust, splattering oil in the locomotive.

A transition to electric trains would require significant investments in railroad infrastructure. The electrification of the 157-mile New Haven-to-Boston line by Amtrak between 1995 and 1999 cost \$321 million, more than \$2 million per mile. Adjusted for inflation, this amounts to \$4.1 million per mile. Accordingly, electrifying the vast networks of major railroads like BNSF, Union Pacific, CSX and Norfolk Southern, with a network of approximately 107,000 miles, would cost an estimated half a trillion dollars. While these carriers possess abundant

resources – over the past eight years, railroad carriers have pocketed \$146 billion in profits while shedding over 45,000 workers – they would likely balk at bearing the full cost.

The carriers' claims that catenary lines could not accommodate double-stack container cars is not credible; this could easily be overcome by constructing taller pantographs. The Trans-Siberian Railroad and other electrified railroads throughout Europe across diverse terrains and remote areas puts to rest arguments that the vast nature of the American railroad network makes electrification infeasible.

In the 1910s – more than 100 years ago – the Chicago, Milwaukee, St. Paul and Pacific Railroad (known as the Milwaukee Road) electrified large swaths of the network through both densely and sparsely populated areas. In the 1960s and 1970s, the Pennsylvania Railroad, Penn Central and Conrail used electric catenary freight trains.

A transition to electric locomotives would reduce noise levels, benefiting both railroad employees and those who live near tracks and repair facilities.

On behalf of the IBEW, I thank the Committee for the opportunity to submit this testimony. We look forward to working with the industry to ensure the freight rail sector makes the necessary investment in electric technology to lower fuel consumption, decrease environmental risks and minimize harm to workers and the public. The feasibility of electrification is well documented and with proper workforce support, the rail industry can successfully navigate this transition.

**Write: Name, Organization, Location, and Statement**

Bill Moyer, co-author of the 2016 book [Solutionary Rail](#), and executive director of Backbone Campaign, based in Vashon, WA. Member of TRB AR040 Standing Committee on Freight Rail. <http://SolutionaryRail.org>  
 Contact: 206-356-9980 or [info@SolutionaryRail.org](mailto:info@SolutionaryRail.org)

For the last decade, the [Solutionary Rail](#) campaign has explored the nexus of US rail transport and the public's interest in solving 21st Century problems. Rail is the most energy efficient form of ground transportation with the lowest emissions per ton-mile. Rail corridors represent an irreplaceable asset and critical national infrastructure. As demonstrated by countries across the globe, rail is also the most straightforward mode of transport to electrify.

Our 2017 book proposed the electrification of BNSF's Northern Transcon. It also advocated for co-location of HVDC transmission and improvements in rapid freight service. All this was to be accomplished in a public partnership with BNSF to deliver clear public interest benefits and improvements owned by the public. Sadly, and to our surprise, our effort to pursue win/win solutions was ignored and even [actively thwarted](#) by BNSF. Forty-five years of deregulation, the arrogance this impunity has imbued, and the industry-wide approach to profit maximization euphemistically referred to as "Precision Scheduled Railroad," aka "PSR" together pose a nearly impenetrable barrier to true collaboration between the class 1 railroads and the public.

Solutionary Rail followed our book with the supplemental 2020 paper [Moonshot Mode Shift](#) which was submitted to the House Select Committee on the Climate. The negative impacts of trucks on our infrastructure, public health, congestion and climate provide a clear impetus for us to mode shift freight from trucks to trains whenever possible. Moonshot Mode Shift documented the massive climate and other benefits of shifting medium and long haul freight to rail. It also recognized the current impacts of that supply chain on our most vulnerable, already overburdened communities. A mode shift cannot come with further harms to these communities.

Solutionary Rail is a member of the [Moving Forward Network](#) (MFN), an environmental justice coalition. MFN has made it crystal clear that rail yards already inflict a disproportionately negative impact on poor, primarily communities of color adjacent to rail yards. Diesel emissions from rail yards and other points on the supply chain are literally killing people. The cancer cluster around the BNSF rail yard in San Bernardino, CA documented by the California Air Resources Board is a perfect example of this impact. Thus, despite the national and public interest in a mode shift of freight from trucks to trains, no such shift is acceptable if it further harms those communities. These competing public interest priorities must be resolved, and done so with alacrity and urgency.

Luckily, there is a clear path forward for addressing the harm of diesel emissions. Rail yard electrification is feasible and beneficial to EJ communities, labor and industry. According to UE President Carl Rosen, the class 1 locomotive fleet is over 20,000, but only a few thousand of those are switching locomotives. According to Rosen, the manufacturing plant in Erie, PA has the capacity to manufacture as many as 1,000 locomotives per year. UE and its Green Locomotive program indicates that EJ and labor interests are aligned.

Though Congress is rightfully constrained in its capacity to subsidize private corporations, it could certainly create incentives for a rapid transition to zero emission locomotives. It could also encourage public ports, state departments of transportation and other entities to create switcher leasing programs so that the assets remain public. The defense production act might be combined with a climate and/or public health emergency declaration to address the current harm and avoid future harm. This is an essential first step in both the gradual electrification of rail lines and a national Moonshot Mode Shift.

Therefore, Solutionary Rail urges Congress and the Biden administration to make the electrification of rail yards one of its highest priorities and a first and essential step toward both the electrification of US rail and the mode shift of freight and passengers from roads to rails.

Thank you for your leadership.

Bill Moyer  
 Executive Director

[Backbone Campaign](#)  
[Solutionary Rail](#) co-author & campaign lead  
c. 206-356-9980  
bill@solutionaryrail.org  
Member TRB AR040 Freight Rail Standing Committee  
pronouns: he/him

**Written Statement for the Record for the Hearing Entitled: “Cleaner Trains:  
Opportunities for Reducing Emissions from America’s Rail Network”**

**U.S. Senate**

**U.S. Senate Committee on Environment and Public Works**

**July 26, 2023**

**By the**

**Wabtec Corporation**

**30 Isabella St.**

**Pittsburg, PA 15212**

Westinghouse Air Brake Technologies Corporation (Wabtec) submits this written testimony for the record for the July 26, 2023 hearing before the U.S. Senate Committee on Environment and Public Works entitled “Cleaner Trains: Opportunities for Reducing Emissions from America’s Rail Network.”

As a global technology leader in the transportation industry, Wabtec designs, manufactures, and services freight rail, marine, and mining products, logistics, and digital solutions that move people and goods across the globe. Wabtec designs and manufactures state-of-the-art locomotives, freight rail parts and components, as well as advanced network logistics and digital solutions. In addition to our freight rail division, we develop passenger transit products and have components or parts on virtually every transit system around the world.

Headquartered in Pittsburgh, PA, Wabtec operates in over 50 countries with 27,000 employees worldwide, including over 12,000 in the U.S. With more than 23,000 locomotives in its global installed base, Wabtec moves more than 20% of the world’s freight in over 100 countries.

**I. Introduction**

Transportation is one of the largest and most vital sectors of America’s economy and critical infrastructure. Across the globe, transportation accounts for nearly one-quarter of all greenhouse gas (GHG) emissions.<sup>1</sup> Current trends indicate that global freight and passenger rail activity will more than double by 2050.<sup>2</sup> Therefore, the United States will require even cleaner and more energy-efficient transportation solutions if it is to continue being a leader in addressing climate change. By increasing utilization of our world-class freight rail network and developing zero- and near-zero emissions locomotives, the United States can reduce emissions by up to 120

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<sup>1</sup> The World Resources Institute.

<sup>2</sup> IEA (2019), The Future of Rail: Opportunities for energy and the environment, IEA, Paris, <https://doi.org/10.1787/9789264312821-en>.

million tons of GHG per year.<sup>3</sup> This is the equivalent of removing 26 million cars from the road or planting nearly 2 billion trees.<sup>4</sup> The freight rail sector presents incredible opportunities for decarbonizing the transportation industry, while remaining the most sustainable way to move people and goods over land.

## II. Freight Rail's Role in the Clean Energy Economy

The United States has the most extensive freight rail infrastructure network in the world. Our 140,000 miles of track are unparalleled – long enough to stretch around the globe over five times.<sup>5</sup> This allows quick and efficient shipment of goods across the nation. As a result, freight rail is already a critical component of today's clean energy economy. Rail can more efficiently and sustainably deliver goods compared to any other mode of transportation. Last year, railroads accounted for 40% of U.S. freight moved, but only 2.1% of U.S. transportation-related GHG emissions.<sup>6</sup> In total, freight rail accounts for just 0.6% of total U.S. carbon emissions.<sup>7</sup>

While freight rail leads the transportation sector in reducing emissions, more can be done. Current trends indicate that freight activity in America will more than double in the next thirty years. The Bureau of Transportation Statistics Freight Analysis Framework estimates freight tonnage will increase roughly 1.2% per year over the next 25 years.<sup>8</sup> The U.S. will require cleaner, more energy-efficient transportation solutions. Increasing the amount of freight shipped on rail will reduce national GHG emissions. If freight railroad utilization increased by 50% for shipments over 500 miles, the United States could reduce 60 million tons of GHG emissions per year.<sup>9</sup> If the U.S. wants to lead the world in decarbonizing the transportation sector, it should look to freight rail technologies and innovation.

## III. Wabtec's History of Innovation for the Locomotive Industry

Throughout its history, Wabtec has successfully demonstrated its ability to design and manufacture best-in-class locomotives that meet industry requirements and reduce emissions. In 2015, Wabtec developed its Evolution Series ET44AC locomotive model to meet the EPA's most stringent Tier 4 emissions standard. This first-of-its-kind locomotive delivers a 76 percent reduction in nitrogen oxide ("NOx") emissions and a 70 percent reduction in particulate matter ("PM") emissions, as compared to EPA's Tier 3 emissions standards. Wabtec has proudly deployed more than 1,000 of these Tier 4 locomotives in commercial operations to date.<sup>10</sup>

<sup>3</sup> Wabtec Internal Documents.

<sup>4</sup> <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.

<sup>5</sup> <https://www.aar.org/wp-content/uploads/2020/08/AAR-Railroad-101-Freight-Railroads-Fact-Sheet.pdf>.

<sup>6</sup> <https://www.aar.org/wp-content/uploads/2021/02/AAR-Climate-Change-Report.pdf>.

<sup>7</sup> <https://www.aar.org/wp-content/uploads/2020/08/AAR-Railroad-101-Freight-Railroads-Fact-Sheet.pdf>.

<sup>8</sup> <https://data.bts.gov/stories/s/Moving-Goods-in-the-United-States/bcvt-rqmu>.

<sup>9</sup> Wabtec Internal Documents.

<sup>10</sup> Railway Age, *Wabtec delivers 1,000th Tier 4 locomotive*, (Apr. 25, 2019), <https://www.railwayage.com/mechanical/locomotives/wabtec-delivers-1000th-tier-4-locomotive/>.

Wabtec's Tier 4 Evolution Series meets the EPA's emissions standards without any type of aftertreatment. This allows railroad operators to avoid significant infrastructure and operational costs associated with urea. Additionally, Wabtec offers its Tier 4 locomotive with a variety of capabilities, such as individual axle control enabling maximum hauling capabilities. Today, less than 5% of the U.S. locomotive fleet is made up of Tier 4 locomotives. If 50% of the current U.S. line-haul fleet was transitioned to Tier 4 locomotives, this would reduce NOx by 48% and PM emissions by 54% (eliminating over 150,000 metric tons of NOx and 4,000 metric tons of PM2.5 annually).<sup>11</sup>

#### ***Battery-Electric Locomotives***

Wabtec is also leading the way in developing battery-electric locomotives and other low-to-zero alternative propulsion technologies. Wabtec's FLXdrive™ battery-electric locomotive is the world's first heavy-haul, 100% battery electric locomotive. The FLXdrive was designed at Wabtec's Campus in Erie, Pennsylvania, a 111-year-old site considered the backbone of innovation for the rail industry. In partnership with a grant from the California Air Resources Board ("CARB"), the FLXdrive locomotive was tested in revenue operation with BNSF Railway, the largest U.S. railroad, across the challenging environment of the San Joaquin Valley in California. With haulage capabilities comparable to its diesel equivalent, the FLXdrive locomotive is designed to replace a diesel locomotive within a train consist, unlocking new levels of operational flexibility for the freight rail industry.

Throughout a three-month demonstration pilot, the FLXdrive successfully reduced fuel consumption by more than 11 percent across the train consist. This fuel reduction is the equivalent of over 6,200 gallons of diesel fuel saved and approximately 69 metric tons of CO2 emissions reduced.<sup>12</sup> The FLXdrive 1.0 prototype successfully demonstrated that battery technology is safe to use in certain rail operations and has the potential to deliver emissions reductions through improved efficiency and fuel savings.

Building upon the success of the FLXdrive 1.0 Pilot, Wabtec is currently developing FLXdrive 2.0 and FLXswitch 2.0. FLXdrive 2.0 has a nameplate battery capacity up to 8.1 Megawatt hours (MWH) and is designed for mainline operations. FLXswitch 2.0 has a nameplate battery capacity up to 4.6 MWH and is designed for yard operations. To date, Wabtec has received orders to be delivered in the next two years from Union Pacific Railroad and Canadian National Railway for 10 FLXswitch and 1 FLXdrive,<sup>13</sup> respectively, as well as 7 FLXdrive locomotives to be

<sup>11</sup> According to STB R-1 Reports, the U.S. fleet has over ~16,300 line-haul locomotives. Assumption based on the oldest Tier locomotives to Tier 4. <https://www.stb.gov/reports-data/economic-data/>.

<sup>12</sup> Wabtec Newsroom, Wabtec's All-Battery Locomotive, FLXdrive, Lowers Freight Train's Fuel Consumption by More than 11 Percent in California Pilot, May 17, 2021, <https://www.wabteccorp.com/newsroom/press-releases/wabtec-s-all-battery-locomotive-flxdrive-lowersfreight-train-s-fuel-consumption-by-more-than-11>.

<sup>13</sup> Wabtec Newsroom, Union Pacific Railroad Makes Largest Investment in Wabtec's FLXdrive BatteryElectric Locomotive, Jan. 28, 2022, <https://www.wabteccorp.com/newsroom/press-releases/union-pacificrailroad-makes-largest-investment-in-wabtec-s-flxdrive-battery-electric-locomotive>; Railway Age, CN Orders Wabtec FLXdrive, (Nov. 4, 2021), <https://www.railwayage.com/news/cn-orders-wabtec-flxdrive/>.

delivered to mining customers in Australia.<sup>14</sup> Wabtec anticipates that it could take up to three years to continue to develop, test, and pilot battery-electric technology for deployment in line-haul operations in the U.S.

***Other Recent Railroad Industry Technology Investments***

The recent interest in Wabtec's FLXdrive technology is just one example of the railroad industry's substantial steps to reduce emissions. The industry is using digital technologies to improve the efficiency of its operations, testing more sustainable fuels like biodiesel and renewable diesel, and continuing to modernize its existing fleet. These efforts are important levers to improve local air quality, reduce emissions, and combat global climate change.

Wabtec's railroad customers have embraced digital technologies and solutions to optimize the rail network and train performance, as well as to achieve substantial fuel savings and emissions reductions. For example, Wabtec's Trip Optimizer™ smart cruise control system, which can be added to existing locomotives, helps improve fuel usage and reduces emissions.<sup>15</sup> It is already installed on 11,000 locomotives globally and has saved 400 million gallons of fuel since 2009. These fuel savings translate to a reduction in CO2 emissions by more than 500,000 tons per year, the equivalent of taking 100,000 cars off the road. In addition, Wabtec's network solutions, from Movement Planner to Precision Dispatch, help railroads handle the complexity of busy rail networks, using movement planning and automation to improve network velocity and reduce dwell time. Together, these types of digital solutions help railroads achieve significant fuel and GHG reductions.

Wabtec is partnering with its railroad customers to develop and test biofuels, including biodiesel and renewable diesel. Union Pacific Railroad ("UP") plans to use a higher biodiesel blend in Wabtec locomotives to support UP's ambitions to increase its consumption of low-carbon fuels consumed by up to 10% of its total diesel consumption by 2025 and 20% by 2030.<sup>16</sup> UP has begun testing with biodiesel ("B20") and renewable diesel ("R80") on trains powered by Wabtec FDL engines operating in California. As testing progresses, it is anticipated that higher percentages of biofuels will be used. Wabtec also partnered with BSNF Railway with a new biofuel project aimed at quantifying the impact of alternative fuels on emissions, durability, and performance in Wabtec locomotives. This project will demonstrate the performance of B20 and R80 in revenue service on Wabtec Tier 3 and Tier 4 Evolution Series locomotives in California between Barstow and Los Angeles.<sup>17</sup>

<sup>14</sup> CleanTechnica, *Wabtec's 100% Electric Locomotive Trickle Suddenly Becomes International Flood*, (Jan. 17, 2022), <https://cleantechnica.com/2022/01/17/wabtecs-100-electric-locomotive-trickle-suddenlybecomes-international-flood/>.

<sup>15</sup> Railway Age, *Trip Optimizer Tops 500MM Miles*, (July 28, 2020), <https://www.railwayage.com/news/trip-optimizer-tops-500mm-miles/>.

<sup>16</sup> UP News Releases, *Wabtec and Union Pacific Railroad Partner to Reduce Emissions with Higher Biodiesel Blends*, (Mar. 8, 2022), <https://www.up.com/media/releases/wabtec-higher-biodiesel-nr-220308.htm>.

<sup>17</sup> Trains Magazine, *Union Pacific, BNSF, and Wabtec move to boost biodiesel fuel use*, (Mar. 9, 2022), <https://www.trains.com/trn/news-reviews/news-wire/union-pacific-wabtec-move-to-boost-biodiesel-fuel-use/>.

Lastly, Wabtec's railroad customers are determined to support the circular economy by maximizing and extending the capabilities of their existing locomotive fleets. Earlier this year, UP signed a historic deal with Wabtec to modernize 600 locomotives.<sup>18</sup> At more than \$1 billion, this deal is the largest investment in modernized locomotives by the rail industry. The modernizations extend the locomotives' lives and provide numerous other benefits, including a fuel efficiency improvement of up to 18%, more than 80% increase in reliability, and haulage ability increase of more than 55%. Moreover, the modernizations reduce CO2 impacts by approximately 350 tons per locomotive per year. The total order will enable UP to realize approximately 210,000 tons in annual emission reductions. The reductions are the equivalent of removing nearly 45,000 passenger cars from the road per year. The modernizations also support circular economy practices, as more than half the locomotive's weight is being reused. Throughout the order, approximately 70,000 tons of steel will be reused and recycled – the equivalent of more than 51,000 passenger cars – helping the rail industry reduce the overall environmental impacts by requiring less new raw materials to deploy cleaner technologies.

Wabtec is pleased to be working with its committed railroad customers on a variety of technologies and solutions to improve rail efficiency, reduce emissions, and minimize overall environmental impacts, including digital solutions, cleaner fuels, and locomotive modernizations. As a difficult to decarbonize industry, it will take multiple technologies and solutions to realize the zero-emissions freight rail network of the future.

#### **IV. Future Alternative Propulsion Locomotive Technologies & Challenges to Commercial Adoption**

Building on its history of technology leadership for the rail and locomotive industry, Wabtec continues to innovate and develop technologies to enable a zero-emissions rail transportation network. These research, development, and demonstration efforts recognize the different needs and operating environments of railroad operators and the challenges that must be addressed prior to commercial adoption.

##### ***Hydrogen and Fuel Cell Technologies***

Taking into consideration the significant energy demands for moving heavy-haul trains over long distances and the infrastructure needs for supplying energy across the vast rail network, the railroad industry will be difficult to decarbonize. While battery-electric technology is a potential zero-emissions solution, it is not suitable for every operating environment. Specifically, line-haul operations demand much greater energy density and may be more suitable to an alternative energy source like hydrogen. If the hydrogen supply grows to meet demand, Wabtec believes hydrogen eventually will be the next step in rail innovation.

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<sup>18</sup> Wabtec Newsroom, *Union Pacific Signs Largest Locomotive Modernization Deal in Rail Industry History with Wabtec*, (July 27, 2022), <https://www.wabteccorp.com/newsroom/press-releases/union-pacific-signs-largest-locomotive-modernization-deal-in-rail-industry-history-with-wabtec>.

Wabtec is pursuing a dual-path technology approach to hydrogen-powered locomotives. Hydrogen in an internal-combustion engine (“ICE”) will likely be the first demonstrable hydrogen rail technology. This application would allow the current installed base powered by diesel-electric ICE to leverage the benefits of hydrogen fuel. In 2022, Wabtec entered into collaborative research and development agreements (CRADA) with the Oak Ridge and Argonne National Labs.<sup>19</sup> In the project’s first phase, the Oak Ridge team will work on hardware changes for retrofitting locomotives. During the second phase of the project, Oak Ridge and Wabtec will continue to alter the engine hardware to increase the amount of hydrogen that can be used. The team aims to completely replace diesel with hydrogen or low-carbon fuels in new locomotives. At the same time, Argonne will create a modeling framework to study combustion and emission control technologies used in hydrogen combustion engines.

The second approach is using fuel cells as an alternative power source for locomotives. To this end, Wabtec and General Motors (GM) signed a memorandum of understanding in 2021 to develop and commercialize GM’s HYDROTEC hydrogen fuel cell systems for use in freight rail.<sup>20</sup> With fuel cells, Wabtec is expecting 65% efficiency, compared to 40%-42% with internal combustion engines.<sup>21</sup>

Given the current state of the research, development, and demonstration for hydrogen propulsion technologies – both within the ICE and using battery and fuel cell technologies, Wabtec is unable to predict when such technologies will be ready for commercial adoption.

#### ***Challenges to Commercial Adoption of Alternative Propulsion Technologies***

Despite being at the forefront of innovation for rail and locomotive technologies, Wabtec acknowledges that there are several challenges that must be addressed to enable commercial adoption of alternative propulsion technologies like battery-electric and hydrogen.

First, the current state of research, development, testing, and readiness for commercial adoption varies by locomotive propulsion technology type. The design, development, and demonstration of alternative energy propulsion technologies remain in various phases of pilot and test programs. As a disruptive technology, a critical path to commercializing battery-electric locomotives in the rail industry is more testing and demonstrating this technology in day-to-day operations. Any new locomotive technology typically requires up to 30 to 50 locomotive years of operation before it can be considered mature and integrated into commercial railroad operations.

Interoperability and infrastructure are additional barriers to adopting new technology. Managing a locomotive fleet with multiple energy sources and demands (e.g., battery, hydrogen, diesel, electricity, etc.) forces rail operators to invest and maintain different infrastructure for each form of technology. Rail operators also need to ensure each technology stays within reach of its power source. The U.S. rail network moves more than a 6 billion tons of freight a year across nearly

<sup>19</sup> <https://www.wabteccorp.com/collaborating-on-carbon-reduction>

<sup>20</sup> <https://www.wabteccorp.com/newsroom/press-releases/wabtec-and-gm-to-develop-advanced-ultium-battery-and-hydrotec-hydrogen-fuel-cell-solutions-for-rail-industry>

<sup>21</sup> <https://www.railwayage.com/mechanical/next-gen-motive-power/?RAchannel=home>

140,000 miles of track between and among 49 states and the District of Columbia. Thus, proximity to rail yards and the associated charging and/or refueling infrastructure for alternative propulsion technologies may constrain rail operators' ability to power certain locomotives.

Alternative propulsion technologies face various supply chain constraints and hurdles as well. To support the eventual adoption of hydrogen technology in the rail industry, hydrogen production and distribution infrastructure projects need to accelerate drastically. Producing clean hydrogen from low-carbon energy is still very costly. Developing hydrogen refueling infrastructure to support locomotive operations also needs to significantly accelerate for the rail industry to safely adopt hydrogen technologies and harness hydrogen's economic and environmental benefits. Similar constraints exist related to battery-powered locomotives. The U.S. battery and rare earth minerals supply chain primarily depends on China today. The United States has a small role in the global battery supply chain, with only 7% of battery production capacity. Most key minerals for batteries are mined in resource-rich countries such as Australia, Chile, and the Democratic Republic of Congo, and handled by a few major companies. The production speed and industry-wide capacity of battery-electric locomotives will be greatly affected by the supply of critical minerals.

Wabtec and the railroad industry are working together to address many of these interrelated challenges. However, it is difficult to predict the time horizon necessary to address these various challenges given the importance of engaging diverse stakeholders, leveraging significant investment for the assets and associated infrastructure, and solving for a dynamic supply chain environment.

## **V. Conclusion**

Freight rail is a critical component of the clean energy economy. The U.S. has the most extensive freight rail infrastructure network in the world, with over 140,000 miles of track. Current trends indicate that freight activity in the U.S. will more than double in the next thirty years. Consequently, the U.S. will require cleaner, safer, and more efficient transportation solutions to reduce emissions, while boosting utilization of the freight rail network. With existing freight rail technologies like its Tier 4 locomotives and digital solutions, as well as next generation locomotive technologies such as battery-electric and hydrogen, Wabtec continues to accelerate innovation to increase customer productivity, utilization, and safety, reduce GHG emissions, and improve local air quality.

Senator MARKEY. For any Senators who wish to ask additional questions for the record, you will have 10 business days, until August 9th, 2023, at 5 p.m. in order to insert those questions, and then we would ask our witnesses to, in a timely fashion, return the answers to those questions to the committee.

With that, this hearing is adjourned.

[Whereupon, at 4:24 p.m., the hearing was adjourned.]

