



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”

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## **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our well-being rests on outdated locomotive emission standards that no longer reflect the current state of technology.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  $\mu\text{g}/\text{m}^3$ .

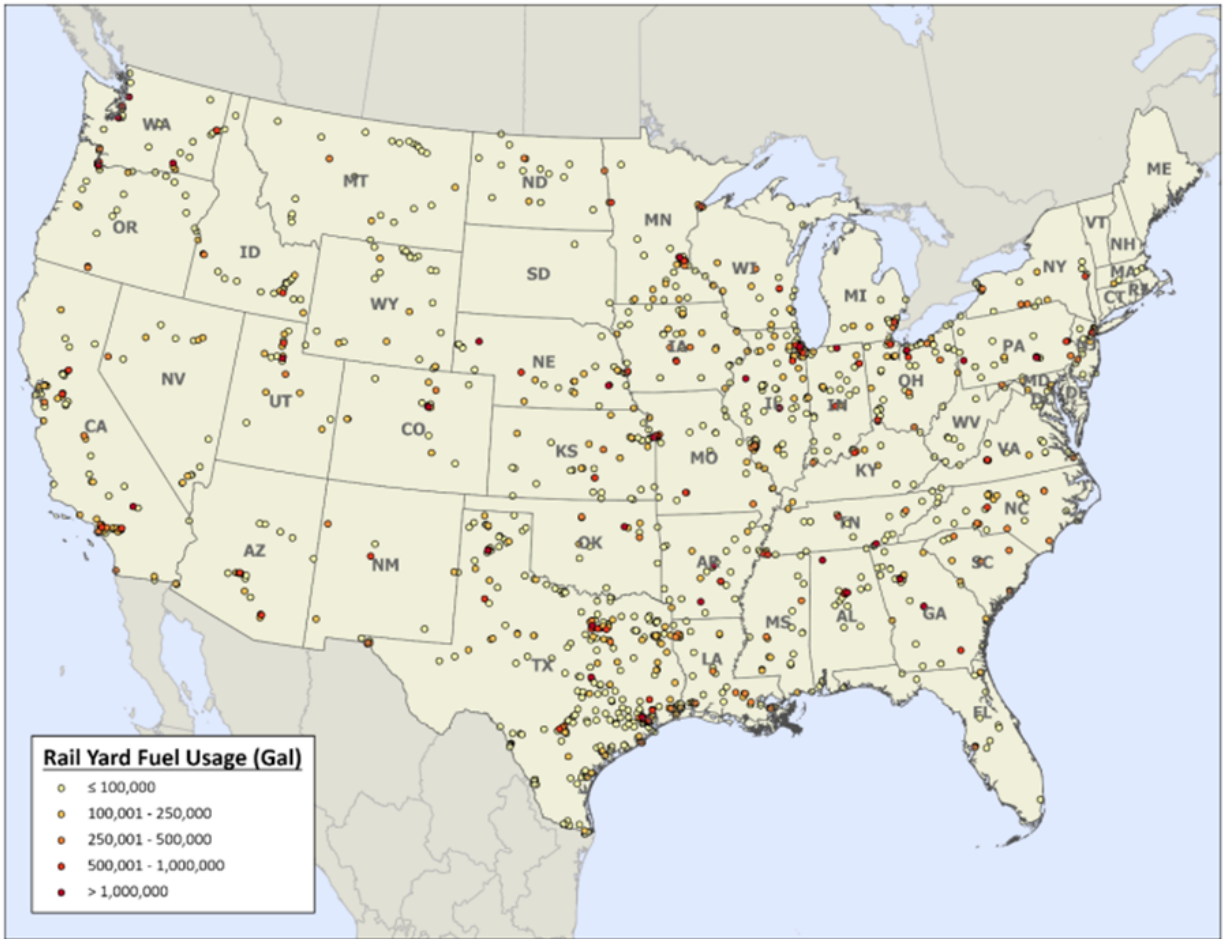
Although states are required to comply with these standards, many continue to fail to meet one or more ozone standards. In fact, almost 125 million people, or 37.7 percent of the U.S. population, live in areas currently classified as being in nonattainment of the 2015 8-hour ozone standard (70 ppb). 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 mile-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 Killearn 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 <sup>s</sup>	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)**

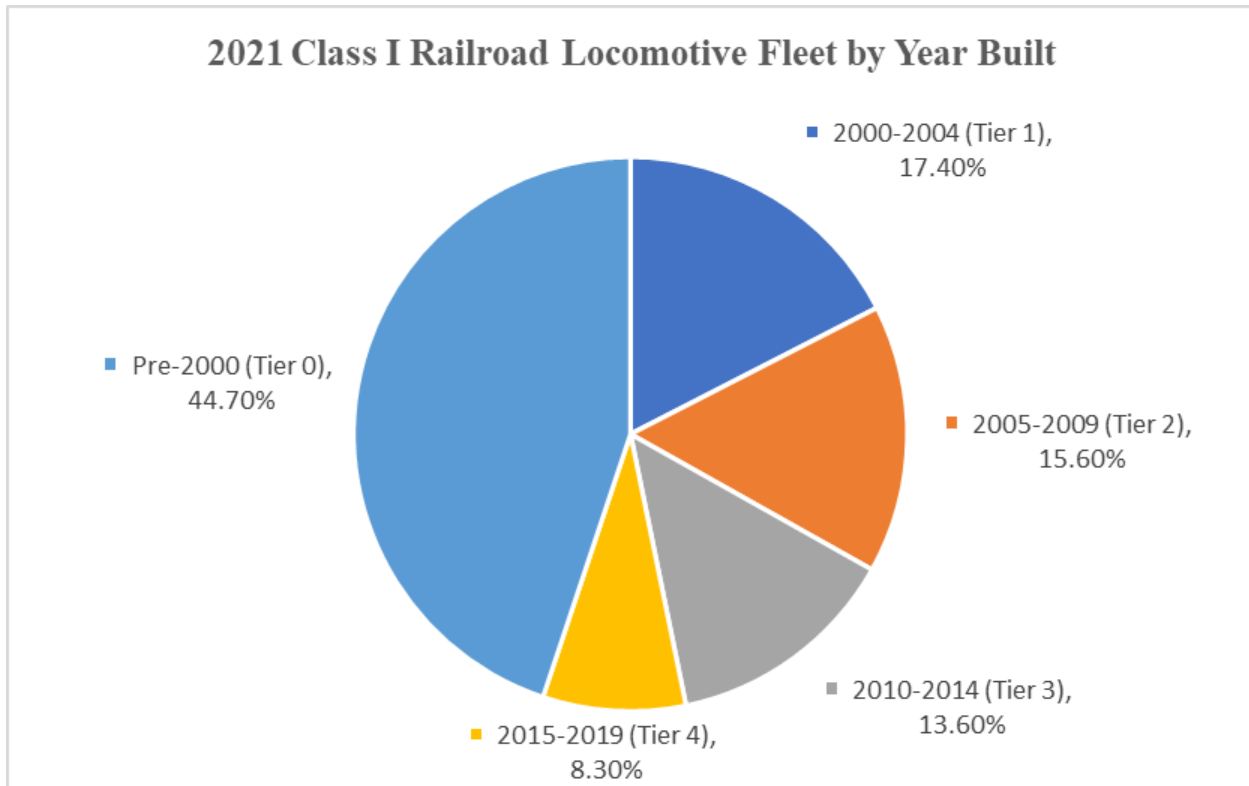
Tier	Tier Name	CH4	CO	CO2	N2O	NH3	NOX	PM10	PM25	SO2	VOC
0	1973-2001	0.8	26.624	10,150	0.26	0.0833	178.88	6.656	6.45632	0.0939	10.513152
0+	Tier 0 Rebuild	0.8	26.624	10,150	0.26	0.0833	149.76	4.16	4.0352	0.0939	6.57072
1	2002-2004	0.8	26.624	10,150	0.26	0.0833	139.36	6.656	6.45632	0.0939	10.294128
1+	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 Hitachi 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**

1. Moving Forward Network. June 16, 2023 posted June 23, 2023. U.S. Environmental Protection Agency's (EPA) proposed Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles-Phase 3. <https://www.regulations.gov/comment/EPA-HQ-OAR-2022-0985-1638>
2. M.J. Bradley & Associates. Newark Community Impacts of Mobile Source Emissions, A Community-Based Participatory Research Analysis (November 2020). p. 12-13. [https://www.njeja.org/wpcontent/uploads/2021/04/NewarkCommunityImpacts\\_MJBA.pdf](https://www.njeja.org/wpcontent/uploads/2021/04/NewarkCommunityImpacts_MJBA.pdf)
3. California Air Resource Board. November 2022. CARB In-Use Locomotive Presentation. <https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/111722/placeholder/22-15-6pres.pdf>
4. National Emissions Inventory Locomotive Methodology Prepared for U.S. Environmental Protection Agency by Eastern Research Group, Inc. (May 19, 2022), at 5, [https://gaftp.epa.gov/air/nei/2020/doc/supporting\\_data/nonpoint/Rail/2020\\_NEI\\_Rail\\_062722.pdf](https://gaftp.epa.gov/air/nei/2020/doc/supporting_data/nonpoint/Rail/2020_NEI_Rail_062722.pdf).
5. Moving Forward Network, Letter Regarding Proposed Locomotive Action at the United States Environmental Protection Agency, (March 15, 2022), <https://www.movingforwardnetwork.com/wpcontent/uploads/2023/04/MFN-Zero-Emission-Locomotive-Letter-March-14-2023.pdf>.
6. Jill W. Moraski, Natalie D. Popovich & Amol A. Phadke, Leveraging rail-based mobile energy storage to increase grid reliability in the face of climate uncertainty (May 16, 2023), <https://www.nature.com/articles/s41560-023-01276-x>.
7. Ed Avol, Professor of Environmental Health, Keck School of Medicine of University of Southern California, testimony ("Avol Testimony").
8. Andrea Hricko et al.,(2014). Global Trade, Local Impacts: Lessons from California on Health Impacts and Environmental Justice Concerns for Residents Living near Freight Rail Yards, 11 Int'l J. Env't Rsch. and Pub. Health 1914
9. Rhonda Spencer-Hwang et al., 2014. Experiences of a Rail Yard Community: Life is Hard, (77) J. Env't Health 8-17, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4486117/>
10. Rhonda Spencer-Hwang et al., 2015. Respiratory Health Risks for Children Living Near a Major Railyard. (40) J. Cmty. Health 1015- 1023,

- [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703713/#:~:text=Children%20attending%20school%20near%20the,%25%20CI%201.19%E2%80%932.12\)..](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703713/#:~:text=Children%20attending%20school%20near%20the,%25%20CI%201.19%E2%80%932.12)..)
11. R. Spencer-Hwang et al., 2019. Association of Major California Freight Railyards with Asthma-related Pediatric Emergency Department Hospital Visits. (13) Preventive Medicine Repts. 73-79, <https://pubmed.ncbi.nlm.nih.gov/30533348/>.
  12. Genna Reed, Beto Lugo-Martinez, and Casey Kalman. 2021. Environmental Racism in the Heartland: Fighting for Equity and Health in Kansas City. Cambridge, MA: Union of Concerned Scientists. <https://doi.org/10.47923/2021.14322>.
  13. Maxine Joselow. April 2023. EPA quietly signals to California can set stricter train emissions rules. Washington Post. <https://www.washingtonpost.com/politics/2023/04/18/epa-quietly-signals-california-it-can-set-stricter-train-emissions-rules/>
  14. Sarah Lazare. March 2023. The Filthy Emissions of Railroad Locomotives—and the Rail Unions Sounding the Alarm. The American Prospect. <https://prospect.org/environment/2023-03-14-filthy-emissions-railroad-locomotives/>
  15. Video and transcript of public comment on April 27, 2023, California Air Resources Board meeting, re-proposed In-Use Locomotive Rule, *available at* [https://cal-span.org/meeting/carb\\_20230427/](https://cal-span.org/meeting/carb_20230427/) (public comment begins at 29:00).