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Metra to Receive US\$169.3 Million Grant for Zero-Emission Trainsets

Metra (Metropolitan Rail, the operator of commuter rail in Chicago area) is to receive the largest discretionary grant in its history: a US\$169.3 million federal Congestion Mitigation and Air Quality Improvement (CMAQ) grant to buy battery-powered, zero-emission trainsets. Metra will be among the first in the nation to operate the innovative green technology. The CMAQ funding was approved by the Chicago Metropolitan Agency for Planning and the Metropolitan Planning Organization Policy Committee in October 2023.

CMAQ funding will support the purchase of up to 16 trainsets, adding a new type of propulsion to Metra's fleet that could accelerate and brake faster than its traditional trains. The lower-capacity trainsets could be a more economical and environmentally friendly way to provide the same level of service or better, particularly during off-peak times, and could play a significant role in helping Metra achieve its vision to provide more frequent all-day service, so-called *regional rail service*.

Buying the trainsets would allow Metra to retire some of its oldest, most polluting diesel locomotives, which are well beyond their useful life, and eliminate tons of carbon

emissions. It would also allow Metra to retire some of its oldest railcars. Metra likely would introduce the trainsets on its Rock Island Line. That would directly benefit the air quality in several economically disadvantaged neighborhoods on the South Side of Chicago and in the south suburbs.

Amtrak Awarded Federal Funds for 12 Projects of National Significance

Amtrak was awarded nearly US\$10 billion in Federal Railroad Administration (FRA) funding from the Biden–Harris Administration to modernize critical infrastructure, improve stations, and support future ridership growth on the Northeast Corridor (NEC). This historic funding came at a critical time as NEC ridership continues to rise, consistently

exceeding prepandemic levels since early 2023 summer as Amtrak delivers a new era of passenger rail.

The grants announced on 6 November 2023 would support 12 Amtrak-led projects through the FRA's Federal-State Partnership for Intercity Passenger Rail Program (Fed-State NEC), as shown in [Figure 1](#).

The NEC is one of the busiest and economically vital transportation systems in the world, serving the Northeast's five major metropolitan regions: Boston, New York, Philadelphia, Baltimore, and Washington. Hundreds of thousands of people rely on the approximately 2,200 Amtrak, commuter, and freight trains that operate over some portion of the route each day. In addition to operating Acela, Northeast Regional, state-supported, and long-distance

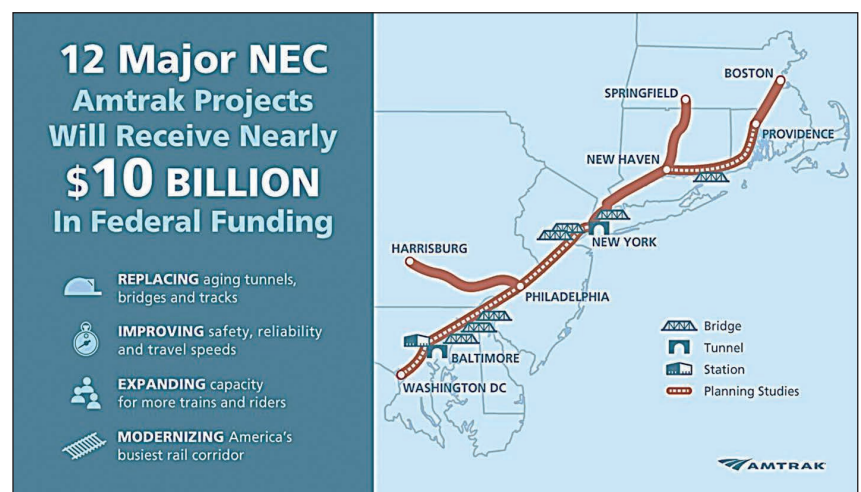


FIGURE 1 Geographic locations of 12 major Amtrak-led projects along the NEC. (Source: Amtrak; used under the Freedom of Information Act.)

trains on the NEC, Amtrak also provides dispatching services and electric traction power while maintaining and improving the infrastructure and facilities used by Amtrak and others.

Alstom Signed Contract With Dallas–Fort Worth International Airport for Skylink Modernization and Replacement Program

Alstom signed a contract with Dallas–Fort Worth (DFW) International Airport in November 2023 to deliver a modernization and replacement program for their Skylink automated people mover (APM) system, as shown in [Figure 2](#). The contract is valued at just over US\$72.2 million. The DFW International Airport is one of the busiest in the world, with over 73 million passengers in 2022, according to the Airports Council International.

Under this contract, Alstom's scope of work includes the overhaul, retrofit, or replacement of vehicle and wayside components necessary to mitigate obsolescence and allow the system to provide continuous, reliable, and safe operation. In 2022, Alstom signed a 10-year contract to continue maintaining the 64 Innovia APM 200 vehicles, subsystems, and related components. Alstom is also responsible for maintaining the 8-km elevated dual-lane guideway, which

includes the guide beam, third-rail power, power distribution, guideway heating systems, and automatic train control equipment.

The driverless Innovia APM is a transportation solution specially designed to serve airports and dense urban areas. It offers quick, comfortable, and convenient service for commuters within cities, to and from airports, or between airport terminals. Innovia APM vehicles operate on a dedicated guideway underground, on ground level, or elevated, avoiding interference with surrounding road or runway traffic. Built on 50+ years of successful and dependable operation, Innovia APM solutions incorporate modern esthetics and advanced subsystems for optimized functionality.

MBTA Announced Ambitious Track Improvement Program to Eliminate All Speed Restrictions by End of 2024

The Massachusetts Bay Transportation Authority (MBTA) announced the launch of its Track Improvement Program on 9 November 2023, a major, bold initiative to eliminate all existing speed restrictions and fix tracks closer to a state of good repair by the end of 2024. This means that the infrastructure is structurally sound, functional, and meets all

applicable safety and performance standards. The program is part of the MBTA's broader efforts to “rebuild, restore, and reimagine” the public transit system.

The MBTA's new program to fix the tracks will involve a wide range of work, including spot repairs, tie replacements, rail replacement, and ballast replacement. The MBTA will also be expanding its engineering teams and engaging specialized rail contractors to execute the work efficiently. The MBTA will schedule the Track Improvement Program work during nights, weekends, and shutdown periods to minimize service, time, and cost impacts.

Speed restrictions are limitations on the speed at which trains can travel to ensure the safety of riders and workers. Existing speed restrictions total 191, as of 6 November. This year, the program aims to address 39 speed restrictions to further reduce travel times. Next year, by the end of 2024, the plan endeavors to revitalize over 27,900 railroad ties and 124,880 feet of track to improve safety and reliability. Over 208,000 feet of tamping (a process used to pack the track ballast under railway tracks to make the tracks and roadbed more durable and level) will help smooth riding surfaces and allow for more comfortable, efficient train operations for the MBTA passengers.

The Track Improvement Program is only one part of the MBTA's overall efforts to “rebuild, restore, and reimagine” the public transit system. The MBTA has been focused on recruitment, retention, skills training, and leadership development to cultivate the workforce needed to operate and maintain a modern transportation system. The MBTA has invested in restructuring the senior leadership team, improving safety protocols, engineering, planning, frontline teams, workforce development, and training to ensure employees are ultimately fulfilling their responsibilities in the most effective way possible.



FIGURE 2 DFW International Airport's Skylink APM system. (Source: Alstom Group; used with permission.)

Norfolk Southern Launched Artificial Intelligence Train Inspection Technology

Norfolk Southern Corporation has deployed digital train inspection portals to enhance rail safety across the company's 22-state network. The portals feature cutting-edge machine vision inspection technology developed in partnership with the Georgia Tech Research Institution (GTRI), which engineered the hardware, and Norfolk Southern's Data Science/Artificial Intelligence (AI) and Mechanical teams, which built the brains behind the program.

The project aims to supercharge Norfolk Southern's safety infrastructure and inspection processes with over a dozen portals to be deployed by the end of 2024. Norfolk Southern leveraged GTRI's expertise in advanced technology solutions, which has already helped further national security and economic development. The first portal, as shown in Figure 3, was deployed in Leetonia, OH, where trains pass through approximately every hour.

This end-to-end process includes hardware, software, and people. First, the digital train inspection portals are equipped with an array of 24-megapixel trackside cameras and stadium lighting, as shown in Figure 4. Together, this machine vision inspection technology captures ultrahigh-resolution, 360° images of passing railcars. The cameras are synced to the microsecond, taking 1,000 images per rail car on average as they pass through the tunnel at speeds up to 70 miles per hour. The high-speed cameras are strategically placed at angles to capture things that are difficult to detect with the human eye during stationary inspections. In addition, capturing images while the train is in a dynamic state provides an inspection for various defects that cannot be done while the train is stationary.

AI analyzes these images for potential defects. Norfolk Southern's in-house Data Science/AI team



FIGURE 3 Norfolk Southern's digital train inspection portal. (Source: Norfolk Southern Corporation; used with permission.)



FIGURE 4 Array of trackside cameras and stadium lighting in Norfolk Southern's digital train inspection portal. (Source: Norfolk Southern Corporation; used with permission.)

has developed 38 advanced deep learning algorithms and already deployed them across heavily trafficked lanes. These best-in-class, field-proven algorithms have demonstrated very high accuracy levels, while having very low false-positives. The AI transmits the information to Norfolk Southern's Network Operations Center where the data are reviewed by subject-matter experts to identify and address issues to proactively ensure the safety of rail operations. Critical defects found are flagged for immediate handling.

Hitachi Rail Signed a Contract With Trenitalia for 30 High-Speed Trains

As part of a major new order, Hitachi Rail signed a contract worth €861 million with Trenitalia for the supply of 30 new ETR1000 high-speed trains, with an option for an additional 10 trains for an additional €287 million. The new fleet will be manufactured at the company's Italian factories in Naples and Pistoia, near Florence, with the first deliveries planned to start in spring 2026, at a rate of eight to 10 trains per year.

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Appendix: Related Articles

- [A1] K. Ntontin et al., "Perpetual reconfigurable intelligent surfaces through in-band energy harvesting: Architectures, protocols, and challenges," *IEEE Veh. Technol. Mag.*, vol. 19, no. 1, pp. 36–44, Mar. 2024, doi: 10.1109/MVT.2023.3344994.
- [A2] M. S. J. Solaija, S. E. Zegrar, and H. Arslan, "Orthogonal frequency division multi-

- plexing: The way forward for 6G physical layer design?" *IEEE Veh. Technol. Mag.*, vol. 19, no. 1, pp. 45–54, Mar. 2024, doi: 10.1109/MVT.2023.3344432.
- [A3] Z. Zhang, Y. Wu, X. Lei, L. Lei, and Z. Wei, "Toward 6G multicell orthogonal time frequency space systems: Interference coordination and cooperative communications," *IEEE Veh. Technol. Mag.*, vol.

- 19, no. 1, pp. 55–64, Mar. 2024, doi: 10.1109/MVT.2023.3345609.
- [A4] X. Mu, J. Xu, Y. Liu, and L. Hanzo, "Reconfigurable intelligent surface-aided near-field communications for 6G: Opportunities and challenges," *IEEE Veh. Technol. Mag.*, vol. 19, no. 1, pp. 65–74, Mar. 2024, doi: 10.1109/MVT.2023.3345608.

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FIGURE 5 Hitachi ETR1000 high-speed train. (Source: Hitachi Rail; used with permission.)



FIGURE 6 ETR1000 high-speed train coverage map in Europe. (Source: Hitachi Rail; used with permission.)

The trains, like the previous ETR1000s, as shown in [Figure 5](#), will have the iconic red Frecciarossa

1,000 livery and are planned to be used primarily for the Italian high-speed network. However, the trains

are also able to run across Europe, including on high-speed lines in France, Germany, Spain, Austria, Switzerland, Belgium, and The Netherlands, as shown in [Figure 6](#). Thanks to the onboard technology, the fleet is capable of traveling on different types of national railway infrastructure—switching seamlessly between the different power supplies and signaling system—in order to complete pan-Europe journeys.

The ETR1000, capable of a top speed of 350 km/h in passenger operation, is also known for its low environmental impact. It sets the standards for high-speed trains with its acceleration, quiet, and smooth running. These characteristics are aiding its success internationally, with ETR1000 fleets running in Spain, where the train has been operating for over a year, and in France, where cross-border service between Paris and Milan began in 2021. Part of the train's success is the use of light alloys for the vehicle's body shell. The design means that the trains are light, relative to their size, so have an excellent weight/power ratio and can offer impressive acceleration. It is this acceleration that allows the trains to get up to line speed quickly and thereby reduce passengers' journey time, a major factor in the success of high-speed trains in Italy.

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