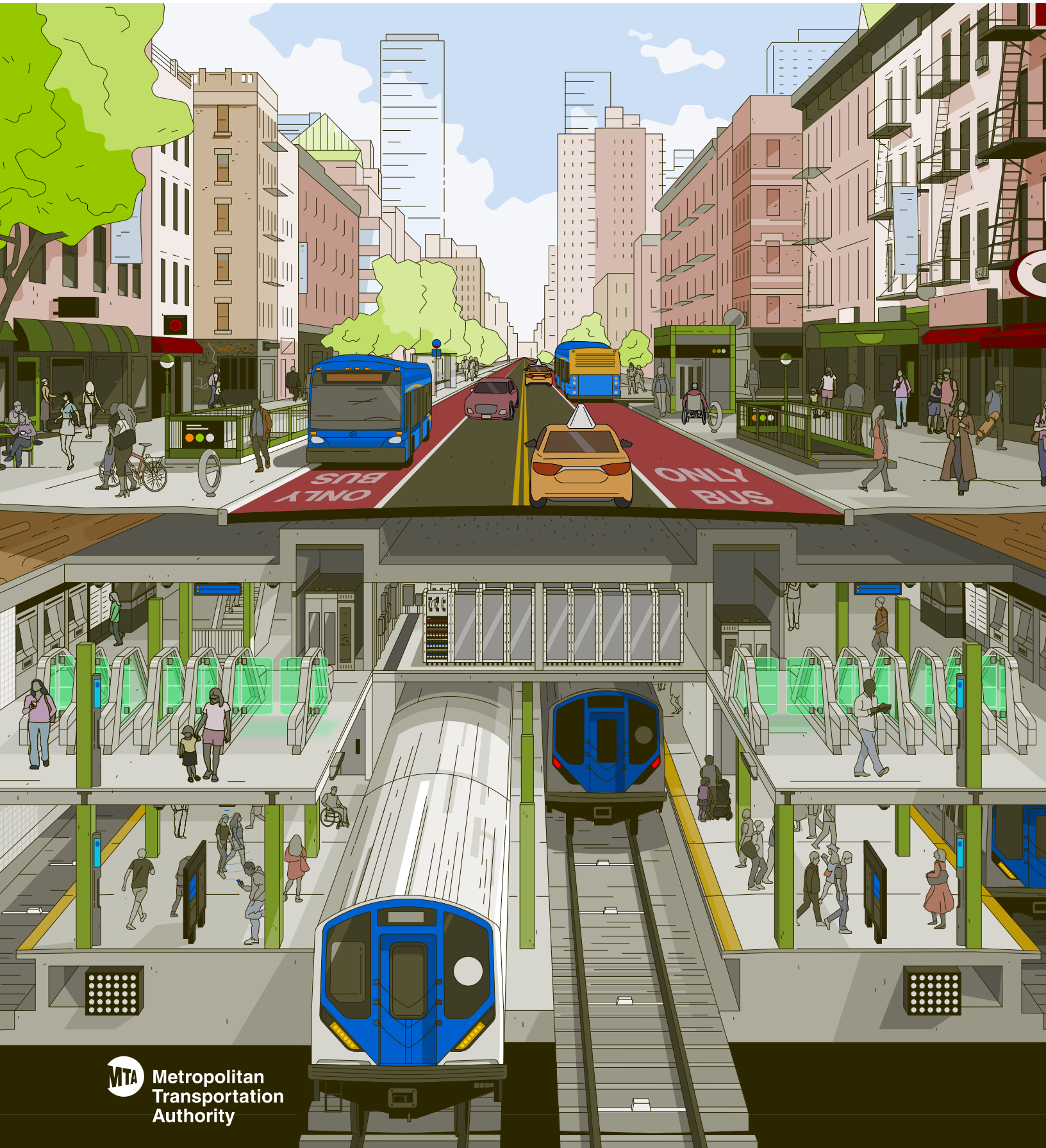
The Future Rides With Us

MTA 20-Year Needs Assessment (2025-2044)



Metropolitan Transportation Authority

Contents

Letter from the Chair and CEO

Janno Lieber, Chair and Chief Executive Officer of the Metropolitan Transportation Authority

I always say New York couldn't exist without the transit system. The City's density, its economy, and our way of life wouldn't be possible if the over 8 million people who live in the City—and the 15 million total in the 12-county MTA region—were only getting around in private cars.

In the decades since Richard Ravitch inaugurated the first Capital Program in 1982, the MTA, with support from City partners, has brought the subway system back from the brink. Today, MTA subway cars break down less than 10% as frequently, while Long Island Rail Road and Metro-North Railroad are poised to run over 30% more trains this year than in 1985. Nevertheless, the MTA network—an asset valued at $1.5 trillion—continues to age and deteriorate after decades of underinvestment that we've only recently begun to make up for.

The new 20-Year Needs Assessment takes an unprecedented look at where we are and what improvements are needed to preserve and modernize our vast and aging system, at the same time considering the profound societal shift in how riders use transit and the growing threat of climate change.

New York's future is at risk if we don't act now to rebuild the foundation of the MTA network. We must achieve the long-dreamed-of State of Good Repair for the system we have today, while planning for the second half of this century and the new travel patterns, technologies, and jobs that are still to come.

Our vision of the future also calls for expanding MTA service where it makes sense to meet the needs of our ever-growing population and to better connect historically disadvantaged communities to employment, education, health care and everything else. Millions of New Yorkers—even our neighbors in adjacent states—their children, and their grandchildren are depending on it.

Thanks to the dedicated staff who worked on this document—utilizing first-ever highly detailed underlying data collected about nearly 6 million physical assets and components across the MTA—this 20-Year Needs Assessment is the most comprehensive and actionable in our agency's history, and the MTA is ready to address the challenges it identifies. I'm confident that with the right investments, we can deliver a better transit system than we found—one that is more resilient, more reliable, and more equitable than ever before.

INTRODUCTION

Coney Island-Stillwell Av Station

The 20-Year Needs Assessment is a broad, comprehensive blueprint that outlines the MTA region's transportation capital needs for the next generation. It provides an extensive, long-term view based upon rigorous data analysis across all the MTA agencies. It's also an opportunity to look beyond today's constraints to envision the possible future of the system if the right investments are made.

A pivotal moment

7 *train in Queens*

Over the past century, New York's transit network has successfully powered the region into global prominence. Today, a series of existential forces are converging—including aging infrastructure in need of ongoing repair—making this a pivotal moment for the MTA and the future of New York.

Over the next 20 years, we will be forced to confront three major challenges.

Challenges

Aging infrastructure

A vast and aging transit network was largely built more than a century ago and could experience catastrophic breakdowns without intervention.

Our system is old.

Our transportation system has served the region for more than 100 years—and much of it is now in desperate need of replacement.

Over the next 20 years, we will be celebrating some milestone anniversaries:

- **200 years** of the Long Island Rail Road (LIRR)
- **125 years** of the New York City Transit (NYCT) subway system
- **125 years** of Metro-North Railroad (Metro-North) Grand Central Terminal
- **100 years** of MTA Bridges and Tunnels (B&T)

LIRR Long Beach Branch

Our system is vast and there's a lot you don't see.

What riders see is just a fraction of all the parts and systems that support your ride.

This hidden infrastructure rarely commands attention—but is essential to safe and reliable transit service. It includes the power substations that provide electricity to the tracks, the shops and yards that allow us to store and repair our railcars, and the signal systems that ensure trains move safely.

Over the next 20 years, many of these assets will age well beyond their expected lifespan. As these overlooked elements begin to break down, their contributions to the reliability of the system will become painfully visible.

New York's future is riding on us to keep up with investment.

Without investment, the reliability of our system is at risk.

With $1.5 trillion in assets, keeping our system in a state of good repair is essential—but our investment has not kept pace with comparable infrastructure. Aging assets require increased maintenance attention and can become obsolete, resulting in higher costs to keep them operational and more disruptive shutdowns for repairs.

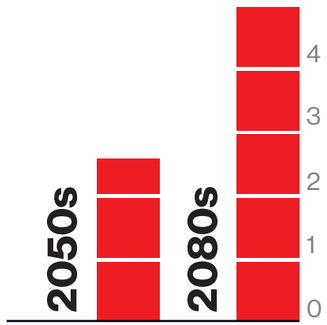
We can't uphold our commitment to reliable service if critical components can no longer work as they should. And without reliable and safe service, New York's region is at risk.

Climate change

Climate change is imperiling infrastructure that was not designed to withstand extreme weather events.

The threat posed by climate change is here—and we must continue to prepare.

Over the next two decades, climate change projections indicate that the New York region will experience more frequent and intense coastal storms, more than twice the current number of torrential rainfall events, and triple the current number of extreme heat days over 90 degrees.



Sea levels will rise
approximately 2.5 feet by the 2050s and almost 5 feet by the 2080s.

MTA infrastructure was not built to withstand these conditions.

Over the past decade, we have experienced severe weather events with increasing regularity. In 2012, coastal flooding from Superstorm Sandy devastated our system, inundating nine under-river subway tubes, the Queens-Midtown and Hugh L. Carey tunnels, and dozens of other critical facilities. In more recent years, flash floods caused by heavy rains have repeatedly wreaked havoc on our infrastructure, overwhelming municipal sewers and pouring into subway stations and train yards, as well as washing out exposed sections of our track.

While we've already made significant and unprecedented investments to fortify the system against severe weather, the severity of the risk and the scale our vulnerability requires us to do even more.

Despite progress, multiple threats presented by climate hazards—particularly floods and extreme heat—mean there is much more to be done.

For example

» Over 400 miles of New York City's subway track are underground or below grade and potentially vulnerable to inland floods caused by torrential rainfall.

» Over 50% of the Metro-North Hudson Line is vulnerable to coastal surge from storms today. Exposure will grow as sea levels rise and as coastal storms become more frequent and intense.

» Multiple LIRR stations will likely experience regular, damaging tidal flooding mid-century due to sea level rise.

To protect our system, we must prepare for the threats we know are coming. The MTA will proactively act on these current and future risks through data-driven approaches that inform climate resilient infrastructure investments.

Metro-North Hudson Line following heavy rain

Changing rider needs

A profound societal transformation around travel, work, and what riders expect from a transit experience is underway.

Our region is projected to grow by over 1 million residents and nearly 1 million jobs by 2045. We must be ready—or risk stifling a new generation of growth.

Jackson Hts-Roosevelt Av Station

Millions of New Yorkers commute daily and depend on us keeping up with service.

The MTA network was originally designed for a traditional commute to Manhattan, Monday through Friday, 9 a.m. to 5 p.m. For millions of New Yorkers, this need hasn't changed. Even with the uptick in remote work, the vast majority of New Yorkers commute, including especially essential workers, and need the transit system to run frequently and reliably. These commuters include some of our city's most vulnerable people, who depend on us every day to maintain a high level of service.

Jay St-MetroTech Station

Millions more have a choice—and the region's economy hangs in the balance.

With the disruption of the pandemic and the rise of remote work, others have a choice on whether to ride our system or not. This is borne out by the data; while weekday peak ridership remains the busiest time in our system, off-peak and especially weekend ridership has recovered faster as a percentage of its pre-pandemic levels.

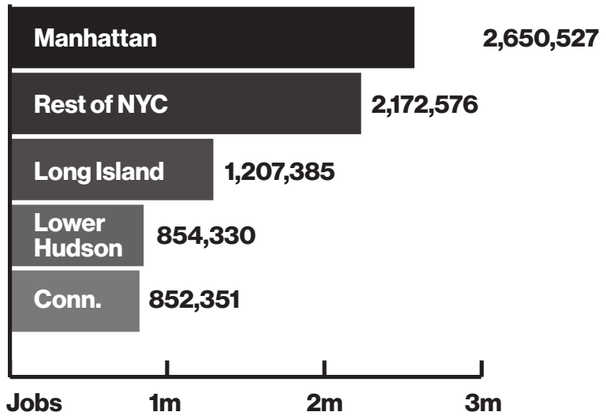
Continuing to attract riders is essential to the economic future of our region. It is more important than ever that the MTA offer reliable, safe, and convenient service.

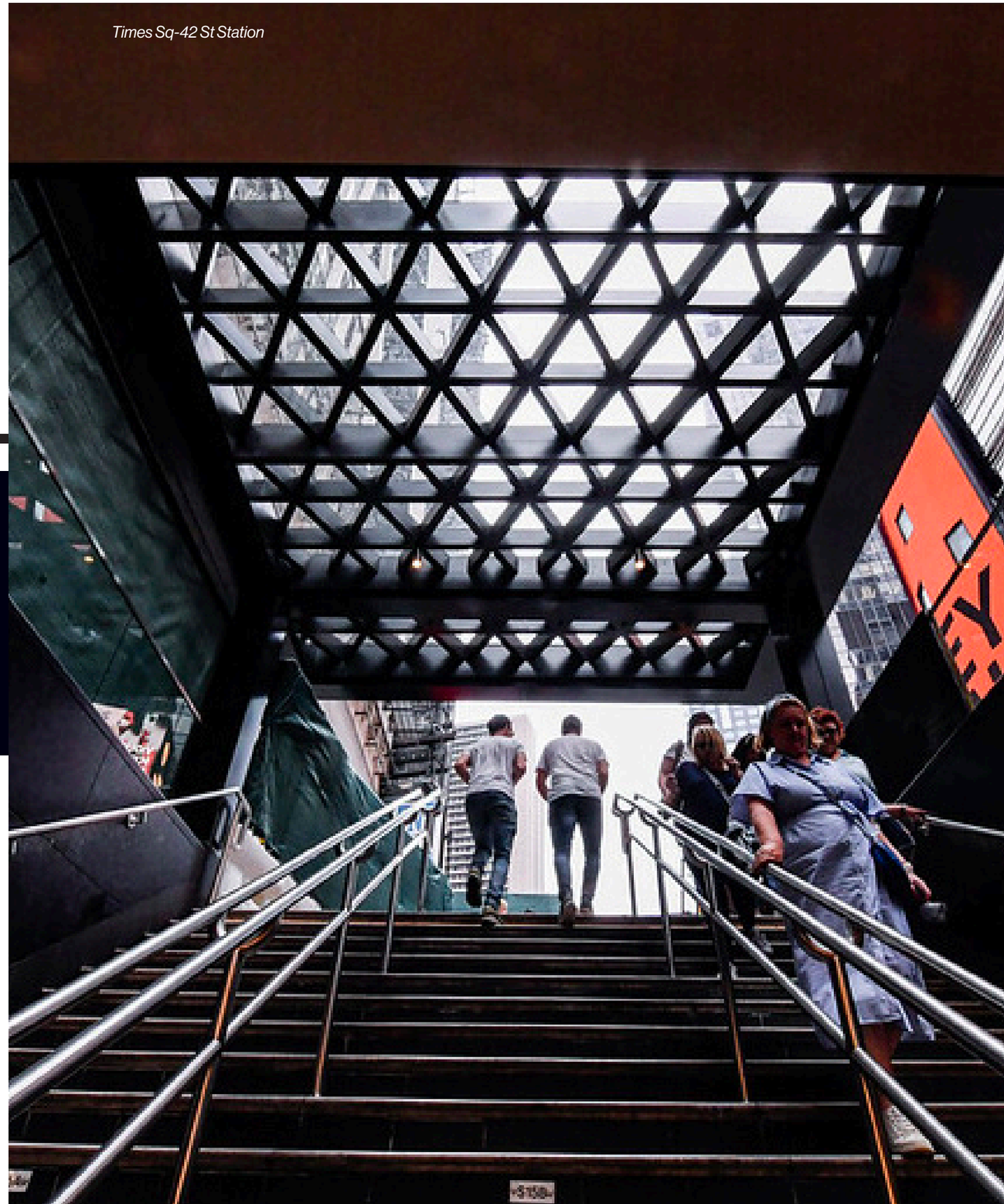
Penn Station East End Gateway

To support a new generation of growth, we must adapt to our region's evolving needs.

Although Manhattan is still important, and traditional peak travel times are still the peaks, new demands are emerging that we must address.

2020 employment




Times Sq-42 St Station

These needs include

Increasingly dispersed business districts outside of Manhattan. While Manhattan continues to have the largest concentration of jobs, the emergence of business districts around the region is resulting in more intra- and inter-borough travel, as well as reverse commuting. Population growth is fastest in the outer boroughs, creating a cycle of economic and residential growth outside of Manhattan.

More varied commute times as work schedules evolve. With the region projected to grow by nearly 1 million jobs over the next two decades, some of the fastest growing industries, such as health care, accommodation, and food services, require travel at all times of day and an in-person workforce.

Increase in off-peak travel. In the years leading up to the COVID-19 pandemic, growing numbers of New Yorkers were choosing transit for trips during off-peak times.

Off-peak ridership

(2001-2018)

24% increase
subway

18% increase
LIRR

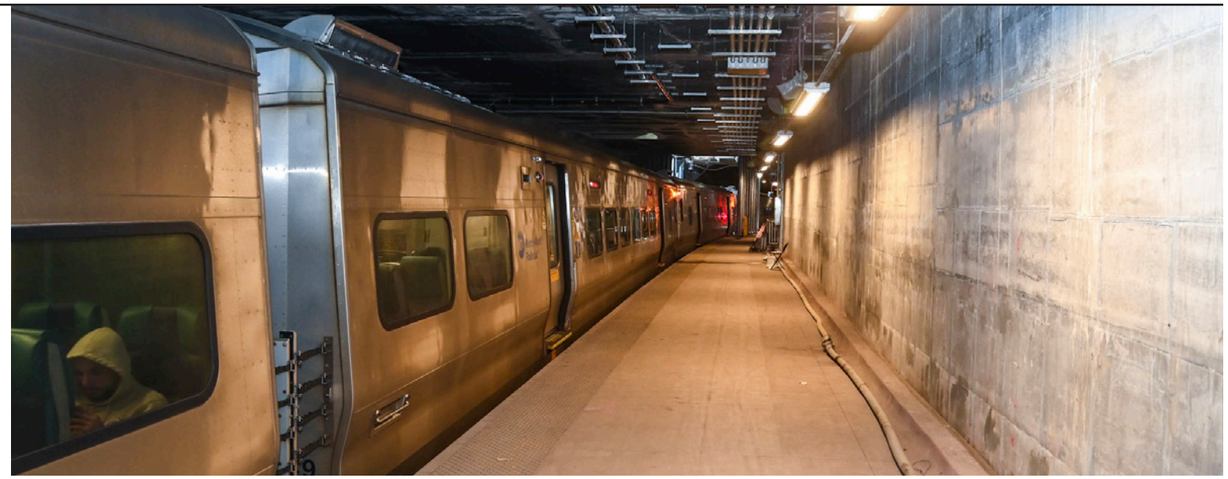
24% increase
Metro-North

New Yorkers are increasingly taking subways and buses during off-peak hours for health care, shopping, social gatherings, and recreational trips.

Traditionally, the MTA has used these off-peak hours for repairs, projects, and maintenance. It is more important than ever to keep our infrastructure in a state of good repair to minimize disruption and provide the services that our riders need, when they need it, to keep the region on its path toward growth.

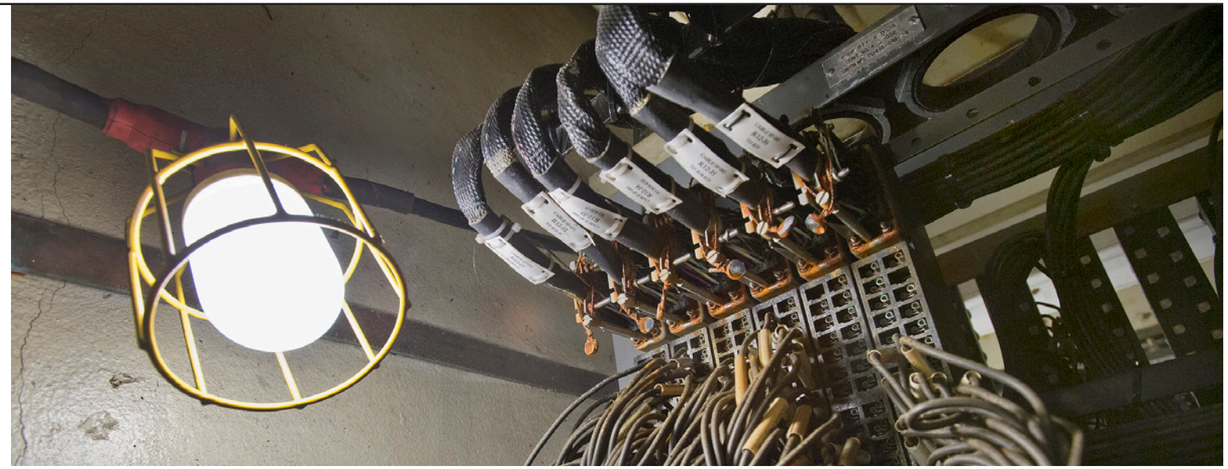
If we ignore these threats, we risk the survival of the system itself—and New York with it.

» Without more aggressive intervention, the deteriorating structural beams holding up the 110-year-old Train Shed at Grand Central Terminal—that supports Park Avenue and provides a roof for trains—are at risk of failure, **suspending Metro-North service into Manhattan**.



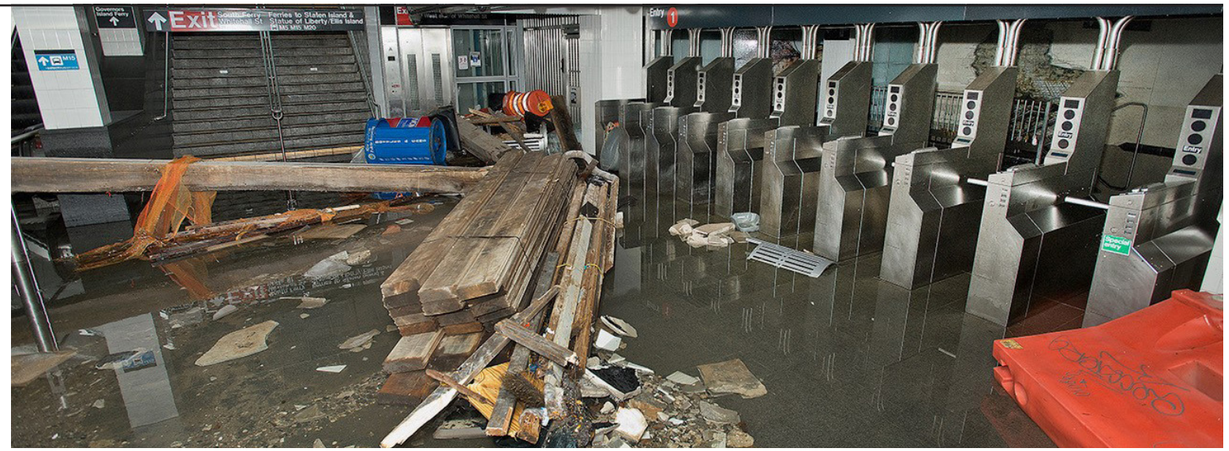
Grand Central Terminal Train Shed

» In 20 years, more than 75% of the New York City subway major power substation components will be more than half a century old, risking **extended power outages across the system and potentially shutting down multiple lines**.

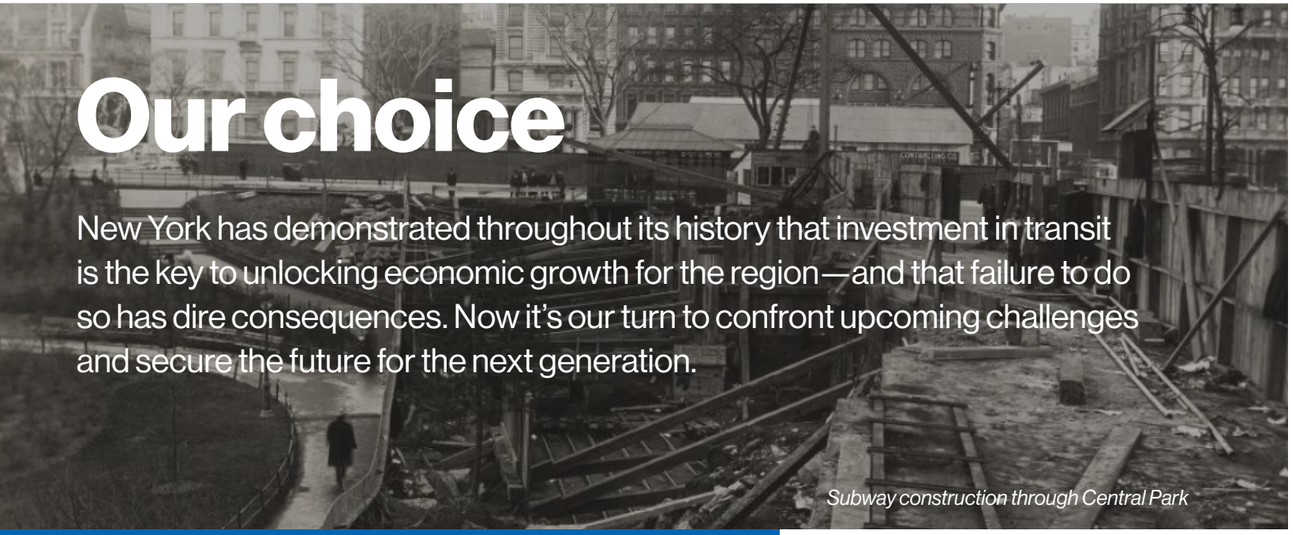


NYCT power components

» As climate change accelerates and extreme weather events become more common, **we risk asset failures and system shutdowns without targeted climate resilience protections**.



South Ferry 1 following Superstorm Sandy



Our choice

New York has demonstrated throughout its history that investment in transit is the key to unlocking economic growth for the region—and that failure to do so has dire consequences. Now it's our turn to confront upcoming challenges and secure the future for the next generation.

Subway construction through Central Park

We've been here before ...

After transit investments more than 100 years ago made modern New York possible, unleashing more than two generations of growth, by the 1970s the system had been allowed to fall into disrepair. As the transit system deteriorated, the city's population and economy plummeted with it, pushing New York to the brink of bankruptcy.

1900-1970

A bold investment in mass transit made modern New York possible.

Subway construction at Bleecker Street

When New York became one of the first cities in the world to build a subway system in 1904, it was during a moment of profound transformation.

The advent of the subway enabled New Yorkers to spread out and reach jobs efficiently and safely, unleashing the development of new industries, opportunities, and neighborhoods and catapulting the New York region into the role of a leading global power. Between 1900 and 1950, as the subway system alone grew by 722 miles, the city's population more than doubled from 3.4 million to 7.9 million.

But over the next two decades, the nation saw a rise in suburbanization and automobiles. The transit network that had powered generations of growth fell into decline.

1970s

By the 1970s, underinvestment brought the system—and the city—to the brink of collapse.

Deferred maintenance and lack of funding meant that the whole system was at risk. Service deteriorated, and the New York City subways became an emblem of national decay. At the height of the transit crisis in 1983, on-time subway performance dropped below 50%.

Busted and graffitied subway cars

With the implosion of the subways came the desertion of the city: New York's population plunged by almost 1 million people.

1980s

An ambitious plan to restore the MTA's infrastructure reversed the decline and set New York on a new path to prosperity.

Richard Ravitch
Source: Regional Plan Association

In 1980, New York's leadership was bold enough to do something different. The MTA's first capital program, spearheaded by Chair Richard Ravitch, meant that, for the first time, the MTA's needs were systematically assessed and addressed.

The new program eradicated graffiti on railcars and stations, replaced or restored the entire subway fleet, brought 100% of subway track into good condition, renovated major stations, and purchased new rolling stock for the commuter rail lines.

And it worked. As on-time performance improved, ridership ultimately more than doubled—while the region gained 1.3 million jobs and 1.5 million residents.

2010s

But by the 2010s, we had forgotten the lessons of the 1980s.

When the public crisis ended, the sense of political urgency went with it. Unfortunately, though progress had been made, the job was far from done.

While the MTA made investments that were highly visible to riders, there were still significant amounts of work unfinished, including investments in "invisible infrastructure" such as power, maintenance shops, and train yards.

In the 2010s, the system was setting records for ridership—

F *derailment, 2014*

but it became clear that capital investment hadn't kept up. The system was strained, and service suffered.

By 2017, the hidden problems could be ignored no longer. In what was widely known as "the Summer of Hell," infrastructure began to break down. That year, New York's subway had the worst on-time performance of any major rapid transit system in the world. Just 65% of weekday trains reached their destinations on time, the lowest rate since the transit crisis of the 1970s.

2020s

The most recent capital program was a historic investment, and the recent operating budget was another great step forward.

New York rose to meet the crisis with the historic 2020-2024 Capital Program. Since then, the MTA and its revamped capital division have been building at a historic pace—and more cost—effectively than ever before.

We are grateful to the leadership shown by Governor Kathy Hochul and the New York State Legislature for the recent operating budget, which recognized that transit is essential to New York and that cutting service was an unacceptable option for the millions of New Yorkers who depend on transit every day.

This budget enabled us to maintain service levels—and even expand it in critical areas—by allowing us to retain workers, pay for utilities, and pay off debt.

But while service levels and personnel are essential, they depend on functioning systems to work. And there is a lot of work still to be done.

Gov. Kathy Hochul on the subway

Today we have a choice:

Pick up the pace or risk falling behind again.

Transit is playing a key role in the city's rebound from COVID-19—but continued success is far from assured.

The scale and age of the transit system—along with threats like climate change and priorities like accessibility—mean there's a lot more to do if we want to keep service trending in the right direction.

We can make the wrong choice again and watch the region's potential become choked by an aging system that cannot match the demands of a modern age.

Or we can break the cycle.

The MTA has spent the past two years analyzing every element of our system, which means we know where the problems are and what it will take to fix them.

This 20-Year Needs Assessment is the result. It allows us to plan holistically and proactively for the next 20 years, outlining a path toward a resilient, reliable, modern system that is safer, more efficient, and unlocks a new generation of prosperity.

It underscores the urgency of investing in our region's transportation network and outlines what capital investments are needed over the next 20 years to keep New York moving.

The MTA is ready to meet this moment

The integration of all capital work under the MTA's Construction & Development (MTA C&D) agency is enabling projects to be delivered more effectively and quickly, beginning with the historic $55 billion 2020-2024 Capital Plan. In 2022, MTA C&D completed $6.2 billion of work and initiated another $11.4 billion in new projects—delivering a historic level of investment into keeping our system in a state of good repair.

Better

Under a unified agency, we can improve at scale—from implementing delivery models that take advantage of design innovation, to instituting smarter project management, to modernizing our approach to signals and systems. This has led to the completion of major projects—from 10 miles of Third Track, to repair of the L Train Tunnel, to transformation of the LIRR Concourse at Penn Station—all on time and on or under budget.

Faster

We have ramped up the pace of our investment to a historic level—including more than doubling the number of stations made accessible under the Americans with Disabilities Act (ADA) in this capital program compared to previous years. We are also getting projects done faster, with our innovative contracting incentives saving an average of four months compared to the estimated schedule in 2022.

Cheaper

New York's density, high wages, significant ridership, and complicated logistics all mean that the region is inherently high-cost. Nevertheless, we deliver our state-of-good-repair projects, more than 80% of our capital plan, at costs on par with peers across the country. With a heightened focus on cost containment, our construction contracts came in $345 million under estimate in 2022.

How the MTA is addressing New York's high construction costs

Building in New York is inherently complex. The city's density, intricate utilities network, high wages, and complicated logistics all contribute to costly construction. Moreover, running 24/7 service carrying over 40% of the country's public transit ridership requires building at a size and scale above other transit agencies in the country and most others worldwide.

Despite these factors, costs for MTA's state-of-good-repair projects, more than 80% of the current capital plan, are largely in line with peer systems across the country. While recent subway expansion projects have high price tags, they are highly cost-beneficial with low cost per rider.

We are committed to reducing costs further across all cost drivers:

Less MTA Control ↓ *More MTA Control*

Major cost driver	How does it impact cost?	What C&D is doing
High ridership and built environment	The MTA accounts for 40% of all public transit riders in the U.S. This means that stations and systems must be sized to meet our higher ridership, from needing to accommodate longer trains to meeting code requirements around safe circulation for millions of riders per day. New York's dense built environment also contributes to high costs for real estate acquisition, utilities relocation, and logistics and transport costs.	» Improved utilities coordination and review » Joint development opportunities to reduce real estate costs
Regional labor and materials cost	New York has some of the highest labor wages in the world – 50% more than similar U.S. cities and more than double that of international peers like London, Paris, and Madrid. This is particularly true for trades most commonly used in our projects, which are double even other high cost U.S. cities like Chicago and San Francisco. We welcome good wage jobs for construction workers, but it leads to higher costs.	» Project labor agreements to improve labor efficiency » Strategic sourcing opportunities
Operating constraints and regulation	Rare among major cities, the MTA runs 24/7 operations, which means that new stations require redundant systems, and work on existing infrastructure requires resources to ensure site safety and provide diversion services. Moreover, regulations unique to New York lead to higher costs in areas like insurance.	» Reforms in outages and MTA labor support » Insurance reform
Scope and design	Historically complex design specifications and lack of clearly defined up-front scope has led to increased costs.	» Better project definition and value analysis » Removing unnecessary tasks where possible » Less-customized specifications
Project delivery	The area most within MTA control, C&D has learned from past practices to improve project delivery –including new delivery approaches, reforms to contract terms that added onerous burdens (and costs) on contractors, and empowering project managers to make decisions.	» Innovative contract models and incentives » Contract bundling » Aggressive project management » Improved digital management and analytics system

Construction work on elevated tracks

Structural reforms

In 2019, the MTA undertook an independent forensic audit of its capital planning process. Performed by Crowe, a leading accounting firm, the audit assessed the performance of the MTA's capital program development processes, specifically evaluating project selection for the five-year capital plan.

The recommendations of that audit are being implemented rapidly, highlighted by:

» **A unified planning approach:** With the creation of MTA Construction & Development, capital planning, development, and delivery are being undertaken by a single, purpose-built capital agency.

» **A focus on state of good repair:** More than 80% of the 2020-2024 Capital Program is dedicated to core infrastructure, rather than expansion projects.

» **A smarter approach to data:** As the audit recommended, the MTA has undertaken a thorough effort to modernize and standardize its data collection, establishing detailed inventories of all assets, including asset age and surveyed condition and integrated Enterprise Asset Management (EAM) where possible. As part of the assessment, we incorporated additional essential metrics including performance, criticality, parts obsolescence, and compatibility with modern systems.

A data-driven approach

Hundreds of expert staff from across every MTA agency have spent the past two years examining every element of the MTA's $1.5 trillion worth of assets, using a robust combination of new, groundbreaking tools, agency data, customer surveys, and long-established inspection protocols, to provide unprecedented insight into the state of our system. Highlights of our sources of data include:

1

Our agencies perform regular and comprehensive **inspections of the conditions of the assets.** These inspections and engineering insights underpin all our findings. Without these, it would be impossible to know the condition of the system.

2

As we implement our **Enterprise Asset Management System**, we have the capability to track the performance of each individual system component. For example, systems like EAM help us to gain insight on where some assets have a pattern of many corrective work hours.

3

Our **customer surveys** help us to understand what customers care about most, particularly reliability, safety, and on-time performance.

4

Our new **climate planning division used geospatial analysis** to identify emerging threats.

5

Our comprehensive **analysis of regional trends** and emerging travel demand helps us to anticipate where new pressures will be made on the system.

6

Our first ever **Comparative Evaluation** systematically compares the costs and benefits of every potential system expansion project, to help us identify the wisest investments, with the greatest impacts.

Marcy Av Station

Our system is vast—and has a lot of needs

This assessment looked at nearly 6 million assets and components across our entire system. To put the vastness of the system and its needs in scale, there are:

- **Over 8,700 railcars**
  - 63% need to be replaced in the next 20 years
- **Nearly 6,000 buses**
  - Over 100% will need to be replaced in the next 20 years
- **Over 1,000 rail bridges**
  - 230 commuter rail bridges require major structural rehabilitation
- **704 passenger stations**
  - Close to 50% need communication system upgrades
- **Seven vehicular bridges and two tunnels**
  - All but the Cross Bay Bridge will be over 75 years old by 2045
- **More than 2,600 miles of track and more than 3,500 switches**
  - NYCT has more than 200 signal interlockings, 23% of which are in poor or marginal condition
- **Over 100 maintenance shops**
  - 69% of subway maintenance support shop roofs are in poor/marginal condition
- **493 elevators today (and we will have even more as we add more elevators)**
  - 100%—or more—will need to be replaced in the next 20 years
- **550 locations face near-term climate risks**
  - Including stations, depots, and substations

Ratings for every asset

This 20-Year Needs Assessment includes an assessment of the condition of every asset in our system, including at the component level for relevant assets.

Poor (Deteriorated): Critically damaged or in need of immediate repair, well past useful life

Marginal (Deficient): Deteriorated, in need of replacement, and may have exceeded useful life

Adequate (Acceptable): Moderately deteriorated, but has not exceeded its useful life

Good: No longer new, but in good condition, and still within its useful life

Excellent (Modernized): No visible defects, new or near new condition, and may still be under warranty (if applicable)

Based on the data analyzed, the following chapters summarize the MTA's strategy to address all critical assets in a poor or marginal condition. This report also includes appendices with more detail on asset inventory and condition for every MTA agency. Budgets and priority projects will be developed as part of the next five-year capital plan to be released in 2024.

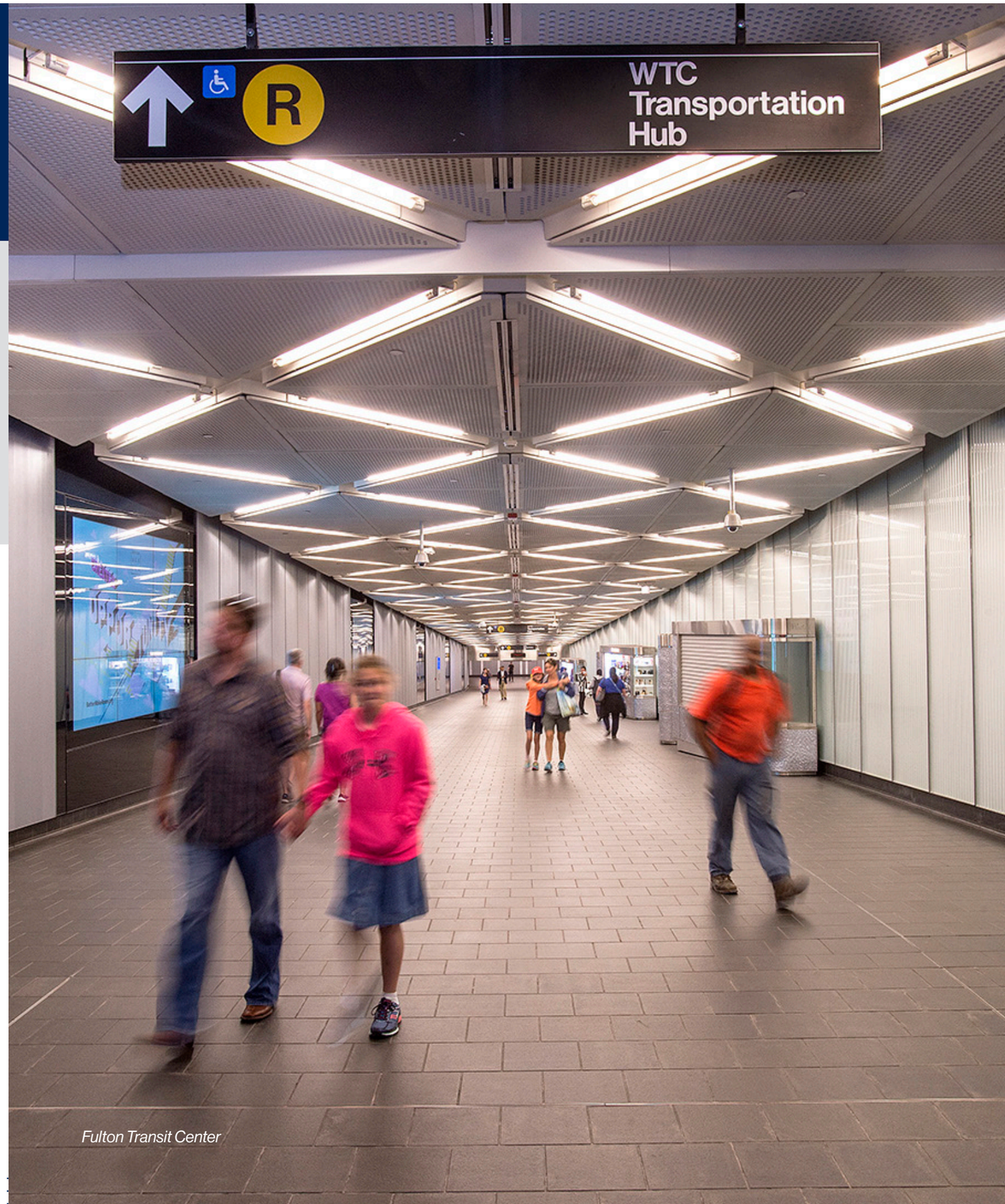
Our plan

We have developed a three-part plan for the next 20 years to achieve the transit network New Yorkers deserve. It is based on three fundamental ideas:

1 Rebuild
the foundation of the system to ensure its survival.

2 Improve
our network to meet 21st century needs.

3 Expand
to support future growth.



Fulton Transit Center

Court Sq Station

Our goals

Rebuild our system so it will last another 100 years

» Replace antiquated signals, switches, and interlockings—on subways and on commuter railroads—that contribute to lengthy delays and upgrade our power systems to meet our needs into the future

» Reconstruct the crumbling infrastructure that leads to Grand Central, avoiding catastrophic shutdown of Metro-North service

» Continue to rebuild our 100-year-old LIRR, especially tunnels to maintain Brooklyn service

» Use innovative technology like dehumidifying our bridge cables on the Verrazzano-Narrows Bridge to extend its useful life

Create additional capacity where it is needed most

» Install modern signals across 80% of the subway system to allow us to safely run more trains closer together and improve on-time performance

» Make capacity improvements for LIRR customers that allow for increased speeds through the Jamaica complex, saving riders up to three minutes per day and enabling more predictable track assignments and transfers

» Enable more scheduled trains for Metro-North riders, through implementing Penn Access, upgrading signals and power, and planning for capacity improvements

» Make the subway and commuter rail system convenient to more riders by building connections between neighborhoods by advancing new projects like the Interborough Express (IBX)

Make the system more accessible to all

» Continue investing in ADA accessibility projects to ensure that, by 2045, 90% of all subway rides take place at fully ADA accessible stations

» Make 95% of commuter rail stations accessible by 2045

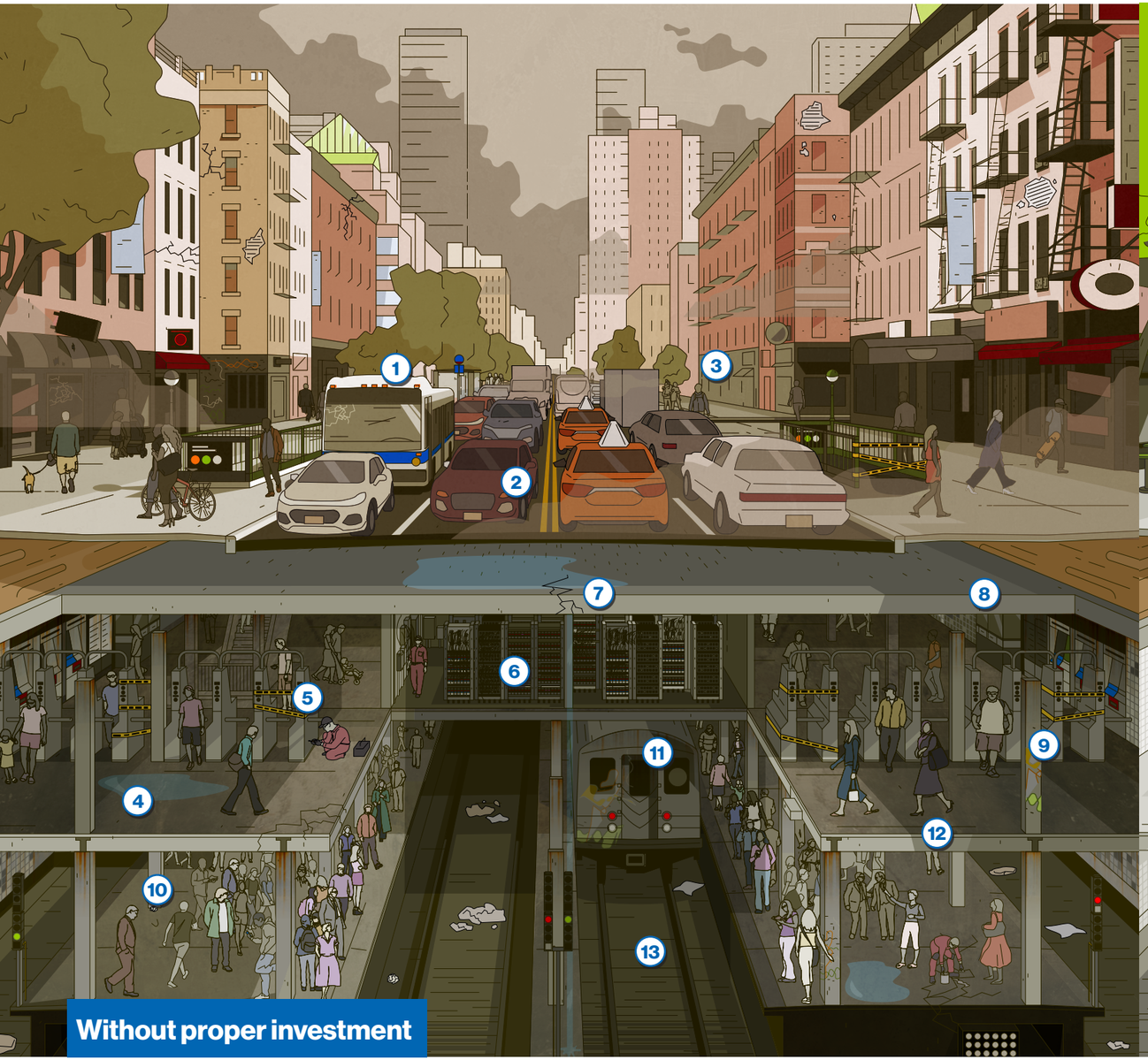
» Make MTA bridges more accessible to pedestrians and cyclists

Accelerate the fight against climate change

» Ensure the system is ready for all kinds of extreme weather—all subway stations, railroad lines, and critical infrastructure will be protected from climate threats

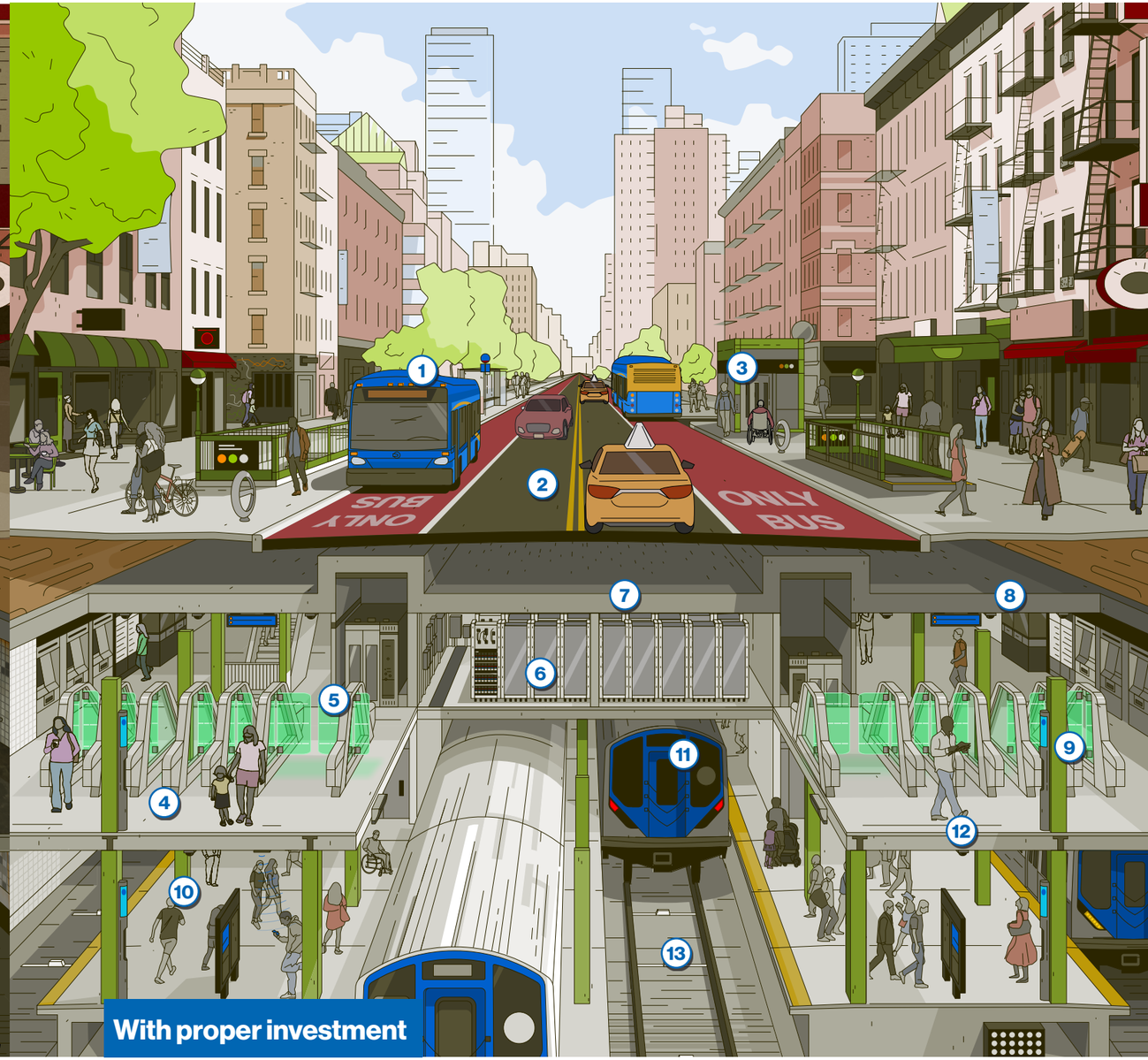
» Cut the MTA's operational greenhouse gas emissions at least 85% by converting nearly 6,000 MTA buses to zero-emissions, retrofitting existing facilities, investing in energy-saving technologies, and more

A look at two possible tomorrows



Without proper investment

1. Diesel bus past its useful life
2. Congestion increasing greenhouse gas emissions
3. Inaccessible subway station
4. Daily water infiltration, vulnerable to climate change-driven storms
5. Broken turnstiles
6. Obsolete, malfunctioning communications and other back of house equipment
7. Structural defects
8. Lack of real-time announcements and information
9. Station component defects
10. Crowded platforms waiting for infrequent and unreliable service
11. Old, frequently failing railcars
12. Lack of integrated security
13. Obsolete, frequently failing signals



With proper investment

1. Zero-emissions bus
2. Clearer streets and clearer skies
3. ADA-accessible subway station
4. Protected from water infiltration and climate change
5. New, more accessible secure fare array
6. New, more reliable communications and other back of house equipment
7. Rebuilt structure
8. Up-to-the-minute announcements and information
9. Renewed station components
10. Reduced platform crowding, thanks to frequent and reliable service
11. New, more reliable, and comfortable railcars
12. Enhanced security
13. Modern, more reliable signals

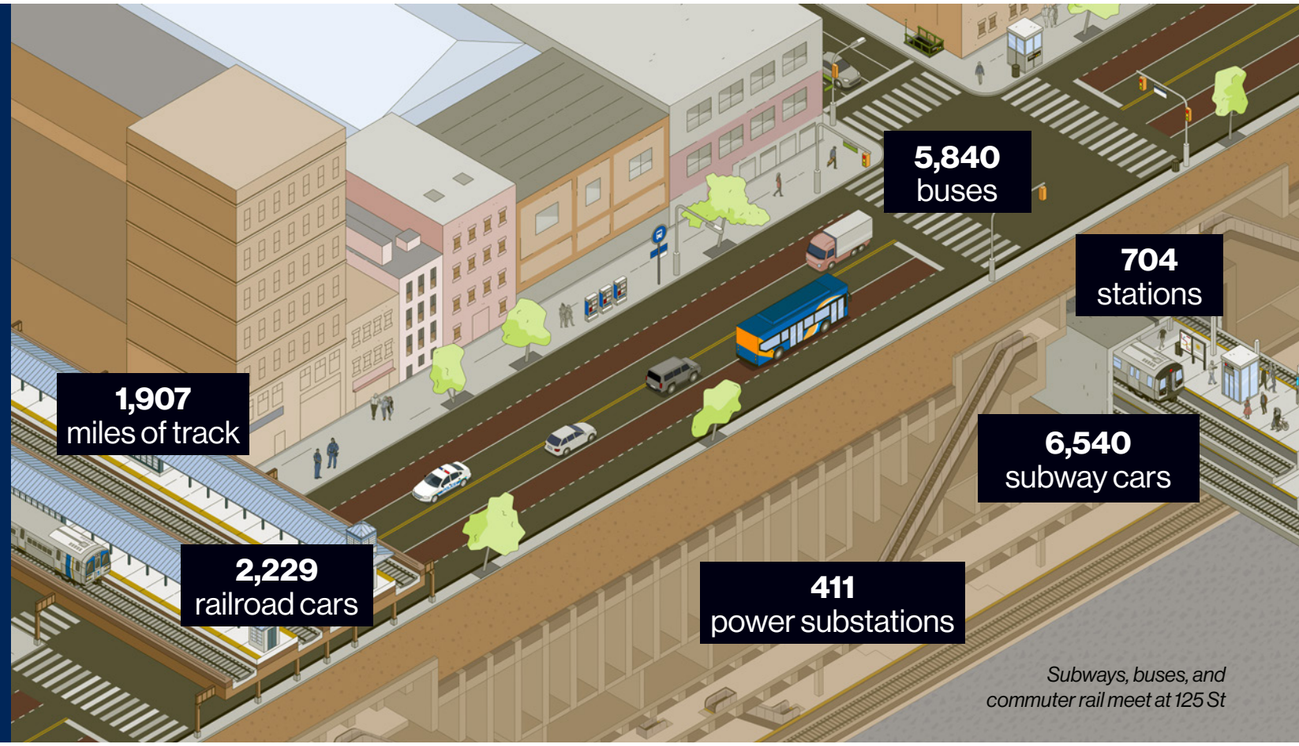
REBUILD

Culver Line structure

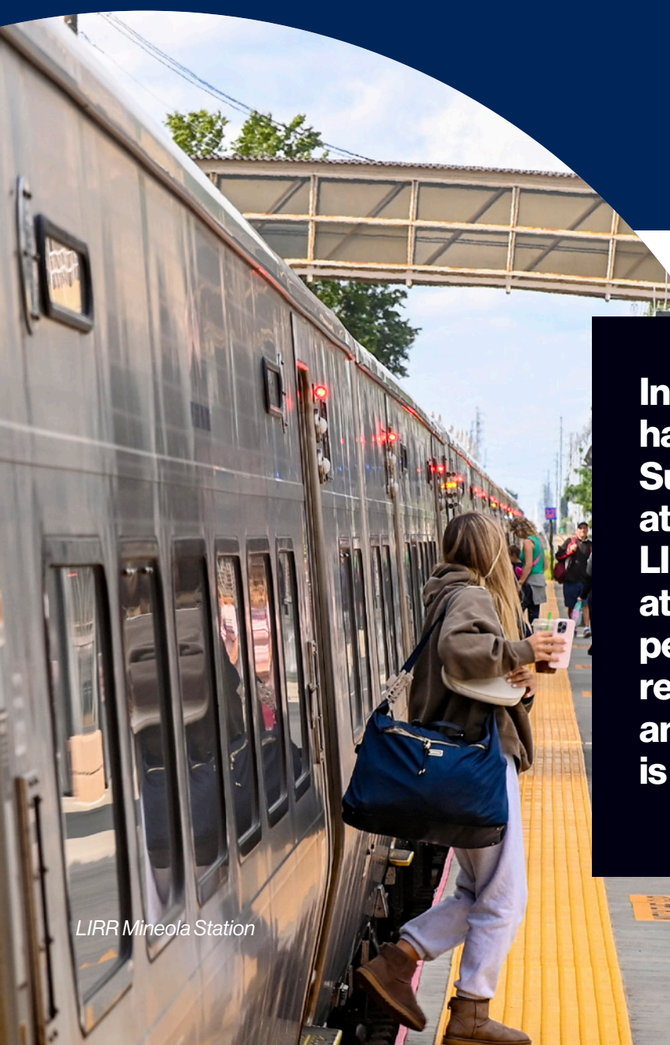
Our future depends on a commitment to rebuild our aging system.

The system is more than a century old, and critical infrastructure is at risk of failure.

We must rebuild our system for the next hundred years.



Subways, buses, and commuter rail meet at 125 St



LIRR Mineola Station

In some ways, the MTA system has never been stronger. Subway service is performing at its highest level in a decade. LIRR and Metro-North are at greater than 95% on-time performance. Ridership is recovering post-pandemic, and customer satisfaction is increasing.

But the system is more than a century old, and critical infrastructure is at risk of failure.

Keeping our system running requires a comprehensive approach to rebuilding it:

We must **reconstruct** critical aging infrastructure, catching up with the needs of our existing system to prevent failures and shutdowns.

We must continue to **renew** essential parts of our system, keeping up with regular replacement cycles to ensure our assets remain in good condition.

Finally, we must **modernize** our outdated technology to bring our infrastructure into the 21st century and deliver the reliability, improved performance and expanded capacity necessary to support our region's growth in the coming decades.

Clifton Car Maintenance Shop

Reconstruct

Our transportation system has served the region for more than 100 years. It is an old system with out-of-date infrastructure, and much of it is now in desperate need of replacement.

Over the next 20 years, we will be celebrating the 200th birthday of the LIRR, the 125th birthday of the subway system, the 125th birthday of Metro-North's Grand Central Terminal, and the 100th birthday of MTA Bridges and Tunnels.

Now we must reconstruct some of our foundational assets or risk catastrophic failures and disruptions across the system.

Challenges

The system—and the need—is vast.

The scale of our infrastructure is enormous—and a significant portion needs to be rebuilt over the next 20 years. That is especially true of the system's "hidden infrastructure," despite its essential role in safe and reliable service. This includes the power substations that provide electricity to the tracks, the shops and yards where railcars can be safely stored and maintained, and the tunnels and structures supporting the tracks that keep the trains running safely.

Culver Line structure

Deteriorating structures

Multiple essential reconstruction projects of some of our most critical infrastructure are needed over the next 20 years to avoid catastrophic shutdowns.

Bridges and Tunnels

» The lower-level suspended span deck on the Verrazano-Narrows Bridge is in need of replacement to ensure the structure can continue to support the tens of millions of vehicles that travel on it every year between Brooklyn and Staten Island.

Long Island Rail Road

» 76 of 568 bridges are in need of comprehensive rehabilitation; these critical line structures allow trains to go over and under obstacles like roadways, water bodies, and along varying terrain.

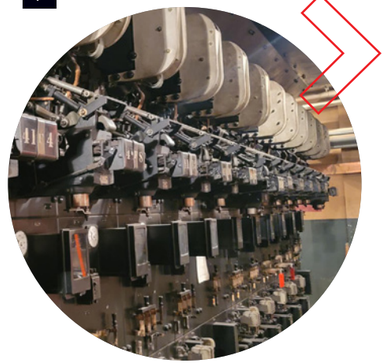
Metro-North Railroad

» Platforms along the Harlem Line are crumbling and currently shored up with added wooden supports to avoid collapse.

More than half of Metro-North undergrade structures are in poor or marginal condition.

Asset	Percent in Poor/Marginal Condition
Undergrade Bridge	46%
Undergrade Culvert	65%

Belt ramps to Verrazzano-Narrows Bridge



NYCT Substation

Aging power substations

We have a large network of substations across our system that are crucial to delivering power to keep our trains running. However, many of these substations have been around for decades and have major components that are at risk of failure.

New York City Transit

- Over the next 20 years, there will be a threefold increase in the number of major substation components that are at least a half-century old—from almost 300 (25%) today, to over 900 components (77%) in 20 years.
- Additionally, the outdated power control system limits the ability to respond to power related problems, such as an unexpected loss of power.

Metro-North Railroad and Long Island Rail Road

- Approximately 88% of Metro-North substations providing traction power have already exceeded their useful life; more than half of LIRR's substations were built in the 1970s or earlier. New substations need to be designed to meet the increased power demand of current and future train service as well as upgraded technological features such as cameras and climate control equipment.

Coney Island Overhaul Shop

Outdated shops and yards

Shops and yards are where we perform maintenance and repairs for our trains and other equipment. These vital support facilities are essential for maintaining a safe and reliable fleet. However, many of these facilities are in extremely poor condition, with leaking roofs, inefficient work areas, poor heating and ventilation, and insufficient employee spaces.

New York City Transit

» Over 200 shop components are in poor or marginal condition, including 73% of subway maintenance shop structures.

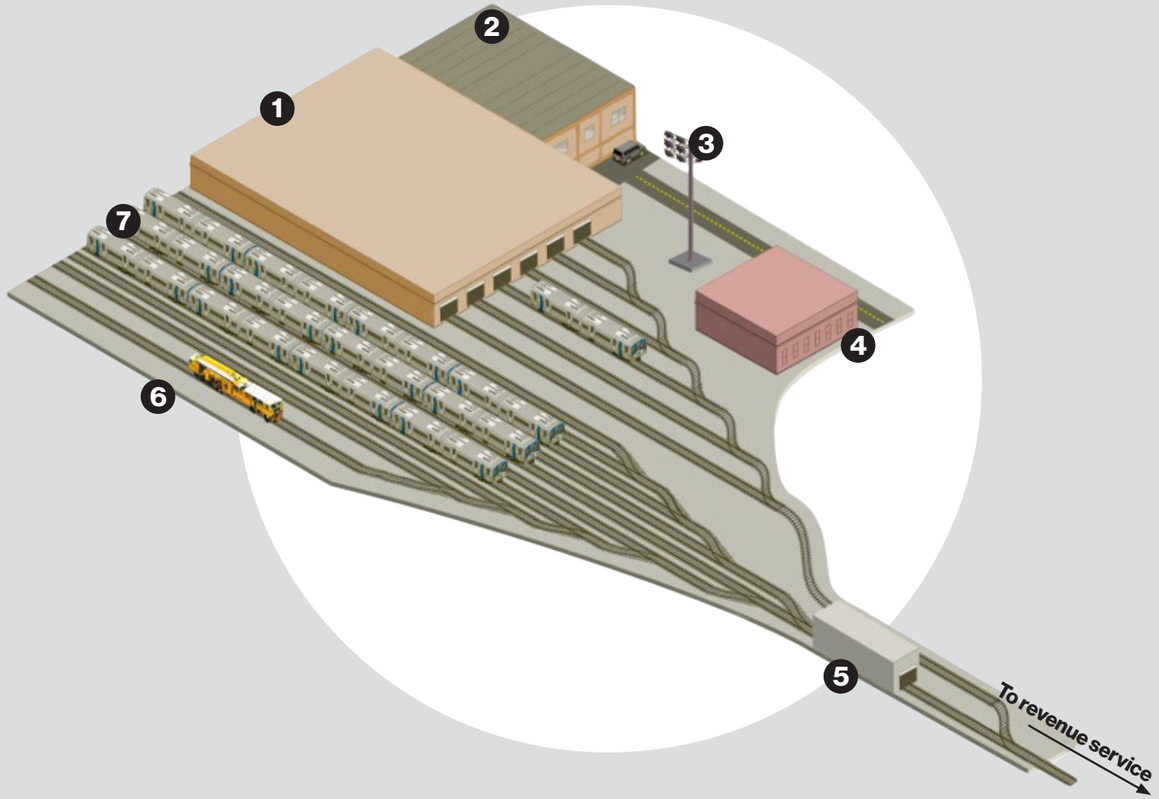
» Several of the oldest facilities, including the 240th Street and Livonia shops, are not able to accommodate modern subway cars and must be reconfigured or entirely reconstructed.

Metro-North Railroad and Long Island Rail Road

» 89% of Metro-North shop equipment used for maintaining railcars—such as car cranes and equipment lifts—is in poor or marginal condition.

» 94% of LIRR work locomotives are beyond their useful life and must be replaced.

What are shops and yards?



1 Maintenance facility

Typically, each of our shops and yards contains one large, central facility where most repair and inspection work is conducted. For regular or ad-hoc maintenance needs, railcars are serviced by our technicians before being put back in service. Typical tasks include large component repairs/swap-outs as well as full bi-monthly inspections.

2 Employee facility

These auxiliary facilities provide space for needed administrative work as well as bathrooms, changing rooms, and break areas for our staff.

3 Yard lighting

With 24/7 operating hours and large amounts of outdoor acreage, sufficient lighting is essential for crews to complete tasks safely and efficiently.

4 Support shop

Some of our yards have additional support facilities that handle specialty tasks. Depending on their capabilities, these facilities can provide services beyond their assigned fleets and send/receive railcars and components from across the system.

5 Car wash

Moving along tracks kicks up dust that accumulates on car exteriors during normal operations. Our shop and yard facilities are equipped with washing facilities to remove this dust as well as any other visual defects or vandalism that may have occurred while the train was in service.

6 Work locomotive

In addition to passenger railcars, work trains that provide a variety of maintenance and repair services throughout the system are also stored in our yards when not in use.

7 Storage tracks

The majority of acreage at our yard facilities is dedicated to car storage. Each yard is generally assigned to one or more service lines, and cars from these lines are stored here as well as given light maintenance and daily inspections.

What we've done

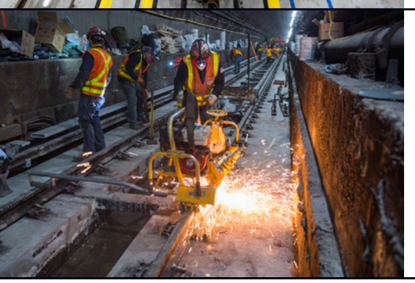
Bronx-Whitestone Bridge

New York City Transit

Staten Island Railway Clifton Maintenance Shop

We comprehensively rebuilt this facility after it suffered severe damage from Superstorm Sandy to create a modern, storm-resistant, and much more operationally efficient home base for Staten Island Railway (SIR) operations.

Clifton Maintenance Shop

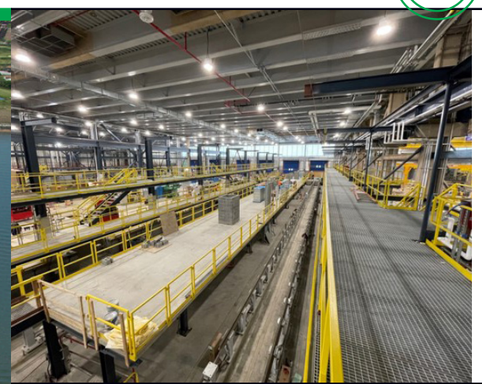


L Train Tunnel

We avoided the full closure of the L line as we reconstructed and strengthened the Hurricane Sandy-damaged Canarsie Tube and completed the project ahead of schedule and $100 million under budget.

L *Train Tunnel*

Metro-North Railroad



Harmon Shop

We will soon complete the replacement of the 100-year-old Harmon Shop, with new, modern facilities for the inspection and maintenance of locomotives, coach cars, and electric railcars. The new Harmon facility provides Metro-North with sufficient space to carry out its preventative maintenance activities, unscheduled and major repairs so trains can quickly resume operation with minimal delays to service.

Metro-North Harmon Shop

Grand Central Train Shed

Work is underway on a section of the Train Shed to replace the roof on E 47 and E 48 streets and a portion of Park Avenue between them.

Construction at Grand Central Terminal Train Shed

Long Island Rail Road

Cherry Valley Avenue Bridge

We have replaced the Cherry Valley Avenue Bridge, which was built in 1905 and expanded in 1918. The original bridge was struck by oversized trucks dozens of times in recent years. The new bridge has additional clearance to prevent delays and safety issues caused by these incidents.

Cherry Valley Avenue Bridge replacement work

Bridges and Tunnels

The majority of the Bronx-Whitestone and Henry Hudson bridges, as well as a significant portion of the Robert F. Kennedy Bridge, have been reconstructed. In addition, the Throgs Neck Bridge suspended span deck has been replaced, and the Verrazzano-Narrows Bridge approaches and upper-level suspended span deck have both been reconfigured and reconstructed.

Verrazzano-Narrows Bridge

Our 20-year plan

By making essential investments in our critical infrastructure, we can secure the foundation of our system and prepare it to deliver reliable, modern service for the coming generations of riders.

NYCT Livonia Maintenance Shop

To see the full plan, please visit future.MTA.info

Highlights include:

1

Rebuild critical, at-risk structures

- We must reconstruct the deteriorating infrastructure that leads to Grand Central to ensure continued Metro-North service to Midtown Manhattan. This crucial work would be completed in phases over the next 20 years to address the Grand Central Train Shed, Park Avenue Viaduct, and Park Avenue Tunnel that provide access to and from Grand Central Terminal and New York City's Central Business District in Midtown.
- We must replace the deteriorating platforms at more than 19 Metro-North stations along the Harlem Line.
- We must fix the LIRR Atlantic Avenue tunnel to keep Brooklyn service running.
- We must rehabilitate nine LIRR viaducts, encompassing 341 individual spans.
- We must rebuild parts of our bridges and tunnels that are at risk, including the lower span of the Verrazzano-Narrows Bridge.

2

» Upgrade aging power substations

- We must repair critically poor conditions at power substations across the system at an unprecedented pace. This includes upgrading nearly 180 NYCT substation locations to avoid subway slow-downs and the potential for extensive power outages.
- We must replace major components of over 50 Metro-North substations and install nine new substations in areas lacking sufficient power to maintain reliability across our system.
- We must completely replace or replace critical components at 72 LIRR substations.

3

» Modernize shops and yards

- We must reconstruct functionally obsolete shops including Livonia and 240th St to ensure facilities are safe, comfortable, able to meet current operational needs, and are prepared for future demand.
- We must renovate railcar and maintenance support shops to 21st century standards that can handle modern trains and support a modern workforce, which will allow us to service newer railcars and infrastructure with updated technology that our riders deserve.

LIRR Third Track Case Study

Third Track added new capacity to the LIRR system. It also reconstructed a critical stretch of the Main Line, including both stations and behind-the-scenes infrastructure. Delivered on time and under budget, it showcased key MTA innovations.

Design-build and bundling

Third Track was a complex project with many moving parts, from station improvements to substations to grade crossing separations to bridge replacements to constructing new parking facilities. No individual element was particularly challenging from a construction perspective; the logistics and sequencing of the work was the key challenge. A design-build contract that bundled what could have been 50 separate projects together put the responsibility and risk with the party best positioned to mitigate them. As a result, we were able to keep the project on schedule.

Define the right scope

During an extensive consultation process, MTA worked with the contracting community to solicit ideas to improve the project's design and delivery. Among other things, this allowed us to incorporate an alternative track alignment that made the project significantly easier to deliver. As a result of this consultation, a project that was initially estimated to take eight years took just five.

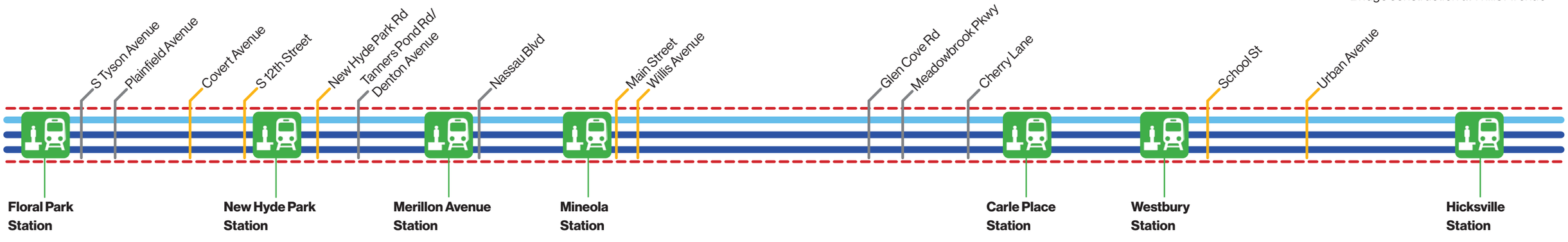
Project team accountability

The project teams, both at MTA and at our contractor, were empowered to make decisions and given a mandate to coordinate all work, aggressively control scope expansion, and enact performance oversight. The leadership on both the MTA and contracting sides developed a strong working relationship in their co-located field office. Given the tools they needed to manage the project successfully, this leadership team was held accountable by MTA leadership as the project progressed, with constant future projections ensuring the project remained on track.

The results

- 9.8 miles of track
- Seven upgraded stations, with
  - Six pedestrian overpasses
  - 15 ADA elevators
- Seven bridge replacements
- Eight substation replacements and upgrades
- Eight grade crossing eliminations
- 7.5 miles in retaining walls

Together with Grand Central Madison and other improvements, Third Track enables a 40% increase in LIRR service.

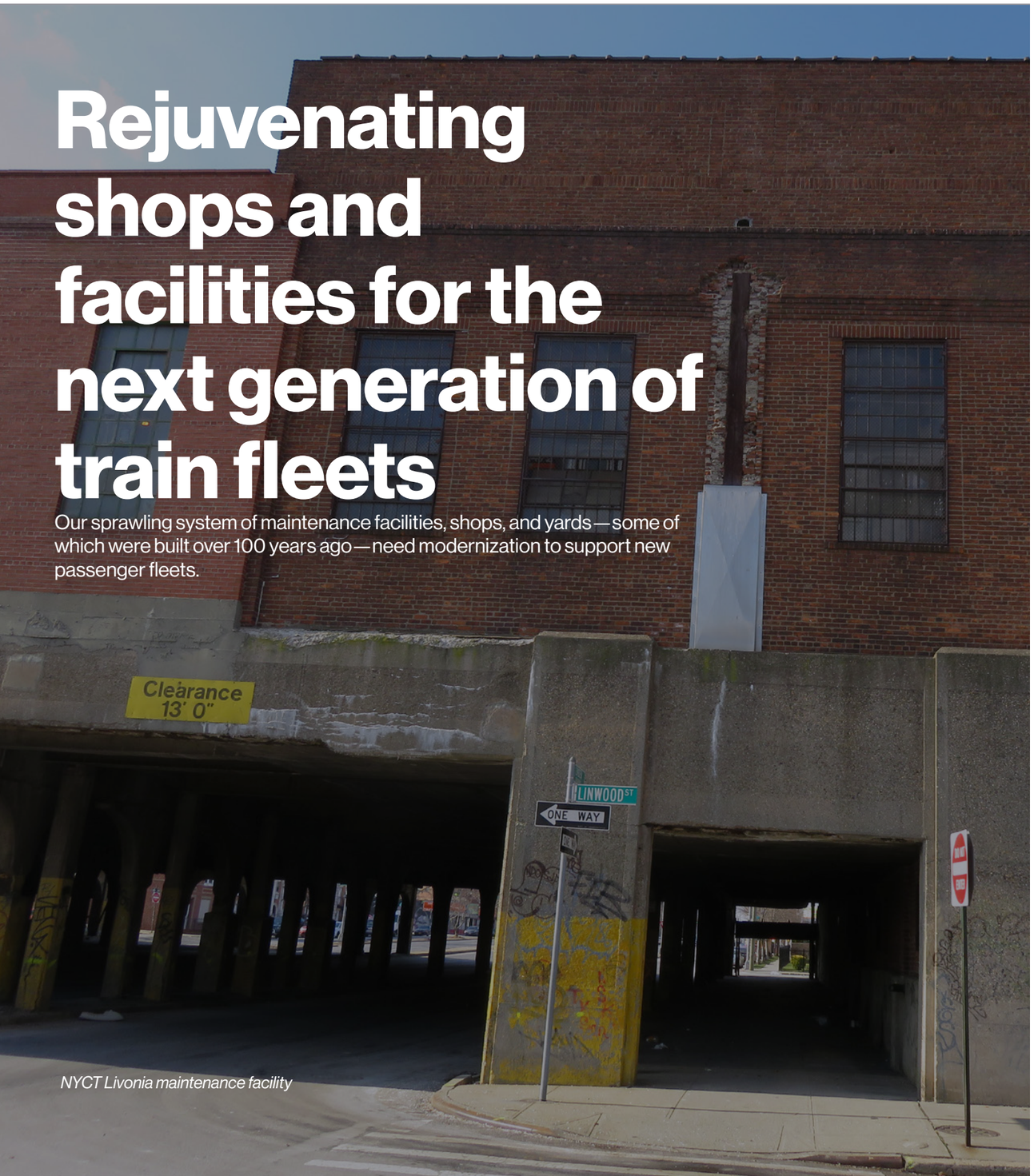


Spotlight: Grade crossing eliminations

Utilizing an innovative box-jacking system, our construction crews complete these complex jobs faster and easier. With close coordination between the contractor and LIRR forces, we were able to install a new railroad bridge over a new underpass in a single weekend, dramatically minimizing interruptions to LIRR riders. This compares to the weeks, months, or even years that similar projects took in the past.

Bridge construction at Willis Avenue

Livonia Maintenance Facility Case Study



NYCT Livonia maintenance facility

Rejuvenating shops and facilities for the next generation of train fleets

Our sprawling system of maintenance facilities, shops, and yards—some of which were built over 100 years ago—need modernization to support new passenger fleets.

We need to talk about Livonia

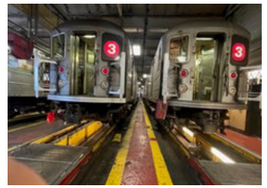
Visitors to New York City Transit's (NYCT) Livonia Maintenance Facility in East New York, Brooklyn, would be forgiven for thinking they had stepped back in time to the industrial revolution, rather than a vital 21st century repair facility responsible for maintaining all of the trains for the subway's 3 line and the Times Square Shuttle.

Railcar maintenance facilities are essential to keeping our passenger railcars in good working order. They should be able to efficiently and safely manage all inspection and cleaning tasks, and perform comprehensive maintenance for 21st century railcars.

Instead, as you step inside the hulking brick building at Livonia, the walls are cracked and deteriorating. When it rains, water leaks through the roof then pools on the floor because several of the drains have collapsed or become too clogged to use. In the winter, a single boiler heats the facility and much of the warmth escapes through the holes in the walls and ceiling. Over the years, we have created additional makeshift bathrooms and locker rooms because the shop was built without facilities for women.

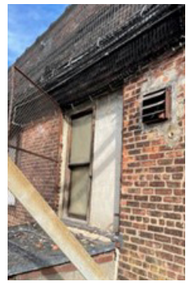
These conditions must be improved. Livonia was built to service trains in 1922. Since then, designs have changed—and the facility can't keep up. Our newest trains have roof—mounted air conditioning units, and with Livonia's low ceilings, we can't access them for maintenance. As a result, we are unable to replace any trains along the 3 line—even though all of the 2 trains have received more modern railcars.

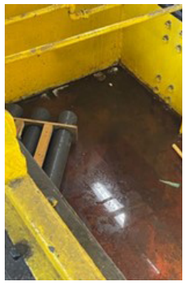
The low ceilings and narrow aisles also restrict the use of cranes and the ability to move other equipment and trains around within the shop, forcing employees to inefficiently shift trains back and forth like a puzzle. The trenches underneath the trains are too shallow and cramped for our mechanics, requiring them to squat to do their work.

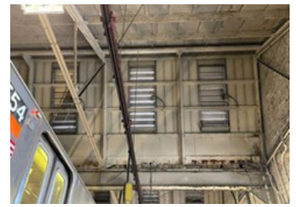


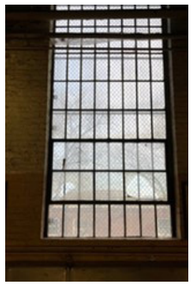
3 *line, NYCT*

Livonia Shop in various states of disrepair









Livonia Maintenance Facility Case Study

This isn't an isolated issue, but we have a plan

When these facilities are unable to function efficiently—or even at all—service suffers. If you've ever been frustrated by a completely empty train flying past you in a station late at night, it's probably traveling to a far-flung facility because its home shop doesn't have the right tools to care for it properly.

Until we update and reconfigure Livonia, we won't be able to modernize trains on the 3 line—denying riders of the comfort, convenience, and reliability they deserve. If we fail to act, it could force riders on those trains to endure car failure rates over five times more than those of a new fleet and workers to spend more time making costly and time intensive repairs in unsuitable conditions.

At Livonia, we're evaluating different design options which would either reconfigure or completely replace the existing facility.

Crumbling exteriors at Livonia

In either case:

- We must address all structural and component deficiencies.
- We must add more administrative and employee space, including offices, workshops, restrooms, and locker rooms—for employees of all genders—to ensure the space is a safe and dignified facility for our staff.
- We must install overhead cranes for removal and installation of HVAC units.
- We must reconfigure the tracks, so our employees have sufficient space to work between railcars and to access side-mounted equipment on the cars.
- We must minimize disruption. While we're doing this work, we need to ensure parts of the facility remain operational so that we can continue to service trains.
- Finally, we must concurrently begin replacing the R62/R62A fleet.

As the R62/R62A cars (the older cars serving the 3) are approaching the end of their useful life, we will soon need to replace them to avoid increasing delays and service disruptions. We have plans to replace them with brand new railcars (referred to as the R262s), which would mean a more reliable, comfortable, and convenient ride for you. But we can't do that unless we first update Livonia.

Interior photo of R62 from 1983

You might know the R62s as the railcars with the orange bucket seating. This is an interior shot of an R62 from 1983, the year they were introduced.

Interior photo of the newer R142 train on the 2 line

Newer R142 railcars on the 2 line feature brighter lighting, streamlined seating, upgraded HVAC, and digital route and destination signs.

R262 prototype train rendering featuring modern amenities

Future R262s will replace the aging R62 and feature modern amenities like car-specific digital wayfinding, wider doors, advanced HVAC, and smoother braking.

Metro-North Capital Plan Case Study

A focus on Metro-North's capital program

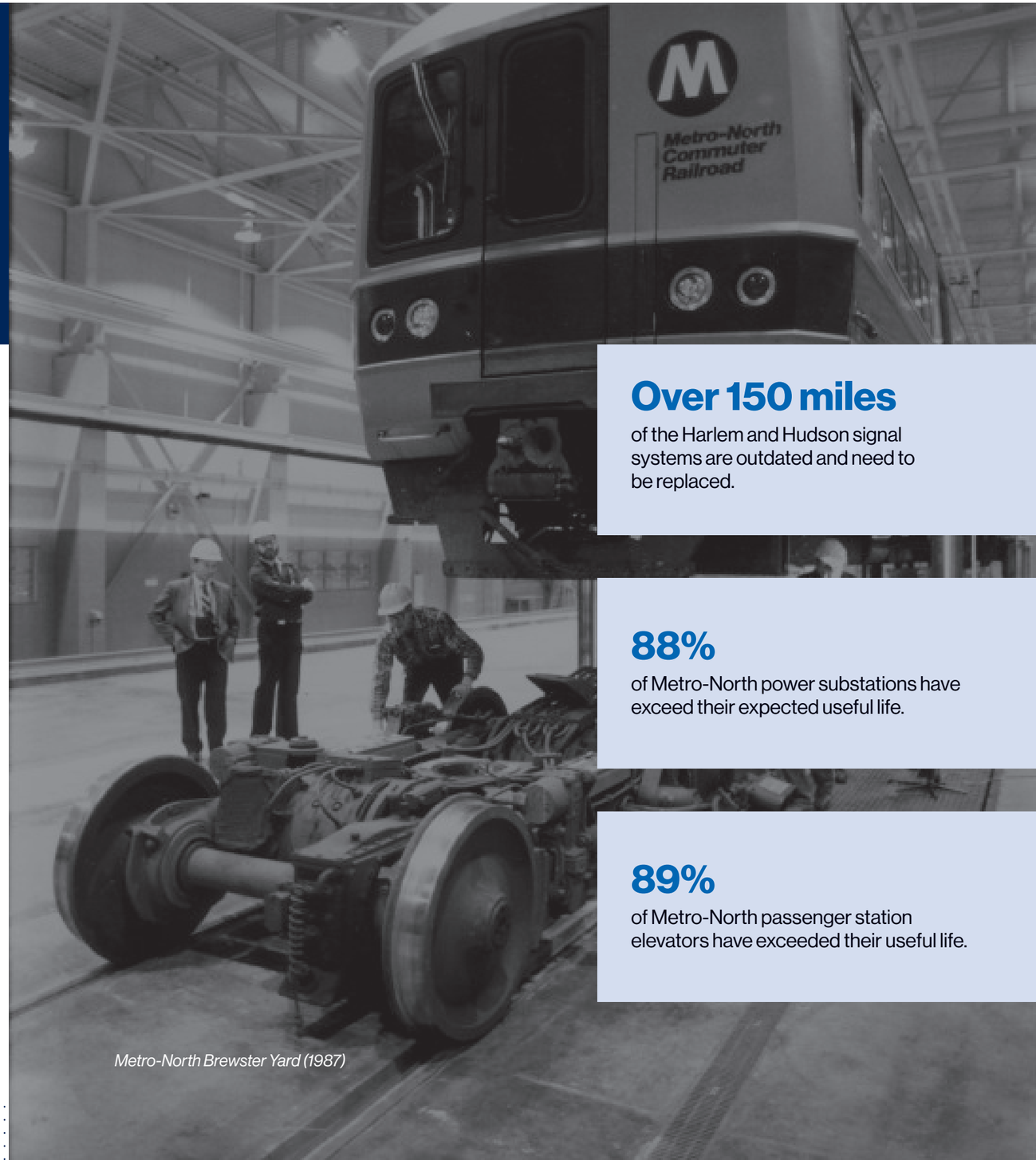
How the capital program saved Metro-North

In the early 1980s, commuter rail service north of New York City was at risk of falling apart entirely. After its original private operators' 1970 bankruptcy and continued neglect from struggling Conrail throughout the 1970s, the system was trapped in a vicious cycle of disinvestment. Infrastructure was failing and service was suffering as a result.

In 1983, New York state stepped up and created the Metro-North Railroad. It was more than a change in name; Metro-North enacted an ambitious plan to restore the railroad's basic infrastructure, requiring large-scale reinvestment in a system that was in severe disrepair. Early focus was on restoring basic infrastructure to reliable condition and working to achieve a state of good repair. This investment worked. Targeted investments in Metro-North's infrastructure have had a dramatic effect on our service reliability: on-time performance was at 80.5% in 1983 and is now at 97.1% in 2022.

Why it needs to again

Now, as Metro-North strives to maintain its accomplishments and provide reliable service to changing customer demands, much of its infrastructure remains largely as originally built and have met or exceeded the end of their useful life. Significant work remains on some vital aging assets that have deteriorated past the ability to continue with routine maintenance and must be substantially repaired, rehabilitated or replaced, such as the 130-year-old Park Avenue Viaduct and the 110-year-old Grand Central Train Shed. Much progress has been made over the years protecting past investments and providing targeted improvements; however, the state-of-good-repair needs of Metro-North's infrastructure are significant and require investment to preserve the accomplishments of the past 40 years and to address the needs of the aging systems to allow Metro-North to continue to serve its tens of millions of riders each year.



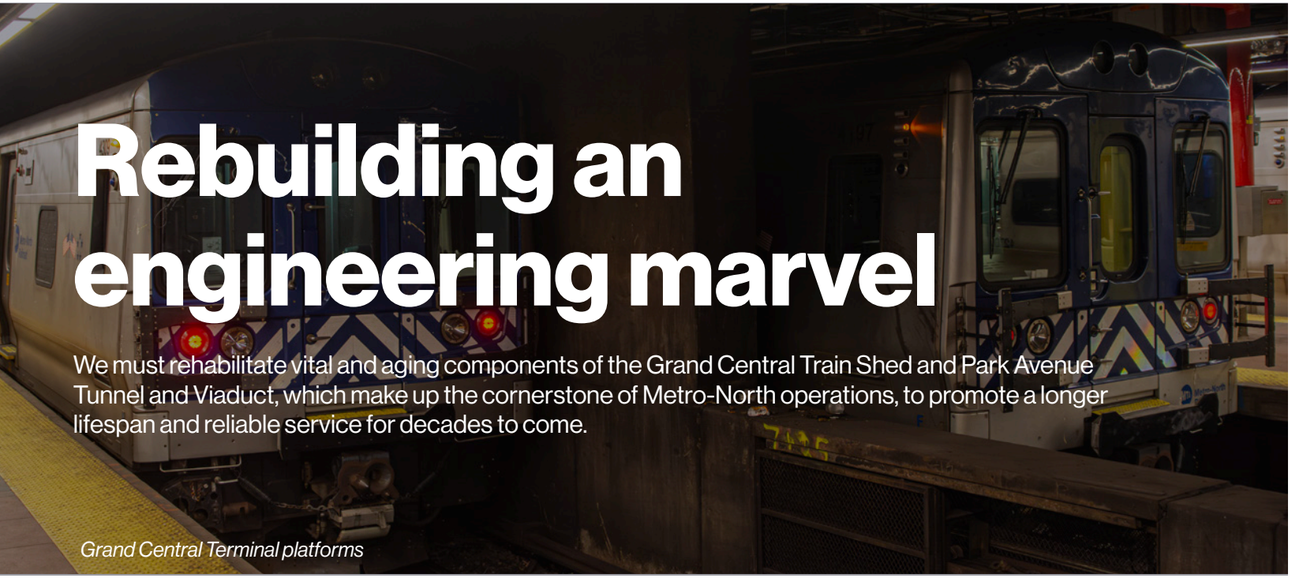
Metro-North Brewster Yard (1987)

Over 150 miles
of the Harlem and Hudson signal systems are outdated and need to be replaced.

88%
of Metro-North power substations have exceed their expected useful life.

89%
of Metro-North passenger station elevators have exceeded their useful life.

Grand Central Case Study



Rebuilding an engineering marvel

We must rehabilitate vital and aging components of the Grand Central Train Shed and Park Avenue Tunnel and Viaduct, which make up the cornerstone of Metro-North operations, to promote a longer lifespan and reliable service for decades to come.

Grand Central Terminal platforms

A once-in-a-generation rehabilitation

Ever taken a Metro-North train into Grand Central Terminal? If so, you've walked through one of New York's most iconic buildings. But did you know that just beyond the building is an engineering wonder that's just as impressive?

A network of underground tunnels, structures, and overhead bridges stretches approximately four miles and encompasses 75 acres, with 44 train platforms and 67 tracks for moving trains in and out of the terminal. Built more than a century ago, this collection of critical, connected infrastructure formed the Grand Central Artery, which helps approximately 200,000 Metro-North riders reach their destinations each weekday.

But most of this infrastructure was built for demands of a different era. Sections originally designed to hold up horse-drawn carriages now provide structural support for Park Avenue, its cross streets and sidewalks, and 24 high-rise buildings.

The structures have held up remarkably well, under pressures they were never meant to withstand. But now the Grand Central Artery—consisting of the Grand Central Train Shed, the Park Avenue Tunnel, and Park Avenue Viaduct—is finally showing its age. Deterioration is outpacing our attempts to fix it. Without more comprehensive, aggressive intervention, this could lead to failures resulting in suspension of Metro-North service into Manhattan.

It is time to give the Grand Central Train Shed, Park Avenue Tunnel, and Park Avenue Viaduct the once-in-a-generation overhaul they need.

Grand Central Train Shed

Constructed over 110 years ago, the Grand Central Train Shed is the underground complex where trains entering the terminal are sorted to passenger platforms—just above the roof of the Grand Central Train Shed is Park Avenue and surrounding side streets.

Water infiltration from street level has led to pervasive rust and deterioration in the roof and structural support system, and the weight of trucks driving over the top of the Grand Central Train Shed along Park Avenue has compounded its damage. Corrosion and deterioration have outpaced the MTA's ongoing targeted repairs since the 1990s.

To adequately address the needs, we must replace the existing roof structure with a new one that has a 100-year service life and a state-of-the-art waterproofing system to minimize and delay future corrosion. Without this kind of comprehensive intervention, the structure could fail, forcing a suspension of all Metro-North service into Manhattan.

Metro-North trains on the viaduct north of Grand Central Terminal

All Metro-North trains use the pictured Park Avenue Viaduct, as well as the Park Avenue Tunnel and the Grand Central Train Shed to deliver passengers to Grand Central Terminal

Park Avenue Tunnel

After leaving Grand Central Terminal, trains pass through the Park Avenue Tunnel, a two-mile stretch running from 57th to 97th Street. This tunnel is also over a century old and needs updating to meet modern-day safety standards.

We have a comprehensive plan to improve it, including new emergency exits, better lighting, and a modern fire protection system, including upgrading our ventilation system.

Grand Central Case Study

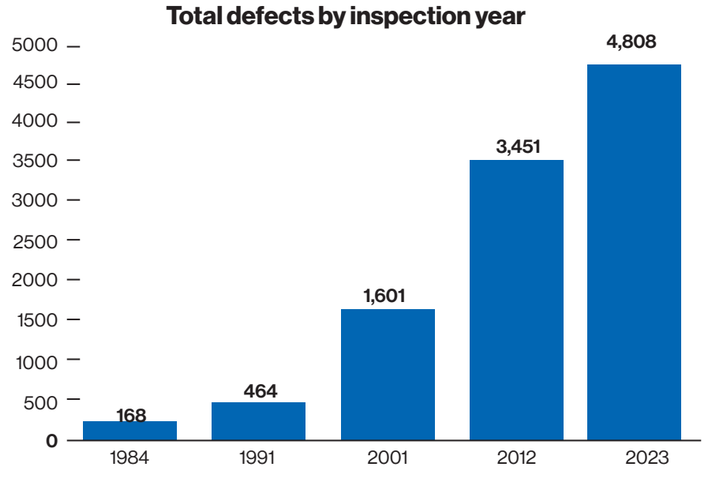
Park Avenue Viaduct

The Park Avenue Tunnel then opens up onto the Park Avenue Viaduct, the approximately 1.7 mile-long elevated structure that carries 98% of all Metro-North trains to and from Grand Central Terminal each day. All Metro-North trains traveling along the Hudson, Harlem, and New Haven lines must travel on it to serve the Harlem-125 St Station and Grand Central Terminal, making it a single point of failure for the operation. Without it, Metro-North would not be able to provide service to Manhattan for riders from the Bronx, Westchester, Putnam, and Dutchess counties, or the state of Connecticut.

Over half of the viaduct was built in the 1890s, and it now carries considerably more trains each day than it was designed to support. Targeted repairs are not sufficient to address the extent of the structural deterioration; maintenance costs are increasing each year.

Half of the segments of the viaduct's elevated steel structure running between E 110 Street and the Harlem River Lift Bridge are over 100 years old, necessitating regular maintenance and costly repairs.

We plan to replace or rehabilitate major segments of the Park Avenue Viaduct, with Phase 1 already underway from E 115 Street to E 123 Street.



Repair needs have proliferated in the 21st century

- **Maintain** the safety of the railroad and the public.
- **Ensure** train service to and from Harlem-125 St Station and Grand Central, serving local residents and businesses.
- **Replace** aging infrastructure and improve rail service reliability.
- **Support** local economy during construction.
- **Reduce** viaduct noise and vibration levels.
- **Improve** pedestrian safety on top of the viaduct.

We can modernize our infrastructure for faster, more reliable service sooner

By adopting a comprehensive approach and aligning with current industry design practices, we're setting the stage for key improvements that are vital to the Metro-North rail system. These upgrades will make train service safer, faster, and more efficient for the thousands who rely on access to Grand Central Terminal and New York City every day.

We're also utilizing innovative implementation strategies designed to cut down on construction time and minimize disruptions. For example, our Grand Central Train Shed replacement plan aims to finish 15-20 years ahead of schedule, saving both time and money while speeding up the use of more dependable infrastructure.

Tackling the needs of these three major, interconnected structures—the Grand Central Train Shed, Park Avenue Tunnel, and Park Avenue Viaduct—in a coordinated manner helps minimize service disruptions and secures the infrastructure for a more reliable system for years to come.

Station improvements at 23 St F M

Renew

Since the first capital plan in 1982, we've made significant investments in the system—and it has made a difference. The graffiti-covered subway railcars are gone. Those trains could travel only 7,000 miles between failures; the railcars that replaced them (many of which are still in service) average 129,000 miles—and the newer ones can last more than 250,000 miles at their peak.

Investment matters. And even more so, **continuous investment matters;** we must continue with replacing assets as they become outdated and beyond their useful life.

New York's future depends on keeping up with that investment. Aging assets demand increased maintenance attention, resulting in higher costs to keep them safe and operational and to avoid more disruptive shutdowns for repairs. Today, we have assets across all categories that are in poor or marginal condition that we must address, including 21% of subway station components, 32% of Metro-North bridges, and 52% of LIRR substations.

We can't uphold our commitment to reliable service if critical components no longer function as intended.

Challenges

Every asset has its own lifecycle for replacement. Some assets may need replacing every 10 years, others every 20 years, and still others, every 100 years. During their functional years, these assets fulfill their purpose. However, as they age, they become prone to age-related wear-and-tear or even outright failure. This moment is approaching for a significant percentage of the system over the next 20 years.

Aging subway railcars at a maintenance facility

Aging subway railcars

Over the next 20 years, over 3,900 railcars will reach the end of their useful life and will require replacement; nearly 1,500 railcars currently in operation are already past their 40-year limit.

Keeping up with railcar replacements is one of the most effective ways of ensuring reliable subway service. New railcars average over 200,000 miles between failures, making them more than 2.5 times as reliable as older "legacy" railcars. Older railcars are more prone to break down, generally require more extensive and costly maintenance to keep in service, and are less comfortable for our passengers due to worn interiors and malfunctioning equipment like air conditioning units. Nearly two-thirds of all August "hot car" incidents, involving air conditioning breakdowns over the past three years occurred in older railcars with underbody-mounted air units, compared to the newer ones with modern overhead AC units.

Necessary bus replacement

Each of our 5,840 buses gets replaced every 12 years. That means **over the next 20 years, we will need to replace the entire fleet.**

SIM35 bus stop

Atlantic Av-Barclays Ctr Station

Deteriorating stations

With 704 subway and commuter rail stations, our transit network has more stations than any other subway or metro network in the world. Some of these stations are nearly 120 years old, and each station is made up of hundreds of components that need attention and are on different replacement cycles. The age and sheer size of our station footprint creates a huge maintenance challenge.

Elevated line structure corrosion

Our exterior steel infrastructure needs regular painting. This is not for aesthetic purposes. The paint on our outdoor structures, like our 61 miles of elevated subway structures and several hundred railroad overpasses, protects the steel against corrosion by providing a barrier from water and other weather-related damage.

More than half of LIRR bridges need to be repainted or waterproofed

Asset	Percent in Poor/ Marginal Condition
Undergrade Bridge (waterproofing)	69%
Culvert-Undergrade (painting)	69%

Verrazzano-Narrows Bridge

Suspension bridge preservation

The life of a suspension bridge is governed by the longevity of its main cables, which are the primary load-carrying elements for a suspension bridge and are extremely difficult and cost-prohibitive to replace.

Cable dehumidification is a proven technique used worldwide to minimize corrosion and preserve the remaining strength of main cables by reducing the relative humidity levels within the cables.

Implementing cable dehumidification on our four suspension bridges is one of our highest priorities.

Culver Line structure

What we've done

New York City Transit

Fleet upgrades

New R211 railcars are in service, the first of the 1,175 new railcars that will be deployed across the subway and SIR over the next few years. These new railcars feature wider door openings, digital displays, CCTV, and other modern amenities and are equipped with the technology required for a modern signal system.

NYCT R211 railcar

Station improvements

In the current five-year capital plan, we are repairing over 1,400 subway station components including stairs, platforms, canopies, mezzanine components, and station ventilators.

We are also renewing 78 station elevators and 66 escalators to keep this equipment available over 95% of the time.

Court St R

Long Island Rail Road

Station improvements

Over the last five years, we have completed vital repair and rehabilitation work at 20 LIRR stations—with more underway. This work includes platform replacements, station building renovations, pedestrian overpass improvements, and installation of new customer amenities like digital screens and platform shelters.

LIRR Carle Place Station

Verrazzano-Narrows Bridge

Bridges and Tunnels

Cable dehumidification

We are protecting the main cables at the Robert F. Kennedy Bridge and the Verrazzano-Narrows Bridge against future corrosion.

Construction at the Robert F. Kennedy Bridge

Our 20-year plan

By keeping up with our replacement needs, we can avoid the cycle of deterioration, breakdowns, and emergency action—and reap the benefits of safe, consistently reliable, and convenient service.

LIRR M9 train

To see the full plan, please visit future.MTA.info

Highlights include:

1

Replace aging fleets

We need to replace eight railcar types totaling over 5,000 railcars for NYCT, Metro-North, LIRR and purchase 9,000 buses over the next 20 years.

New York City Transit R211 train

New York City Transit

Subways

We must complete the replacement of all "legacy" subway railcars built prior to 2000. Continuing to transition to our newest railcars, which have equipment malfunctions a fraction of the time compared to older ones, as well as have improved features like wider doors to expedite boarding, security cameras, digital information displays, and automated announcements is important. Modernized railcars are also essential to the rollout of a modernized signal system.

Buses

We must transition our entire bus fleet to zero-emissions by 2040, significantly reducing greenhouse gas emissions. The new fleet will also feature digital information screens and other modern technology to enhance safety and customer experience.

Long Island Rail Road

We must purchase up to 340 new railcars to expand the fleet and replace old ones so that the entire passenger railcar fleet is within its useful life. Expanding the fleet will allow us to provide more travel options and run service to match the expected changes in ridership demand caused by the opening of Grand Central Madison and the boost in "reverse peak" service that is possible with the recent completion of the Main Line Third Track expansion project.

Metro-North Railroad

We must replace aging locomotives, coaches, and railcars by purchasing over 750 new vehicles, including up to 15 new locomotives for West-of-Hudson service, all while preparing for expansion of service from the New Haven Line into Penn Station. With these investments completed, all revenue equipment would be within their useful life.

Staircase at Court Sq-23 St Station

2

Prolong the lifespan of our structures

» We must complete painting all 61 miles of elevated steel subway structures and repairing thousands of priority structural defects that will help our structures last longer.

» We must dehumidify the main cables of the Bronx-Whitestone Bridge and Throgs Neck Bridge to preserve their strength.

3

Upgrade stations

» We must implement station repair projects quickly when deteriorated components or other needs are identified so that we expedite fixing our stations in a shorter timeframe and improve our customers' experiences.

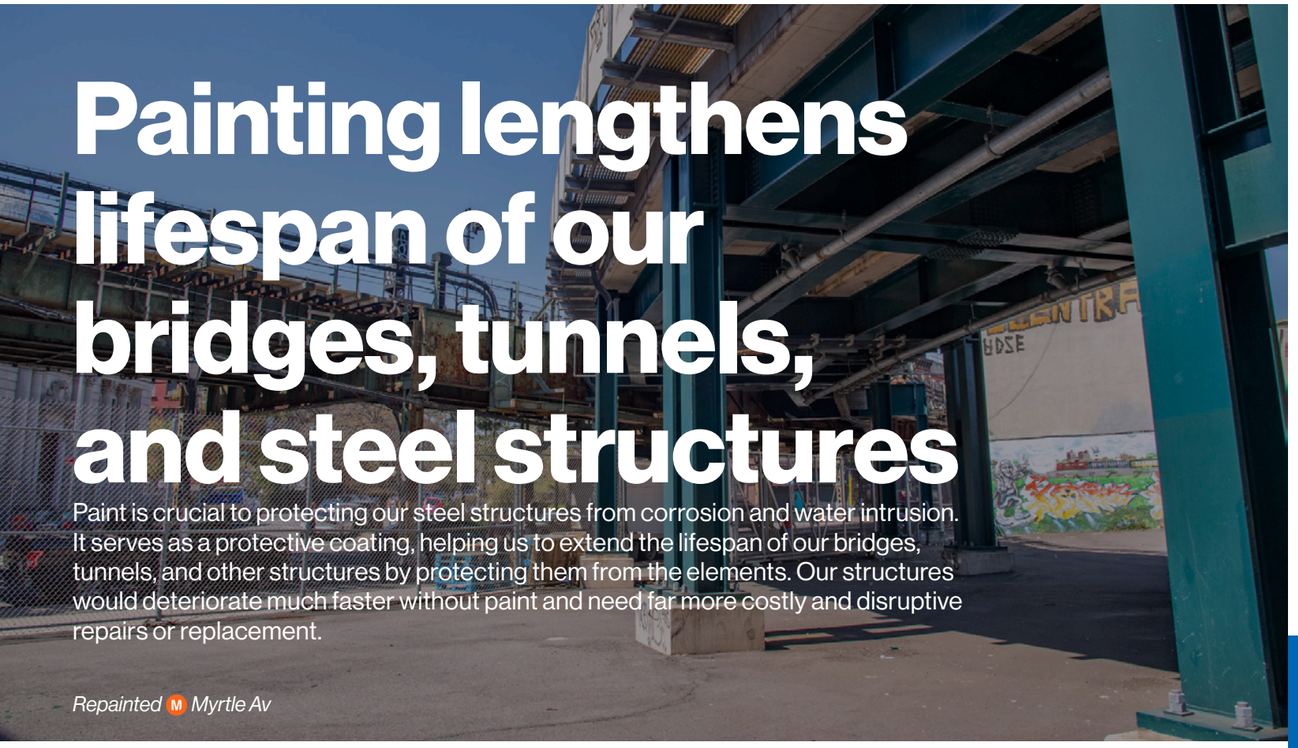
» We must enhance security by improving lighting, CCTV, and other station elements.

» We must improve circulation within selected stations by adding stairs or reconfiguring station elements.

» We must address degraded station electrical utility conditions and upgrading station lighting.

» We must rehabilitate or replace aged, deteriorating station components, including platforms at 70 stations and 160 elevators throughout the LIRR and Metro-North systems.

Painting Case Study



Painting lengthens lifespan of our bridges, tunnels, and steel structures

Paint is crucial to protecting our steel structures from corrosion and water intrusion. It serves as a protective coating, helping us to extend the lifespan of our bridges, tunnels, and other structures by protecting them from the elements. Our structures would deteriorate much faster without paint and need far more costly and disruptive repairs or replacement.

Repainted M Myrtle Av

Rust and deterioration on the West End Elevated

If you've ever taken the D train through Brooklyn's Borough Park, New Utrecht, Bensonhurst or Coney Island neighborhoods, you might have noticed the elevated steel structure holding up the tracks has seen better days. Peeling paint flakes along all 3.6 miles of the century-old structure, known as the West End Elevated, revealing rusted and corroded steel with warped surfaces and cracked foundations.

While we inspect these structures regularly to ensure that they remain safe and structurally sound, without intervention the deterioration will continue, leading to large, costly, and disruptive repairs or worse—a partial service shutdown while we install a full replacement.

Luckily, the solution to prolong its life is surprisingly simple: a new coat of paint.

What is happening?

Steel structures are vulnerable to corrosion or rusting from everyday exposure to the air, rain, snow, and salt water, where it exists. The stress of holding up continuous trains running along the tracks can cause additional deterioration. Without intervention, the combination of weather damage and daily usage can result in serious structural defects.

But, well-maintained exterior paint can provide significant protection—in some cases even doubling the lifespan of the infrastructure. It also has the added benefit of creating a cleaner, more vibrant look for the communities these lines serve.

To protect New York City Transit (NYCT), Long Island Rail Road (LIRR), and Metro-North Railroad (Metro-North) structures, we have a plan to paint—and regularly repaint—our exposed structures to prevent long-term damage and even more expensive corrective work.

Rusted steel structure

We're getting smarter

Over the past few years, we have overhauled our approach to painting our transit infrastructure, incorporating new techniques and materials to make these protections even more effective.

That's in part thanks to a new level of interagency collaboration, facilitated by the 2019 formation of the MTA Construction and Development (C&D) agency, which brought experts from all agencies under one roof to share best practices.

Our Bridges and Tunnels (B&T) division has had a robust and advanced painting program in place since the 1990s when they undertook a significant upgrade of their painting program. This effort dramatically reduced the level of deterioration across our seven vehicular bridges and two vehicular tunnels.

Now, MTA C&D has begun applying that knowledge and expertise to improve how we care for our bridges and elevated structures on the subway and regional railroads, too.

This includes using better performing and more varied sets of coatings, enabling us to tailor our approach to the specific environmental conditions. It also involves new and more efficient methods for stripping old paint, cleaning and prepping structures, and applying new coats of paint. Combined, this helps us more than double the service life of our structures without major reconstruction.

Painting Case Study

How are we doing better?

By taking a new approach to structural overcoat painting:

» Our steel structures will corrode less quickly, preventing serious safety concerns and very costly repairs or even the full replacement of a structure. This will save customers from delays or service cancellations for lengthy periods of time while a structure is repaired or replaced.

» Our new coatings have a better bond with the structures, helping increase the painting cycle from every 15 years to every 30. Because the new materials are more in line with industry standards, there is more competition for the work, allowing us to find more competitive pricing. Both mean better-quality work at a lower overall price.

» In some cases, we must remove old lead-based paint which can pose health risks. Safely removing it from very old structures and replacing it with more environmentally friendly epoxy paints has real public health benefits for the communities these lines serve.

Metro-North overhead rehabilitation

Painting can be a part of a broader maintenance or upgrade job

We've applied B&T's approach to abrasive blasting to remove aging paint from our subway structures. These blasting rates are 4x higher than our previous power tool cleaning rates, and because abrasive blasting cleans steel more effectively than power tools, steel defects can be better identified for repair extending the structural service life.

Before and after photos of aged paint removed using abrasive blasting

We have a plan

The MTA has a plan for leveraging the power of paint to preserve our structures over the next 20 years and avoid costly repairs and disruptions.

Almost half of the subway's 61 miles of elevated line structures have been or will be painted in the current 2020-2024 Capital Plan. We will continue painting and recoating using high-performance paint over the next 20 years. We are integrating painting efforts with other major projects to accomplish multiple improvements at once, reducing overall costs and minimizing disruptions.

Our work also extends out to the commuter rail network. Over the next 20 years, LIRR will paint and waterproof up to 100 bridges and viaducts in greatest need of rehabilitation or replacement to prevent accelerated structural deterioration. Meanwhile, Metro-North is replacing and rehabilitating many of its undergrade and overhead bridges, including painting and waterproofing projects.

Bridges and Tunnels Case Study

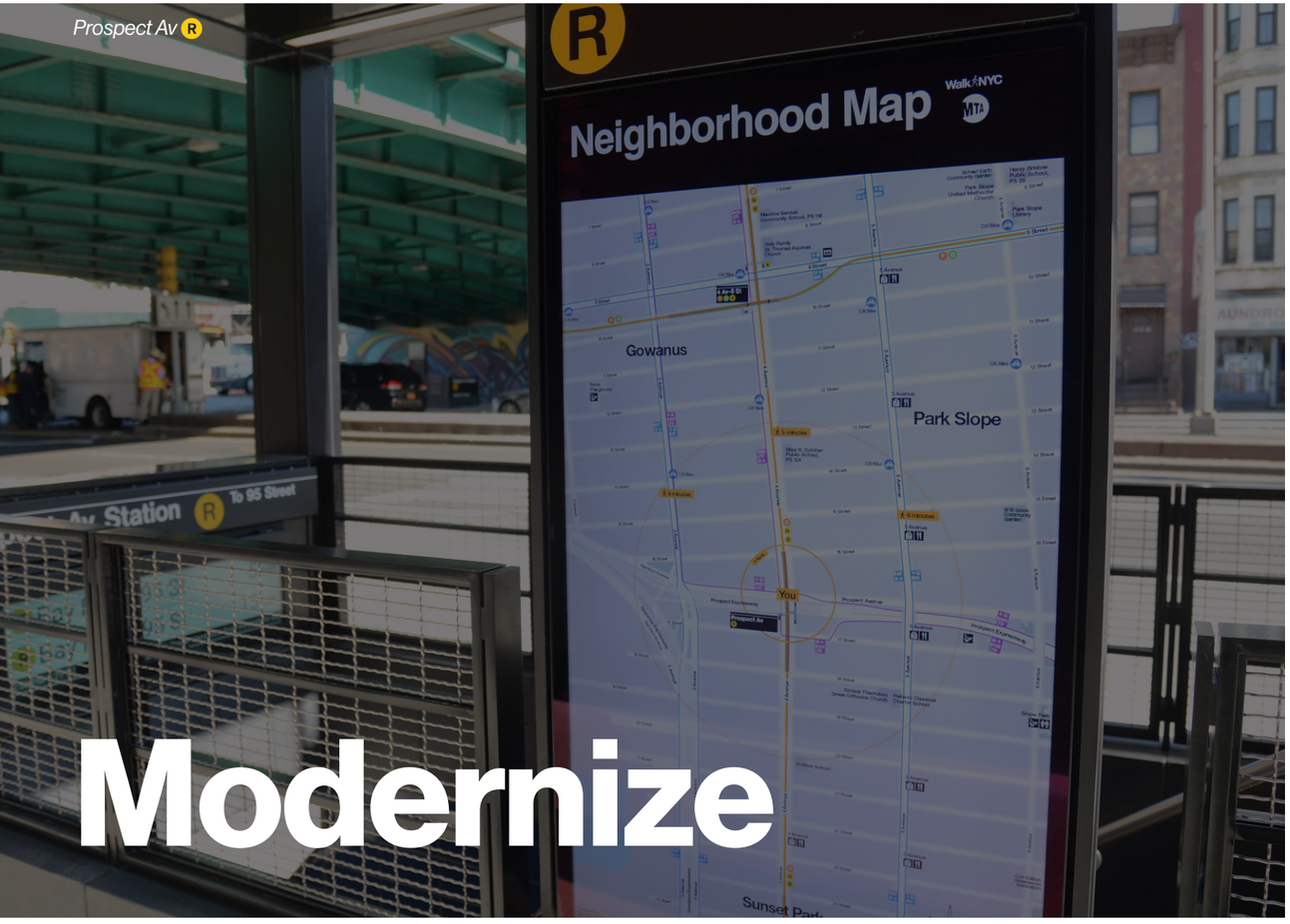
The unique work of Bridges and Tunnels in supporting regional mobility

MTA Bridges and Tunnels was established in 1933 as the Triborough Bridge Authority. Today, B&T is among the largest of the nation's bridge and tunnel tolling authorities, in terms of revenue and traffic volume, operating seven bridges and two tunnels in New York City, connecting the boroughs of Manhattan, Brooklyn, Queens, the Bronx, and Staten Island. These bridges and tunnels are essential links for both regional traffic corridors and major truck routes and serve a vital role in the operation of bus/HOV traffic operations within NYC. In 2022, B&T collected more than $2.3 billion in toll revenue. With over 60% of this toll revenue dedicated to the MTA's mass transit operations, B&T performs a unique and vital function in support of regional mobility.

Thanks to a steady pace of capital investment over the past several capital programs, B&T's bridges and tunnels are currently in good condition. In addition, B&T constantly makes improvements to its bridges and tunnels to improve regional traffic flow and safety, improve accessibility on its bridges, improve resiliency for both its structures and supporting infrastructure, and addresses any known risks such as seismic, fire, wind, vessel impact, and security. This has resulted in the upgrade and modernization of a significant portion of B&T's bridges and tunnels as well as supporting infrastructure.

B&T requires continuous capital investment to maintain its aging bridges and tunnels in good condition, upgrade remaining original components, improve accessibility, implement sustainability initiatives, and adapt to evolving regional traffic patterns, new codes, and technology, while maintaining an uninterrupted revenue stream to support the MTA and mass transit.

View from Verrazzano-Narrows Bridge



Modernize

To reach our region's potential, we will need a transit system that can meet the needs of 21st century riders.

We must modernize some of our outdated and deteriorating infrastructure to create a system that is more efficient, reliable, and easier to navigate.

By making these foundational investments, we can prepare our network for its next century of service.

Challenges

Today, we are using signal technology developed during the days when radio was considered cutting-edge, created decades before the invention of the internet.

Some of our technology is so old that its components are no longer manufactured, forcing the MTA to painstakingly craft its own replacement parts. By modernizing the grossly outdated and wildly inefficient parts of our system, we can avoid breakdowns and support safer, more reliable service. Two particularly important systems we need to modernize are signals and communication technology.

NYCT signal equipment

Signals

The current signaling system on the majority of the subway, known as fixed-block signaling, is both safe and effective at directing trains along lines. It uses green, yellow, and red lights, much like road traffic signals, to direct operators on how fast they can operate trains relative to others. By now, however, this system is significantly outdated, with many parts of it dating back to the 1930s. The age of the signal infrastructure leads to all too many signal failures, a top cause of delays on the subway system, and it limits the number of trains we can run and our ability to track them precisely throughout the system.

We know the solution. Communications Based Train Control (CBTC) technology allows trains to move closer together, increasing throughput capacity and allowing service to recover from disruptions more quickly. Paired with advanced Automated Train Supervision (ATS) systems, CBTC also allows more accurate train movement monitoring—and, therefore, more accurate customer information. Given the size and age of our system, it is a significant undertaking to execute.

LIRR updated platform screens

Communication technology

Providing information about train arrivals, service changes, or other important messages has become a standard our customers expect. But currently, just over half of our stations can deliver this information effectively due to outdated systems.

Communication technology becomes obsolete faster than other assets due to rapid technological advancement and innovation. That means that while other assets have a typical lifespan of 25-50 years, communication assets tend to have a shorter lifespan of 10-15 years.

Though each technology has different challenges and vulnerabilities, as well as compatibility requirements, updating them is essential. In addition to informing customers, this infrastructure also facilitates clear and timely communication between train operators, control centers, and station personnel. It is also critical in emergency response situations.

More than half of NYCT subway stations have public address systems in poor or marginal condition

Asset	Percent in Poor/Marginal Condition
Public Address/Customer Information Screen	52%

Grand Central Terminal

What we've done

New York City Transit

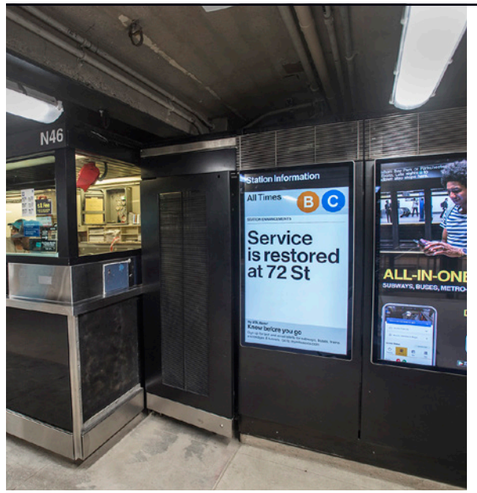
CBTC installation

Subway signal modernization has been fully completed on the L and 7 lines. Since the upgrades, they have become our highest performing lines, both consistently exceeding 90% on-time performance.

Modernization is also completed on portions of the E F M R (Queens Boulevard West) and currently underway on the Culver F G, 8 Avenue A C E, and Crosstown G lines.

Plans are underway to award signal modernization projects on the Fulton A C, 6 Avenue B D F M, and 63 Street F lines by the end of 2024.

8 Av Line Signal Modernization project



Communication upgrades

We have been making advances in rehabilitating and upgrading communication assets across our subway system. Our 2020-2024 Capital Program included a 97% increase in funding for communication infrastructure over the previous capital program.

We are currently rolling out connection-oriented ethernet (COE) across the system. This will enable us to upgrade security and communications capabilities.

72 St B C

Our 20-year plan

We will embrace changes that improve service and reliability into the next century.

NYCT subway signal

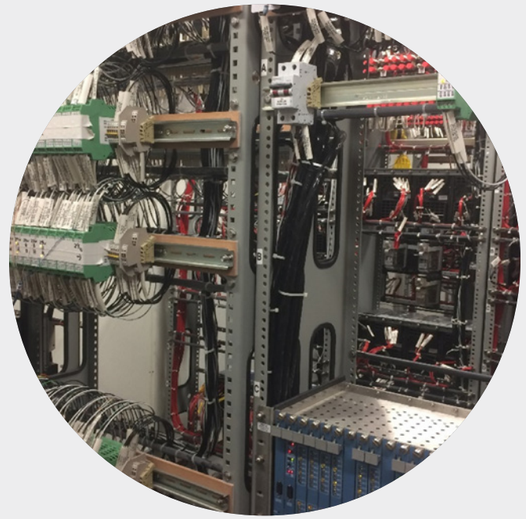
Highlights include:

Modernize signals

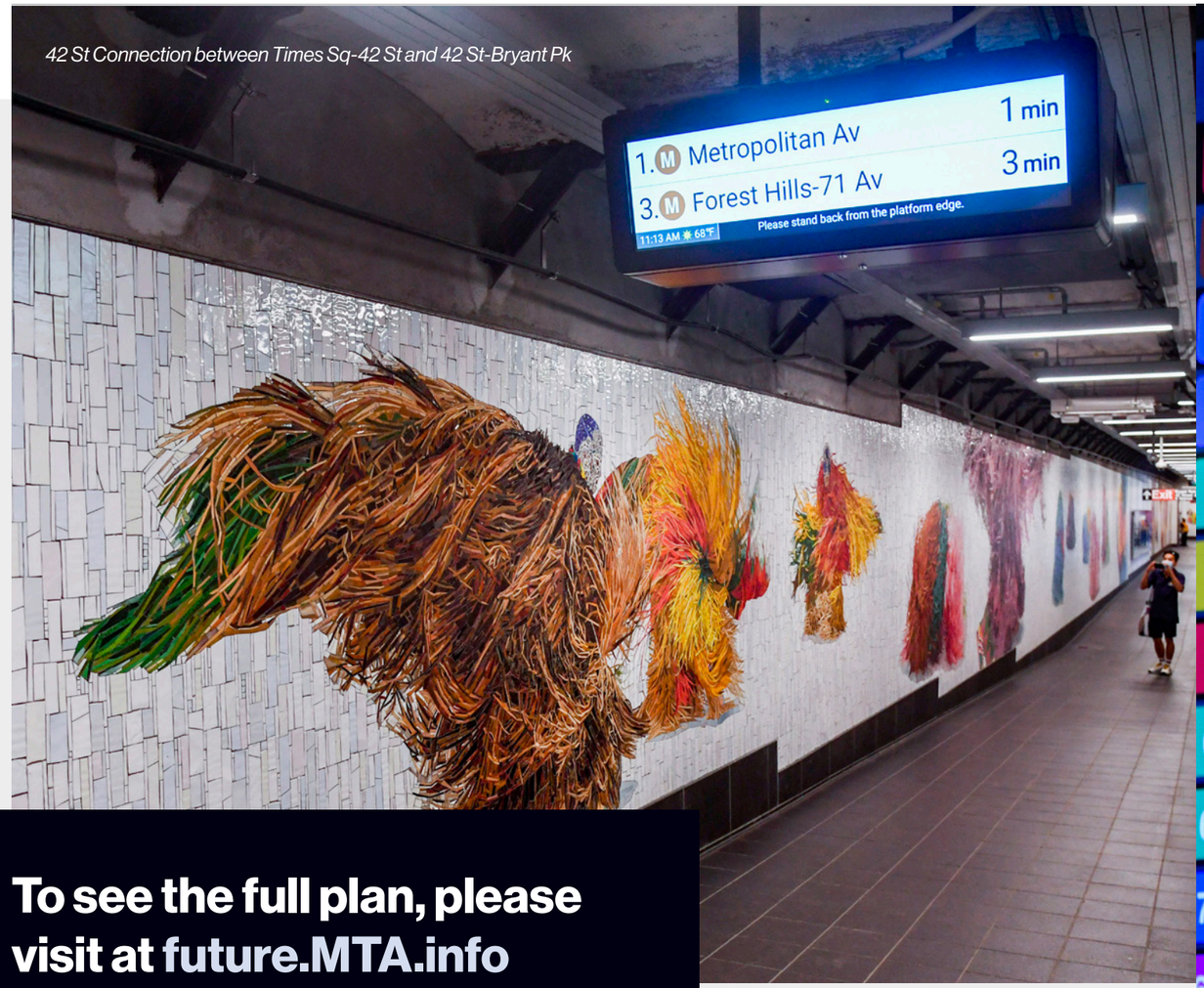
We must modernize our signaling system across the MTA system. Updating signals is one of the most important things we can do to improve service reliability, reduce delays, and allow us to increase train service in the future if needed. For the subway system alone, this means improvements to 315 miles of signals.

- We must expand modernized signaling from approximately 234 signal miles (already complete or underway) to 549 total signal miles, resulting in improved service for about 90% of riders.
- We must upgrade the entirety of Metro-North's Harlem and Hudson lines to operate with next generation signal systems. This means replacing over 150 route miles of outdated signal system assets, installing next generation train supervision systems, and building a modernized Operations Control Center.
- We must modernize approximately 50 miles of signaling and complete the installation of signal and communication systems to provide LIRR passengers with better and more timely information.

Signal maintainer at 4 Av



LIRR communications room



42 St Connection between Times Sq-42 St and 42 St-Bryant Pk

To see the full plan, please visit at future.MTA.info

Update customer communication technology

» We must upgrade our communication systems across our network so riders can plan their trips and their days with confidence, thanks to easy-to-read digital screens and audio announcements that are clear and easy to understand.

» We must modernize customer communication systems so that all stations have public address systems and customer information screens that can broadcast clear and accurate information to all riders.

Grand Central Madison

Public Address and Customer Information System Case Study

Broadway N W

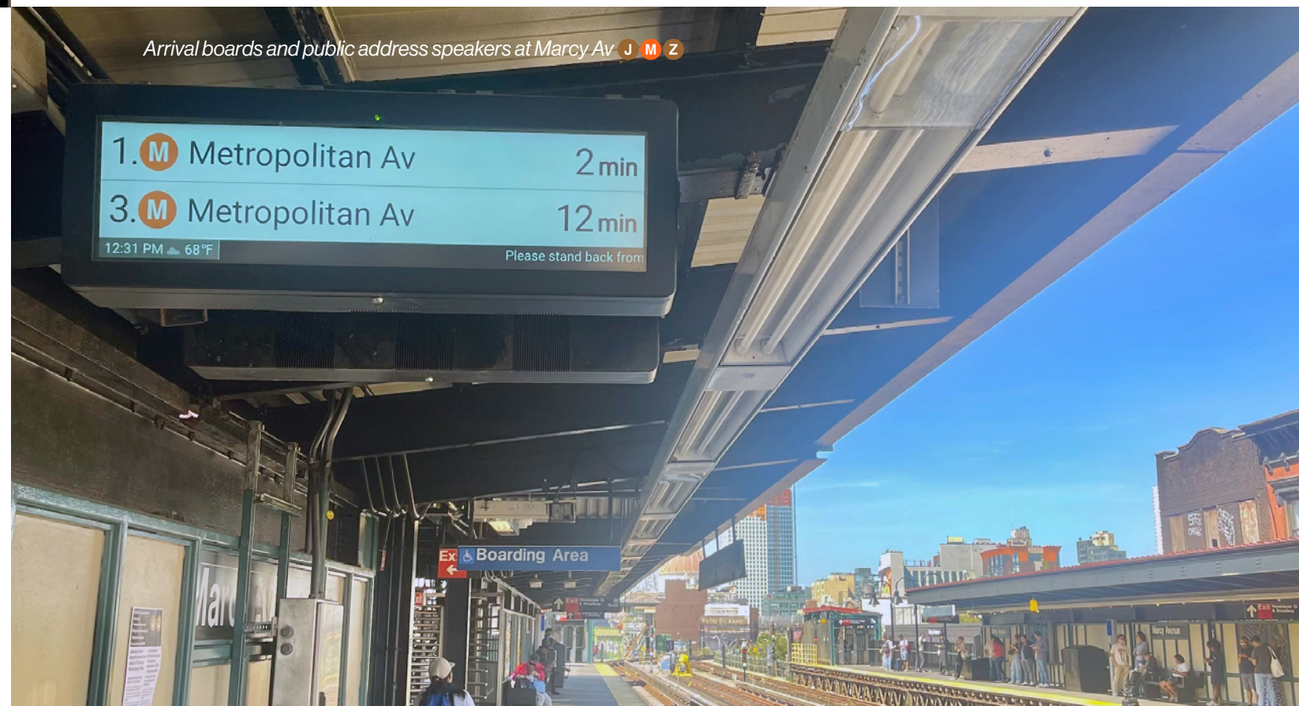
As you're riding the subway, you've likely encountered a variety of speakers, signs, and screens in our stations and on our platforms. These components are part of our Public Address and Customer Information System (we call this PA/CIS), and they help our employees share important information with passengers on service changes and critical emergency instructions. They also help us provide riders with real-time train arrival and departure times and help passengers navigate the subway system and make informed decisions about their travel.

When we installed the first public address systems in our stations in the early 20th century, they were rudimentary compared to today's standards. The early systems relied on basic amplification and loudspeakers, offering limited clarity and range in announcements. Without digital displays, passengers depended solely on audible announcements, which posed challenges for those with hearing impairments or in noisy stations. Technology has changed a lot since then and we've made a lot of updates over the years but we haven't been updating our stations consistently. In some stations, we still operate technology that became obsolete decades ago, while others have more modern PA/CIS setups with advanced audio equipment for clearer announcements and digital displays for real-time updates and station navigation aids.

All of this information comes from what we call the Rail Control Center (RCC), a single location which serves as the central command for all trains. The RCC oversees operations of our trains and handles routing and dispatching, train tracking, and manages disruptions or delays that may occur. In emergencies or unexpected issues, they make quick decisions to maintain safety and efficiency. In an ideal scenario, The RCC would be able to quickly and automatically send information on service changes and disruptions to passengers waiting in stations, but this is not the case at a lot of our stations.

Right now, we're effectively operating at least three different generations of PA/CIS technology in our stations. 76 subway stations still rely on communications infrastructure that has not been updated in 40 years. These stations do not have a direct connection to the RCC and customers who use these stations receive announcements from station agents or nearby announcers who receive their information second-hand through verbal contact with workers at the RCC. This game of telephone leads to poor and delayed information to our customers and worse, these announcements are not at all connected to any of the station countdown clocks or visual signage infrastructure, which can result in irrelevant or even conflicting information.

We're working to bring all of our stations up to the newest generation of PA/CIS so that riders at all stations can hear and see announcements directly from the RCC, ensuring all riders get the most up-to-date information from the source in real time.



Arrival boards and public address speakers at Marcy Av. J M Z

Equity

New York as a whole depends on the MTA, to access jobs and basic needs (85% of jobs are within walking distance from rail and subway) but this is especially true in historically marginalized communities, where high concentrations of low-income, minority, and transit dependent populations live, and auto ownership is low. In New York City, the average percentage of zero-vehicle households in Equity Areas is 65%, compared to 29% in non-Equity Areas.

This means that investments we make to rebuild the system, ensuring its reliability and longevity, are also equity investments. The converse is also true—if we fail to invest in rebuilding our system, the delays and disruptions will hit disadvantaged communities the hardest.

Metro-North Stamford Station

Service

Rebuilding the MTA's aging assets—from structures to shops to substations—is essential to ensuring a safe, reliable transit network for the New York region. A robust and efficient transit system is the key to connecting all communities—but particularly those who have been the most underserved—to employment, education, and healthcare.

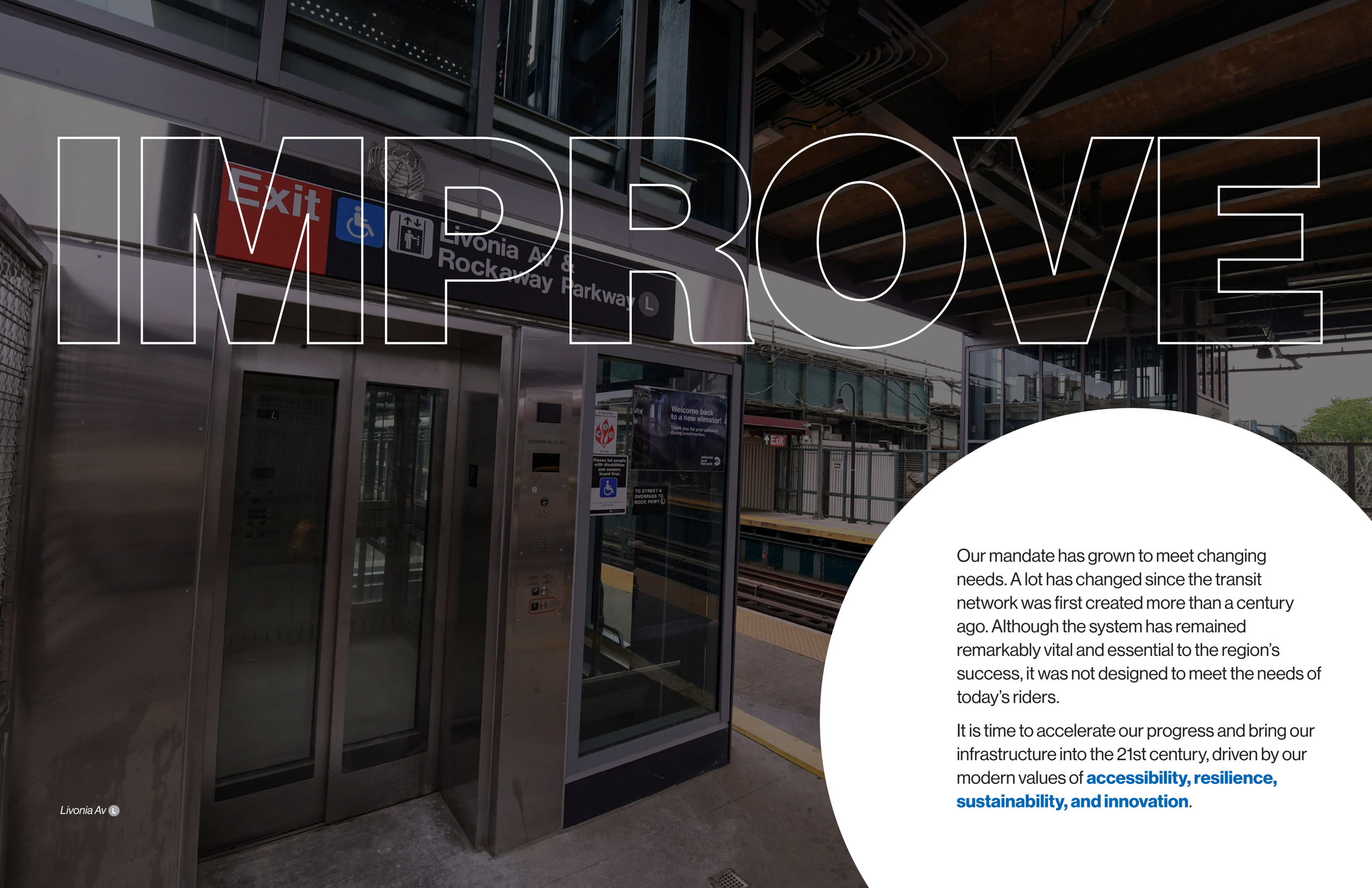
Affordability

Keeping our fares affordable is an important part of making the transit system as accessible to all as possible. When our system is in good physical condition, it means fewer operating dollars need to be spent to constantly fix broken parts. When we spend fewer operating dollars, it means there is less pressure on fares.

Reliability

We know how important it is to deliver for our riders that most depend on reliable service, and we take that seriously in our planning. This includes prioritizing investment in reliability—key among them modernizing our antiquated signals system—for subway lines that serve communities that are most transit reliant. For the 2020-2024 Capital Program, this means we advanced signaling upgrades to improve on-time performance and reduce delays on the A C Fulton Line and the G Crosstown Line.

IMPROVE



Livonia Av L

Our mandate has grown to meet changing needs. A lot has changed since the transit network was first created more than a century ago. Although the system has remained remarkably vital and essential to the region's success, it was not designed to meet the needs of today's riders.

It is time to accelerate our progress and bring our infrastructure into the 21st century, driven by our modern values of **accessibility, resilience, sustainability, and innovation**.

Accessibility

LIRR Floral Park Station

The original design of our century-old stations excluded too many people because it did not fully account for the diverse needs of our riders. We are now on course to change that and can make tremendous progress in the next 20 years if the MTA's capital plans are adequately funded.

In 2022, the MTA announced an agreement alongside accessibility advocates that reaffirms our commitment to systemwide subway accessibility and provides a clear path and timeline to get there. The subway accessibility plan will make at least 95% of our subway stations accessible by 2055.

We are also continuing to work toward improving accessibility on our commuter rail stations by building new elevators and ramps, and replacing old ones.

We are committed to making our subway and rail systems more accessible so that people of all abilities have better access to the opportunities our region has to offer.

Challenges

This critical improvement plan is not a small undertaking. The lack of accessibility in our system affects hundreds of stations—
and the lives of millions of people.

493 subway and SIR stations
142 are ADA-accessible today

For example, in order to make our subway stations accessible, we face three challenges:

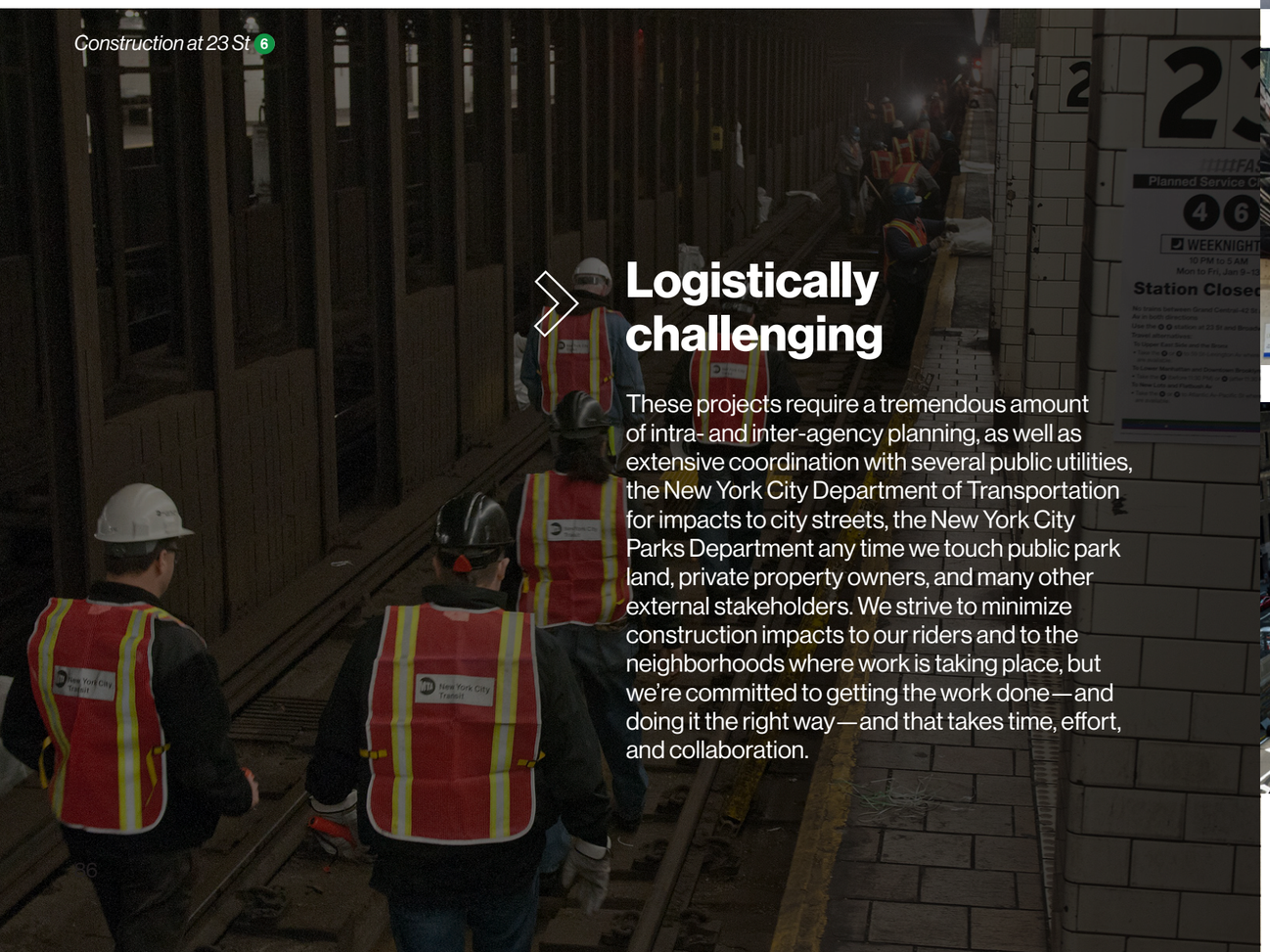
A vast undertaking

With 493 stations, New York City has more subway stations than any subway or metro system in the world. Our vast network is a boon to most riders, but the sheer size of the network means maintaining and upgrading our system to modern standards for accessibility is an enormous undertaking, especially coupled with historic system disinvestments that we are working to overcome. We've made a lot of progress, having made 142 stations throughout the five boroughs ADA-accessible (as of Sept., 2023), but that is only about a quarter of our 493 subway and SIR stations.

Construction at Livonia Av L

No cookie cutter solutions

Space for new elevator shafts and equipment, or for ADA-compliant ramps, is limited in the close quarters of subway stations and in the dense street environments where subways run. Typically, subway stations are surrounded on several sides by existing buildings and above or below busy streets. Throughout the past 100 years, a complex web of underground utility lines has grown around the subway system, and these utilities sometimes must be relocated. In addition, the station's structure has to be modified—cutting holes in concrete floors and metal beams to make room for the elevator shafts and machinery. For these reasons, each new accessibility project is a major undertaking that must be designed and constructed to a station's individual constraints.



Construction at 23 St 6

Logistically challenging

These projects require a tremendous amount of intra- and inter-agency planning, as well as extensive coordination with several public utilities, the New York City Department of Transportation for impacts to city streets, the New York City Parks Department any time we touch public park land, private property owners, and many other external stakeholders. We strive to minimize construction impacts to our riders and to the neighborhoods where work is taking place, but we're committed to getting the work done—and doing it the right way—and that takes time, effort, and collaboration.

What we've done

Elevator at 8 Av N

New York City Transit

We have already begun making historic progress in the current capital plan. When completed, this program of investments will deliver 67 new accessible subway stations, more than were completed in the last three capital programs combined. **This pace sets the tone for investments in future capital plans over the next 20 years.**

Since 2020, we've awarded ADA projects at 36 subway stations. Another 16 are forecast for award by the end of 2023, and another 29 are funded in the current capital program and are scheduled to be awarded in 2024 or soon after.

LIRR Murray Hill Station

Long Island Rail Road and Metro-North Railroad

Currently 84% of full-service LIRR and Metro-North stations are fully accessible, and we are improving accessibility at 11 more stations under the current capital program.

Hugh L. Carey Tunnel entrance

Bridges and Tunnels

MTA B&T has already made significant progress toward improving bicycle and pedestrian access on our bridges in the current and previous capital programs. Once the current program is completed, the lower level of the Henry Hudson Bridge will have an ADA-compatible shared use path, as will the Cross Bay and the Robert F. Kennedy Queens Suspension bridges. Other portions of the Robert F. Kennedy Bridge complex will have been upgraded to have ADA-compatible shared use paths as well, including a newly completed bicycle/pedestrian ramp connecting the Harlem River Lift Span to the future Manhattan Greenway.

How we select subway stations for accessibility upgrades

When determining which stations to include in each capital planning cycle, by statute we consider the following factors:

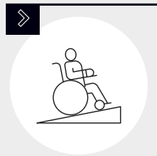
- **Coverage**: A critical strategy for increasing accessibility across the subway system is to reduce gaps in coverage—in other words, to reduce the number of stops between accessible stations. This way, customers in neighborhoods across the city are never too far from an accessible station.
- **Destinations**: Participants in our public meetings have given us input on local preferences and priority destinations in their communities, such as schools, parks, retail, cultural hubs, medical centers, and other community institutions served by different subway stations.
- **Demographics**: To ensure that accessibility investments reach communities with the greatest need, the MTA gathers data on the populations of seniors and people with disabilities, and the socioeconomic status of neighborhood residents surrounding each station.
- **Ridership**: Within the framework of increasing geographic equity and systemwide coverage, we consider which stations could serve the greatest number of customers. We also consider which neighborhoods are growing.
- **Transfers**: Making the subway system's major transfer points accessible helps customers travel more seamlessly throughout the region. This includes subway stations that are transfer points between subway lines, as well as stations that are major connection points to bus or commuter rail lines.
- **Constructability and cost**: The cost and time required to retrofit a station can vary dramatically based on site conditions. By considering project costs and complexity in our selection process, we can extend the reach of our accessibility investments and more quickly deliver benefits to our customers.

To see the full plan, please visit future.MTA.info.

Our 20-year plan

Over the next 20 years, we will continue our bold pace toward an accessible system. This means reaching 95% of subway stations being accessible by 2055, 95% of full-service commuter rail stations by 2045, and improving accessibility on our bridges.

Highlights include:



Accessible infrastructure

In addition to creating step-free access to trains, we will also make other accessibility improvements like upgrading tactile warning strips on platform edges, raising platforms so they are more level with train doors, and working to install fare payment gates that allow for easier access for customers with mobility devices, luggage, or strollers. Building off of existing and past pilots, we also plan to add accessibility features that improve customer wayfinding and the reliability of the accessible path of travel. Compliance with the ADA is a minimum standard, and we look to go above and beyond the ADA as we modernize the system in the next 20 years.

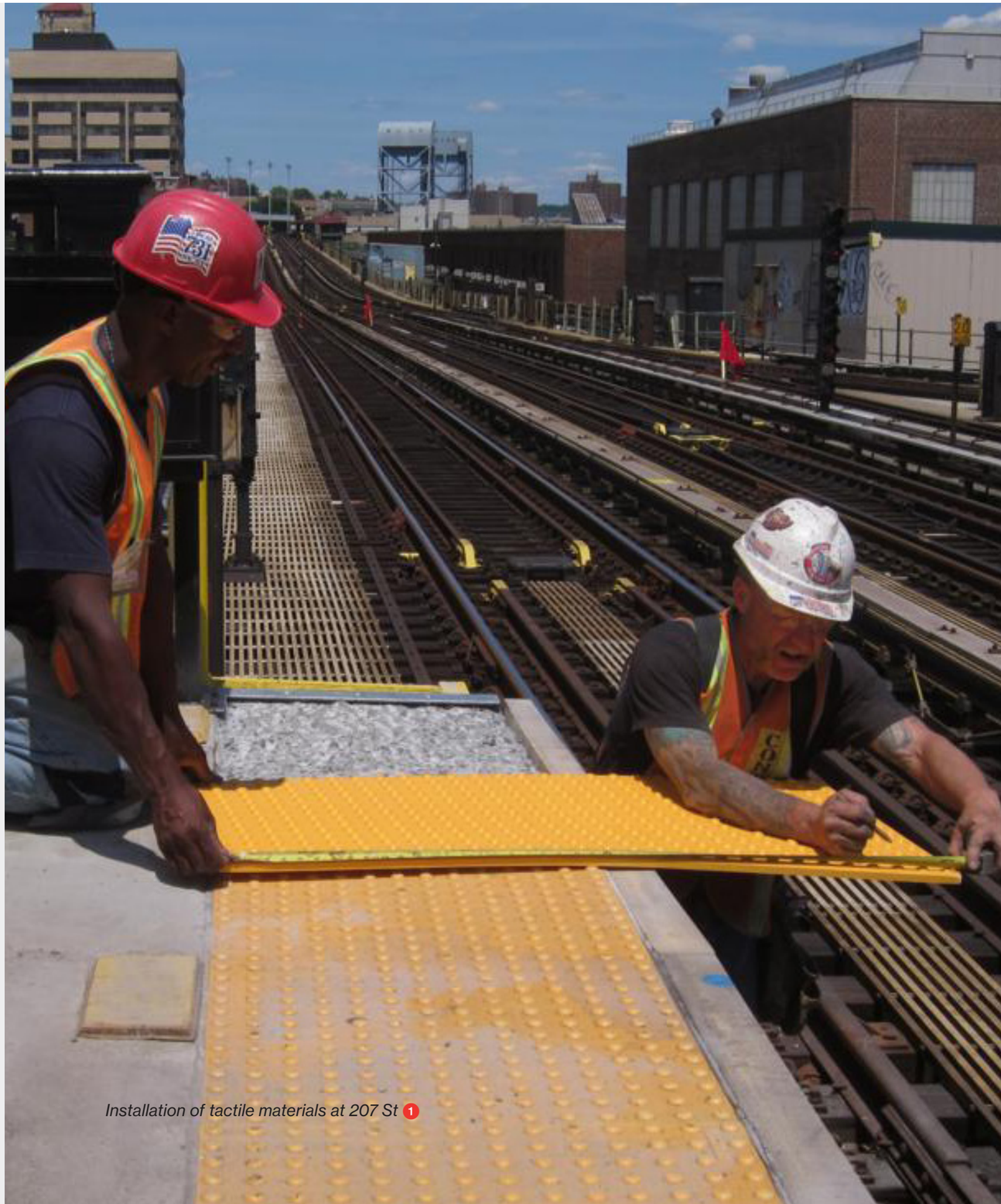
At Bridges and Tunnels, we will advance accessibility improvements like a shared use path on the RFK Bridge's Harlem River Lift Span, making the Manhattan to Randall's Island connection a fully ADA-compliant path from end to end.

Renew existing elevators and escalators

Even as we add new elevators, we must also continue addressing existing elevators that need replacement. The large expansion of the station accessibility program over the next 20 years will ultimately lead to a doubling of the lifecycle replacement needs by the 2040-2044 timeframe; for example, over 350 subway station elevators will be due for replacement over the next 20 years.

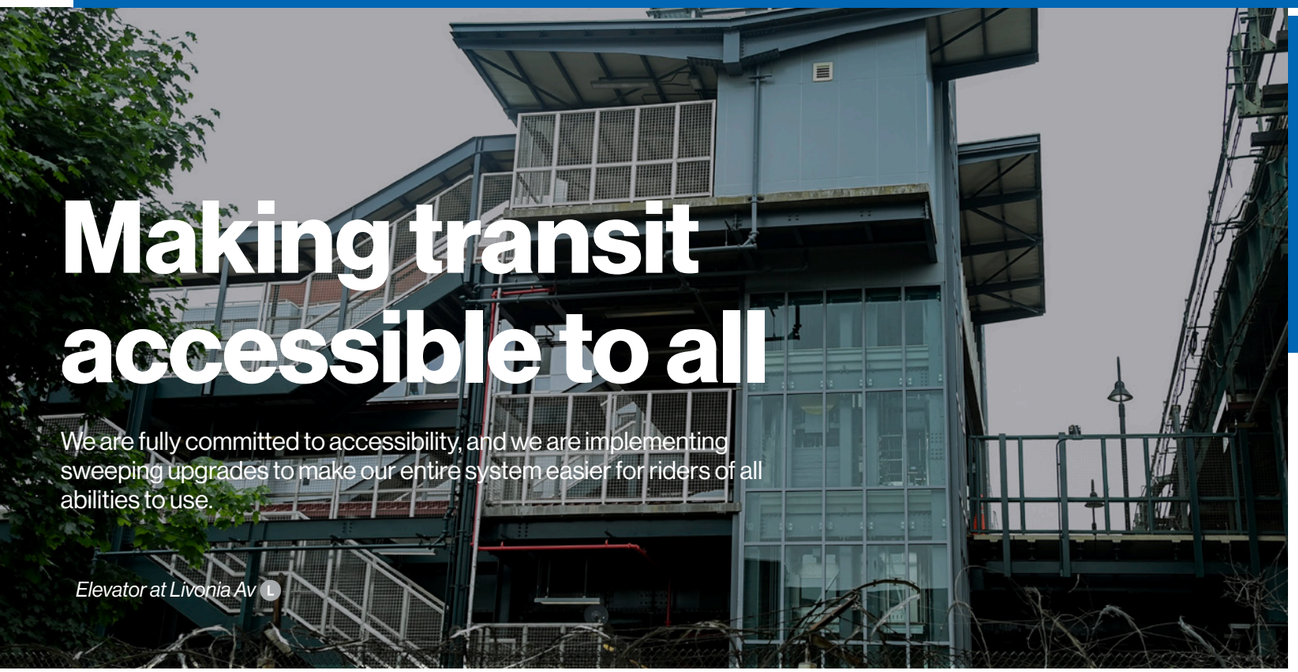
Efficient and cost-effective upgrades

Our plan bundles these upgrades with planned station repairs to make the process as efficient and cost-effective as possible. Additionally, we will continue collaborating with the private sector to make our network more accessible more quickly. In New York City, we're taking advantage of Zoning for Accessibility, which requires developers of sites adjacent to stations to work with us to provide an easement on their site if we can use it for future station entrances, such as elevators and stairs, and includes incentives for developers of eligible properties to build station accessibility improvements at no cost to the MTA in exchange for more density in their developments.



Installation of tactile materials at 207 St 1

ADA Case Study



Making transit accessible to all

We are fully committed to accessibility, and we are implementing sweeping upgrades to make our entire system easier for riders of all abilities to use.

Elevator at Livonia Av L

New elevators at Livonia Av L

We are working to bridge accessibility gaps

With the addition of ADA elevators at Brownsville, Brooklyn's Livonia Av L station in 2022, we filled a major gap in the accessibility of our subway network and for transit users in New York City. Previously, subway riders in Brownsville and surrounding neighborhoods had to travel more than a mile to reach an accessible station. That meant longer and more complicated trips for riders who use mobility devices, or travel with children in strollers, in a predominantly low-income area where commute times were already long.

We are undertaking a historic effort to redesign the system to meet the needs of all riders

Livonia Av is one of dozens of stations with accessibility projects either recently completed or in progress. This station fit several of the criteria we consider when determining which station accessibility projects to prioritize.

Demographics

To ensure that accessibility investments reach communities with the greatest need, the MTA gathers data on the populations of seniors and people with disabilities, and the socioeconomic status of neighborhood residents, surrounding each station. Livonia Av serves the neighborhoods of Brownsville and East New York, both of which have a high percentage of residents living in poverty, and both of which are majority minority communities.

Network coverage

A critical strategy for increasing accessibility across the subway system is to reduce gaps in coverage–in other words, to reduce the number of stops between accessible stations. This way, customers in neighborhoods across the city are never too far from an accessible station. Prior to this project, there was a gap of 10 stations between the Canarsie-Rockaway Pkwy station (the terminal of the L line in Brooklyn) and the next fully accessible station at Myrtle-Wyckoff Avs. After the completion of this project and others in the MTA's 2020-2024 Capital Program, those gaps will be greatly reduced with five more accessible stations on the L line in Brooklyn alone.

Transfers

Making the subway system's major transfer points accessible helps customers travel more seamlessly throughout the region. This includes subway stations that are transfer points between subway lines, as well as stations that are major connection points to bus or commuter rail lines. This project is the first step in upgrading the transfer between the Livonia Av L and Junius St 3 stations, with the Junius St Station to be made accessible and an in-system transfer between the stations to be built in the 2020-2024 Capital Program.

In addition to these criteria, we also consider ridership, community input on what destinations are most important, as well as constructability and cost.

ADA Case Study

ADA-accessible ramp at Avenue H Q

Each project is an extensive undertaking

Each project to bring accessibility to our stations is a major challenge, and no two projects are alike. We need to find space in dense environments—both on the streets and within the stations—to locate elevator shafts, reconstruct structural elements of stations, and relocate critical underground utilities. All while keeping the station open and trains running.

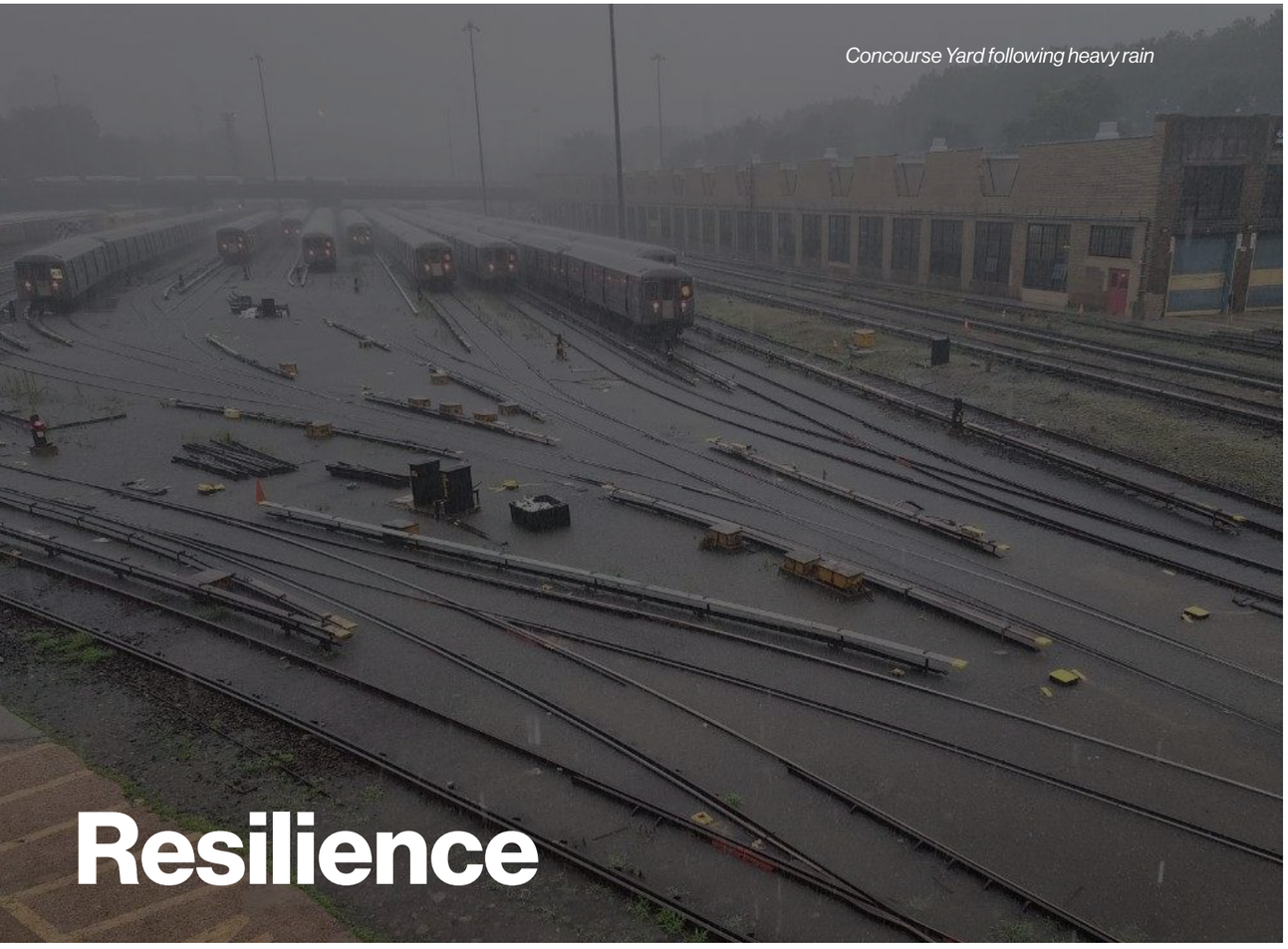
At Livonia Av, we made the station accessible by installing a steel elevator structure along with two new elevators, a walkway overpass, high-level platforms, and accessible fare gates. This project was both very challenging and unique to design and construct. Livonia Av is an elevated station that directly abuts a freight railroad right-of-way, so it was not possible to build an elevator that rises up from the street or mezzanine to the southbound platform, the usual configuration for elevated stations. Because of the layout of this station and its unique space constrictions, the elevator to the southbound platform actually comes from above the platform, which passengers access via a new elevated overpass that crosses over the tracks and connects to the northbound side of the station.

Wide-aisle gate at Atlantic Av-Barclays Ctr

Platform improvements at 167 St B D

There's more to come

Livonia Av is just one of the accessibility projects we've completed in recent years. Across the system, 142 subway and Staten Island Railway (SIR) stations are currently ADA-accessible in at least one direction. Since 2020, we've awarded ADA projects at 36 stations, another 16 are forecast for award by the end of 2023, and another 29 are funded in the current capital program and will be awarded in 2024 or soon after.



Concourse Yard following heavy rain

Resilience

Climate change is here—and we must prepare. Over the next two decades, climate change projections indicate that the New York region will experience more frequent and intense coastal storms, more than twice the current number of torrential rainfall events, and triple the current number of extreme heat days over 90 degrees. Meanwhile, sea levels will rise approximately 2.5 feet by the 2050s and almost five feet by the 2080s.

Our infrastructure was not built to withstand future climate conditions. We've made significant progress retrofitting, renovating, and rebuilding infrastructure in anticipation of future climate conditions, but climate change won't wait for us to finish. For our systems to keep running as lifelines through the coming climate-induced crises, we must move faster.

Challenges

Over the next 20 years and through the end of the century, climate change vulnerabilities will permeate every MTA system.

We will work to minimize the impacts of extreme weather events on the safety of our riders and workforce, on service reliability, and on infrastructure. The scale and urgency of the task will transcend capital, operational and emergency planning functions across the MTA.

Subways

Over 400 miles of subway tracks are below grade and potentially exposed to inland floods caused by torrential rainfall.

Torrential rain can flood tracks through vents, stairs, and other openings, causing damage to electrical equipment and service disruptions.

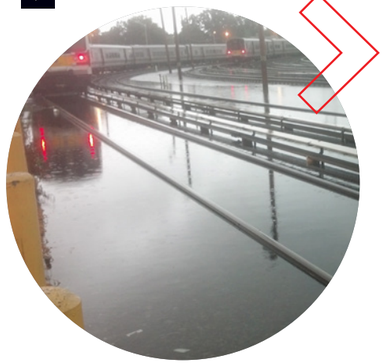
Above-ground tracks can expand during heat waves with sustained temperatures above 90 degrees, posing derailment risks and speed restrictions.

South Ferry Station after Superstorm Sandy

Metro-North Railroad

Around 50% of the Hudson Line is in the FEMA floodplain today. Flood exposure will grow over time as sea levels rise, surface runoff from adjacent properties increases, and as coastal storms become more frequent and intense. At the same time, inland floods caused by torrential rainfall at critical locations, such as Mott Haven Yard in the Bronx, are already disrupting East-of-Hudson services at least once a year.

Metro-North Hudson Line following heavy rain



Long Island Rail Road

Stations like East Rockaway, Oyster Bay, Island Park, Douglaston, and Oceanside are susceptible to flooding during torrential rainfall. These same stations may also experience regular tidal flooding shortly after the 2050s due to sea level rise.

Flooding at Babylon Yard

Buses

Depots like Castleton, Michael J. Quill, Yukon, and Grand Ave are vulnerable today to inland flooding caused by torrential rainfall. Inland flood risks will expand to more depots by the 2050s.

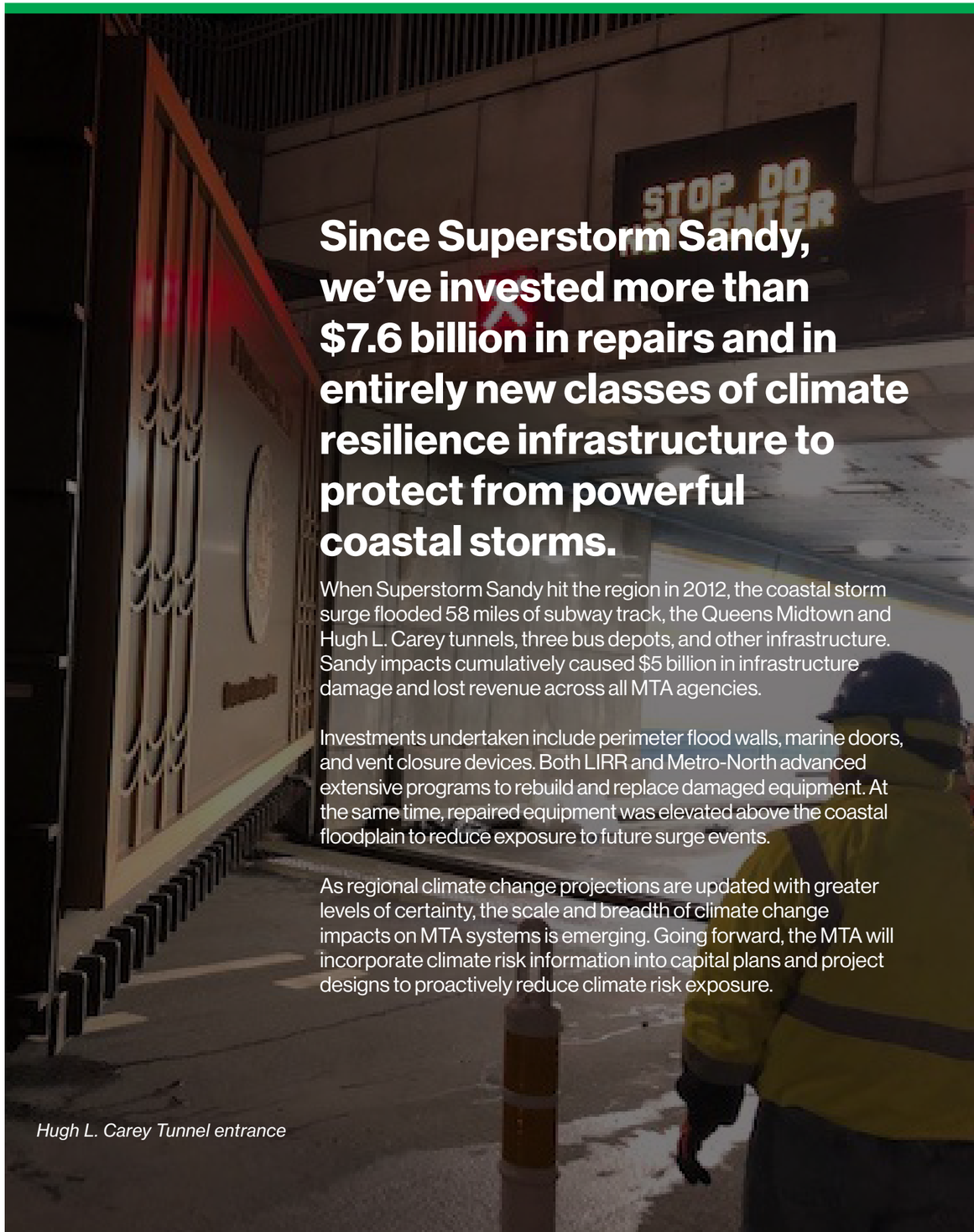
NYCT buses during Superstorm Sandy

Bridges and Tunnels

Bridges and tunnels are vulnerable to flooding. Stormwater drains, both on and off property, are no longer capable of handling the torrential rainfall events that are occurring on a regular basis, leading to flooding events that impact traffic flow. An example of this is the regular flooding of the Cross Island Parkway approach to the Throgs Neck Bridge.

Throgs Neck Bridge

What we've done



Since Superstorm Sandy, we've invested more than $7.6 billion in repairs and in entirely new classes of climate resilience infrastructure to protect from powerful coastal storms.

When Superstorm Sandy hit the region in 2012, the coastal storm surge flooded 58 miles of subway track, the Queens Midtown and Hugh L. Carey tunnels, three bus depots, and other infrastructure. Sandy impacts cumulatively caused $5 billion in infrastructure damage and lost revenue across all MTA agencies.

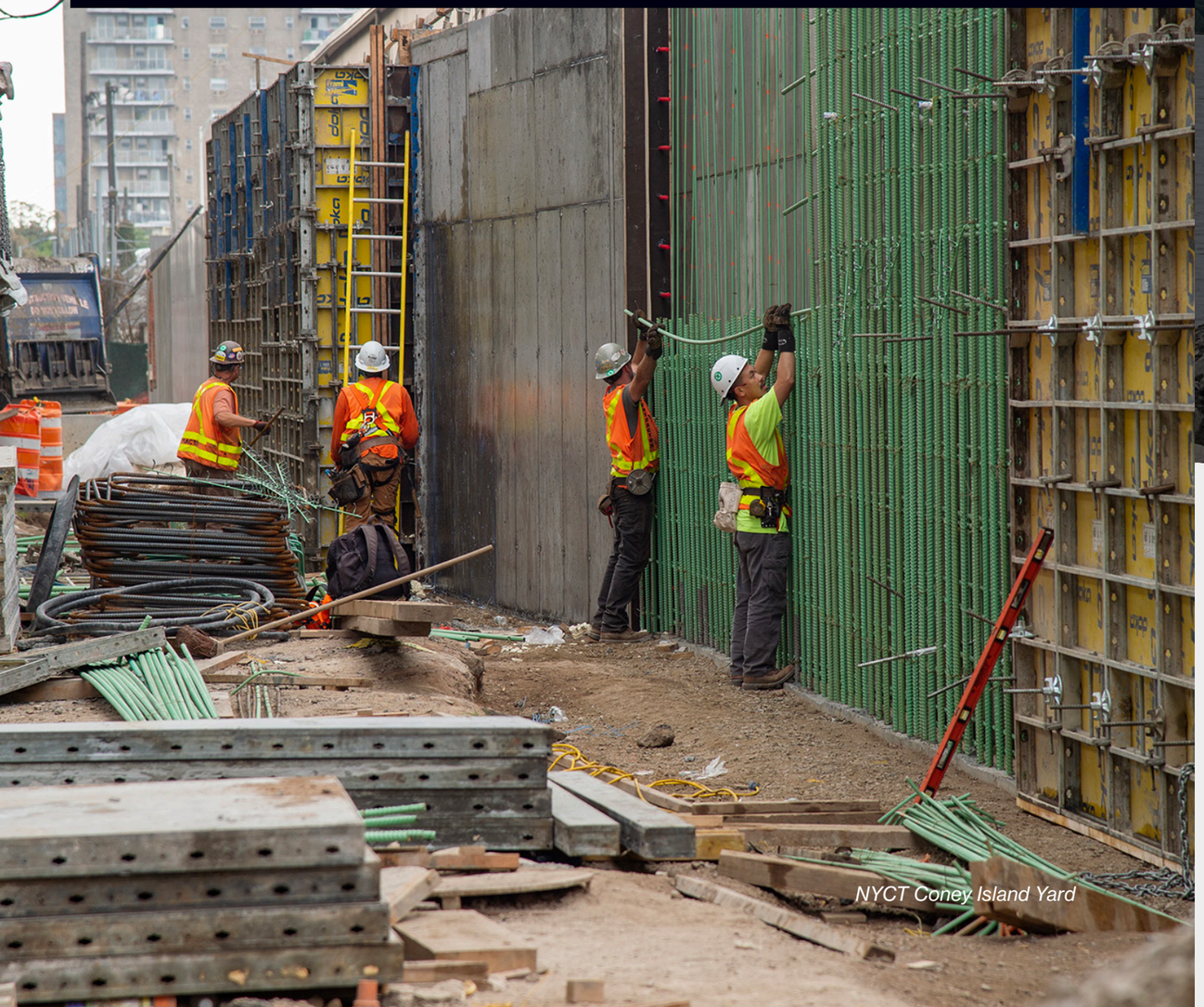
Investments undertaken include perimeter flood walls, marine doors, and vent closure devices. Both LIRR and Metro-North advanced extensive programs to rebuild and replace damaged equipment. At the same time, repaired equipment was elevated above the coastal floodplain to reduce exposure to future surge events.

As regional climate change projections are updated with greater levels of certainty, the scale and breadth of climate change impacts on MTA systems is emerging. Going forward, the MTA will incorporate climate risk information into capital plans and project designs to proactively reduce climate risk exposure.

Hugh L. Carey Tunnel entrance

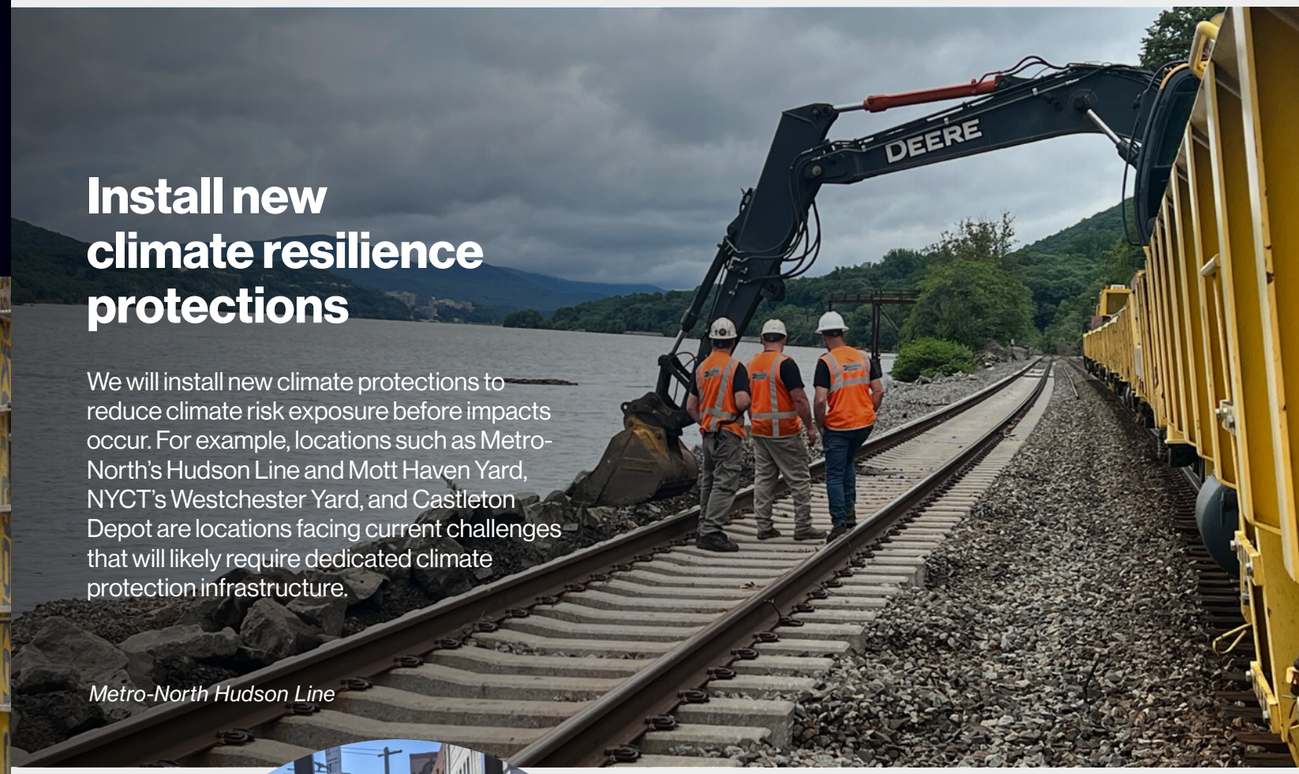
Our 20-year plan

Over the next 20 years, we will advance climate resilience strategies to reduce exposure before impacts occur.



NYCT Coney Island Yard

Highlights Include:



Install new climate resilience protections

We will install new climate protections to reduce climate risk exposure before impacts occur. For example, locations such as Metro-North's Hudson Line and Mott Haven Yard, NYCT's Westchester Yard, and Castleton Depot are locations facing current challenges that will likely require dedicated climate protection infrastructure.

Metro-North Hudson Line

Incorporate climate-resilient design strategies

We will incorporate climate-resilient design strategies into capital projects. This approach will inform the scope and performance requirements of capital projects and enable us to design risk mitigations that correspond to the asset's useful life.

Bay Ridge Av R

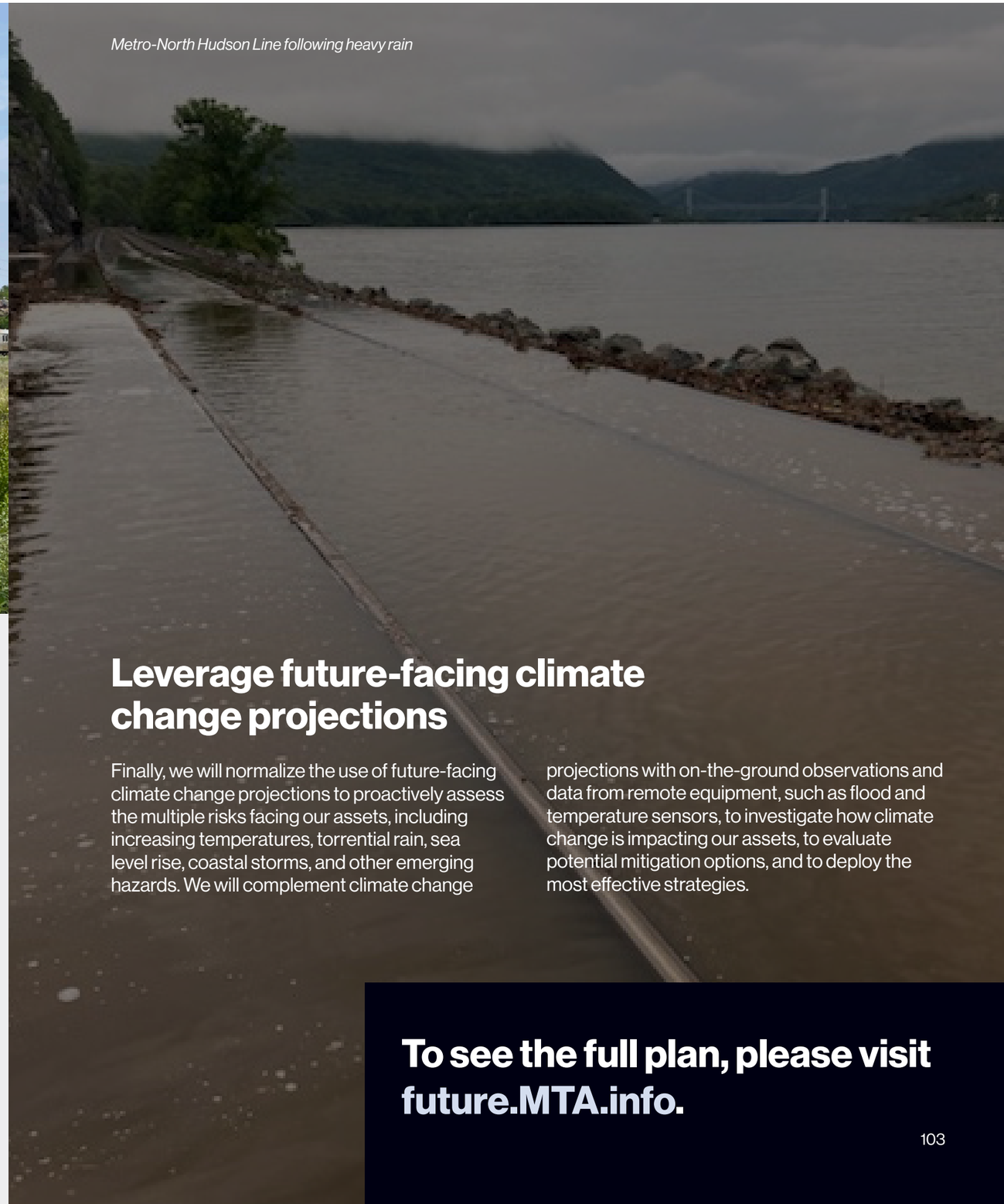
SIR railcars crossing over Mill Creek

Engage partners to address climate vulnerabilities

We will engage partners to address climate vulnerabilities in areas where successful mitigations extend beyond locations under our jurisdiction.

Staten Island Mill Creek Bluebelt

The Mill Creek Bluebelt, recently completed by the New York City Department of Environmental Protection (DEP), reduces tidal flooding risks on the SIR that runs over the waterway. DEP's Bluebelt system manages stormwater by restoring or expanding natural drainage systems to divert flood waters from surrounding areas. Flooding interrupts service south of Huguenot several times a year. Bluebelts not only benefit the passengers who rely on MTA service, they also bring ecological habitat and neighborhood stormwater management co-benefits.



Metro-North Hudson Line following heavy rain

Leverage future-facing climate change projections

Finally, we will normalize the use of future-facing climate change projections to proactively assess the multiple risks facing our assets, including increasing temperatures, torrential rain, sea level rise, coastal storms, and other emerging hazards. We will complement climate change projections with on-the-ground observations and data from remote equipment, such as flood and temperature sensors, to investigate how climate change is impacting our assets, to evaluate potential mitigation options, and to deploy the most effective strategies.

To see the full plan, please visit future.MTA.info.

Subway Resilience Case Study

Preparing the subway system for climate change

We will make the subway system resilient to the risks from climate change.

South Ferry Station after Superstorm Sandy

Extreme weather poses significant subway system risks

On the evening of Oct. 29, 2012, Superstorm Sandy made landfall and soon began battering New York City with winds of 80 miles per hour and a storm surge over 14 feet. The following morning, about 17% of New York City was flooded. Our subway system was not spared. South Ferry Station, which carries more than 30,000 riders on an average weekday, was flooded nearly up to the ceiling. When the waters receded, the station was completely destroyed. Similar stories were repeated across the city.

It was a painful lesson. Climate change is here, and we must be prepared.

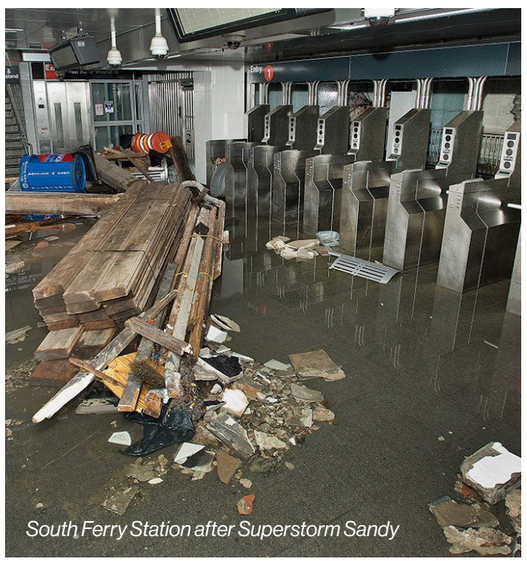
We've responded to protect the system

In the years since Sandy, the MTA has invested $7.6 billion in repairs and new coastal flood protections across all of our systems, including over $340 million in repairs and coastal storm surge protections alone at South Ferry. These coastal storm protections, like marine doors and vent closure devices, are designed to protect the subway system and reduce the risk of catastrophic flooding from storm surge, which will be exacerbated in the coming years by sea level rise.

More must be done

When our subway system was built in 1904, it was not designed to withstand the extreme weather events we experience today. As a result, we have widespread vulnerabilities to a growing range of climate threats, including torrential rainfall and prolonged heat. And these risks are only growing. By the 2050s, climate change projections indicate that New York City will experience more than twice the current number of torrential rainfall events and triple the current number of extreme heat days over 90 degrees.

That's why we must act now to protect against the threats we know are coming. We have developed plans to address the extreme weather events our city will face in the years ahead.



South Ferry Station after Superstorm Sandy

Working to withstand stormwater floods from torrential rainfall

A total of 418 of New York City's 665 miles of subway track are underground. When stormwater from average rainstorms (that produce less than 1.75 inches of rain per hour) enters the underground subway system through openings like street vents and stairways, it travels through a complex underground hydraulic system. This system of drains, drain lines, and pumps connects to the city's sewer system to drain the stormwater and keep the system dry.

However, during torrential rainfalls, stormwater can collect on the street and inundate our underground system, flood stations and track, and damage critical infrastructure like communication and electrical equipment. For example, in August 2007, when roughly 3.5 inches of rain fell in parts of Brooklyn and Queens over a two-hour period, it caused a shutdown of subway service.

More recently, in September 2021, Hurricane Ida brought a record 3.15 inches of rainfall in one hour and a total of 6-8 inches of rainfall in some locations across New York City, causing critical damage and service suspension across the system.

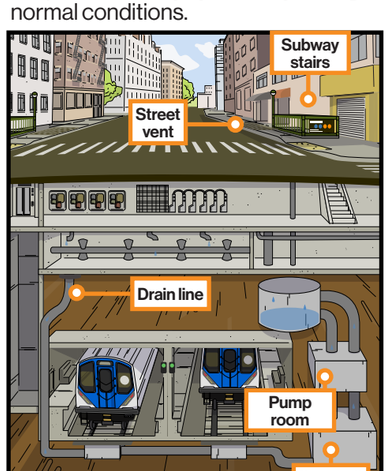
In response, we installed new mitigation measures, like raised stairway landings, raised vents, and flash flood mechanical closure devices, across stations that are vulnerable to torrential rainfall flooding.

Over the next 20 years, we will continue investing in these "passive" protection measures, which do not require special deployment but begin working as soon as rainfall begins. We will also invest in increasing pumping capacity and sump pit detention capacity across the system to reduce the amount of stormwater draining to the city's overwhelmed sewer system.

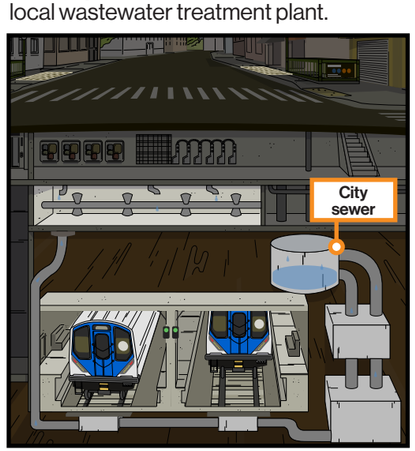
Subway Resilience Case Study

How stormwater from torrential rainfall can flood the subway

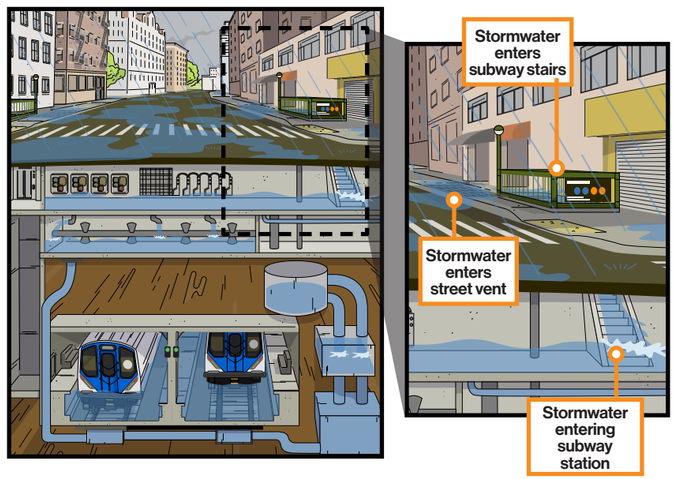
1. A complex system of underground drains, drain lines, pumps and sumps keeps the subway system dry during normal conditions.



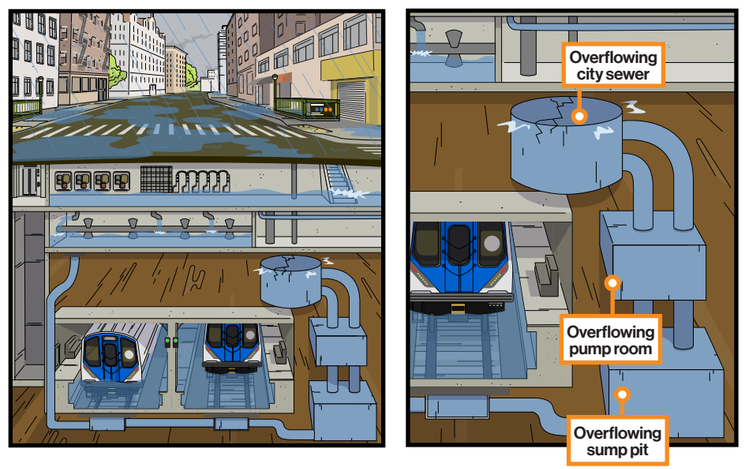
2. The subway drainage system connects to the New York City storm sewer system that takes the water to the local wastewater treatment plant.



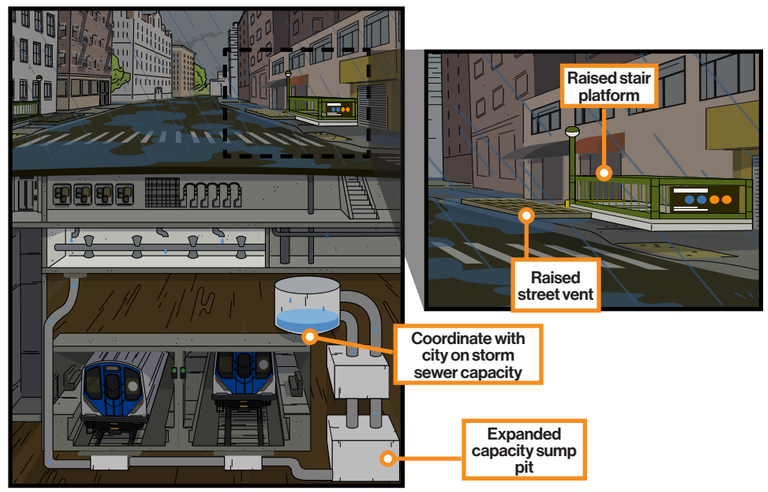
3. When sewers are overwhelmed, torrential rainfall events cause water to collect on the street. This stormwater can enter the subway from the street through openings like sidewalk vents and stairs.



4. In addition to entering the subway from the street, stormwater can also back up within the subway when sewers are overwhelmed.



5. Over the next 20 years, we will adapt the subway to more torrential rainfall events by installing more flood mitigation measures at the street-level and improving the subway drainage system where possible. We will also coordinate with the city to reduce the impacts of overwhelmed storm sewers.



Subway Resilience Case Study

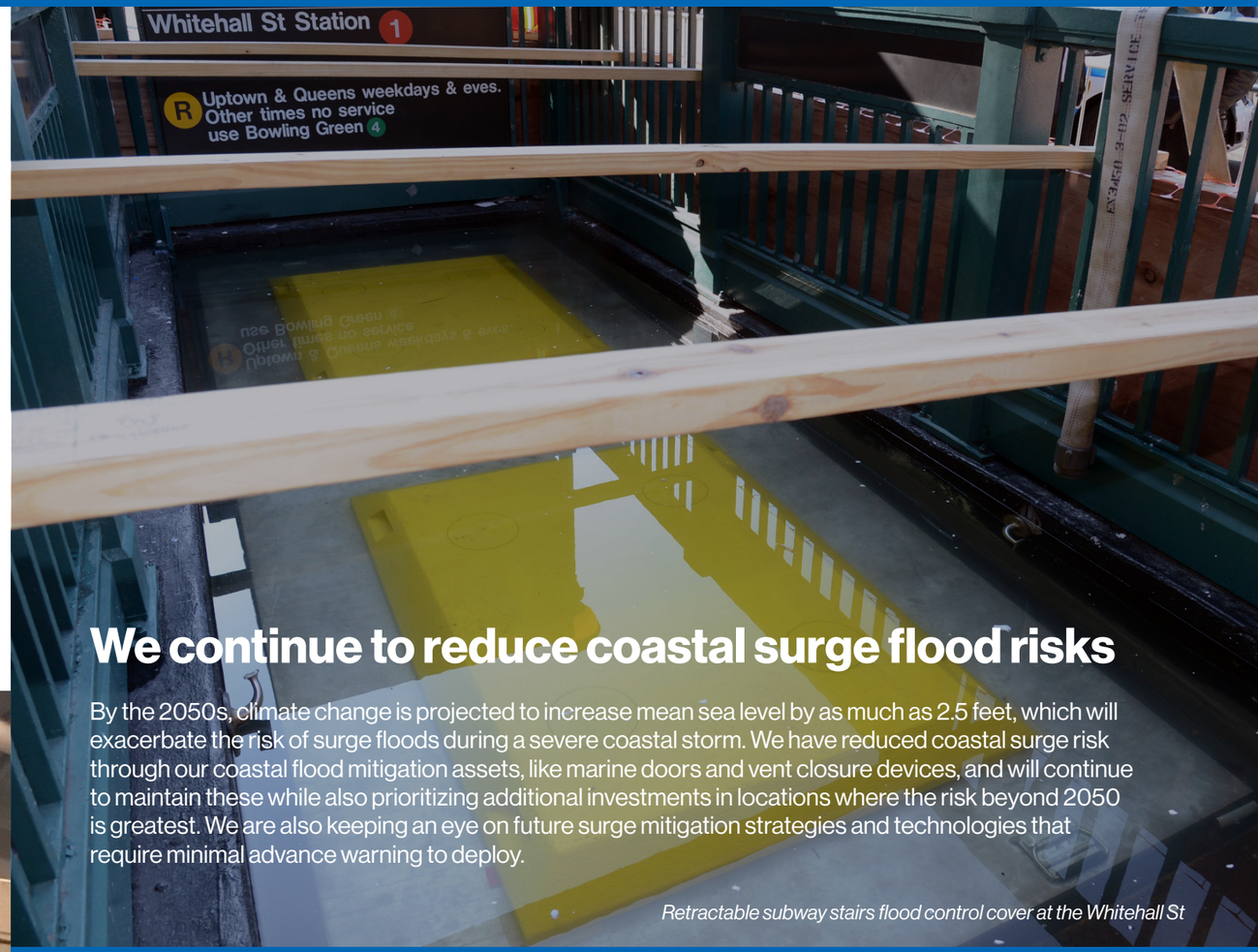
Preparing for more extreme and prolonged heat waves

Extreme and prolonged heat days above 90 degrees are projected to increase from 17 days per year to more than 65 days per year by the 2050s. This kind of heat can cause exposed, outdoor tracks to expand, buckle, and kink, posing a derailment risk. Subway signals and switches can also expand and malfunction, disrupting service; and communication and fare control equipment can degrade and impact closed-circuit television (CCTV) and voice and data communications with customers.

To account for the prolonged heat waves that will occur over the next 20 years, future design of projects will consider heat-related impacts. We will also collect real-time temperature data in stations and assets within stations, like communications and electrical rooms, to prioritize investments in cooling and air circulation technologies.

Technician collects temperature data on subway car while testing HVAC systems

Air conditioners cool communications equipment at 8 St-NYU R W



We continue to reduce coastal surge flood risks

By the 2050s, climate change is projected to increase mean sea level by as much as 2.5 feet, which will exacerbate the risk of surge floods during a severe coastal storm. We have reduced coastal surge risk through our coastal flood mitigation assets, like marine doors and vent closure devices, and will continue to maintain these while also prioritizing additional investments in locations where the risk beyond 2050 is greatest. We are also keeping an eye on future surge mitigation strategies and technologies that require minimal advance warning to deploy.

Retractable subway stairs flood control cover at the Whitehall St

We must rise to the climate change challenge

With the investments of the past 15 years, the New York City subway system is undoubtedly more resilient to climate risks than it was before. But climate change will continue to expose the system to new and growing risks. That's why we are taking a proactive approach to anticipate and prepare for future threats by continuously assessing climate risk and making the capital investments needed to protect the system from extreme weather for the next generation.

Hudson Line Resilience Case Study

Confronting sea level rise along Metro-North's Hudson Line

Metro-North Hudson Line along the Hudson River

We will invest in long-term climate resilience measures to continue safe and reliable regional service for millions of riders annually.

Climate change poses an existential threat to the Hudson Line

Metro-North's Hudson Line is renowned for its scenic views of the Hudson River. However, this proximity to the water also means that it is increasingly threatened by flooding. Over 50% of the approximately 74-mile-long line is vulnerable to coastal flooding from storms today. This number will grow as sea levels rise and coastal storms become more frequent and intense due to climate change.

For 10 million annual Hudson Line riders, that means more potential service delays as storms and chronic flooding get worse in the coming decades. It will also impact riders on Amtrak and freight deliveries carried by CSX, as both services rely on portions of the Hudson Line.

Recent resilience investments have reduced coastal flood risk

During Superstorm Sandy in 2012, over half of the Hudson Line flooded, resulting in significant damage to power, communications, signal systems, and other assets. After Sandy, we made significant investments in resilience measures along the 30-mile electrified portion of the line from the Bronx to Croton-Harmon. These investments enable critical power, communications, and signals assets to withstand the impacts of coastal storm surges and reduce the duration of potential service interruptions during and immediately after such events. But our work is not done. As the climate changes, we must also grapple with the growing climate hazards that threaten the Hudson Line tracks and right-of-way.

Sea level rise is leading to growing and changing flood risks

While the MTA's post-Sandy investments help mitigate coastal flood risk, flood events related to non-coastal surges are increasing. Sea level rise will lead to higher tides and chronic sunny day flooding along the Hudson Line right-of-way.

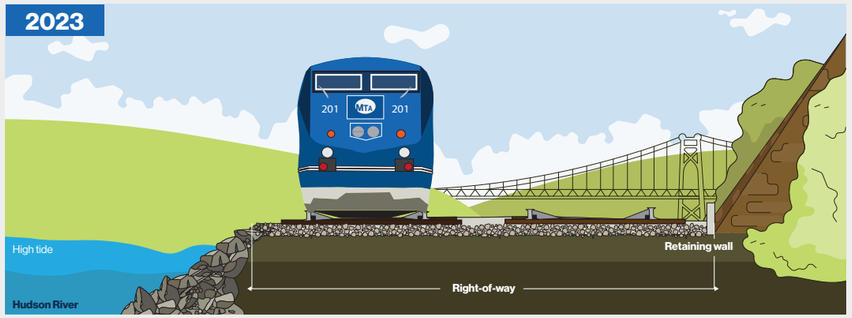
Sea level rise also accelerates shoreline erosion and enables smaller, routine storms to result in more extensive flooding. In addition, these higher tides can reduce the functionality of existing gravity-dependent drainage systems, further exacerbating flooding.

The threats posed by sea level rise, particularly combined with the increased torrential rainfall we are already experiencing, mean that we must proactively act to ensure continuous service over the long term.

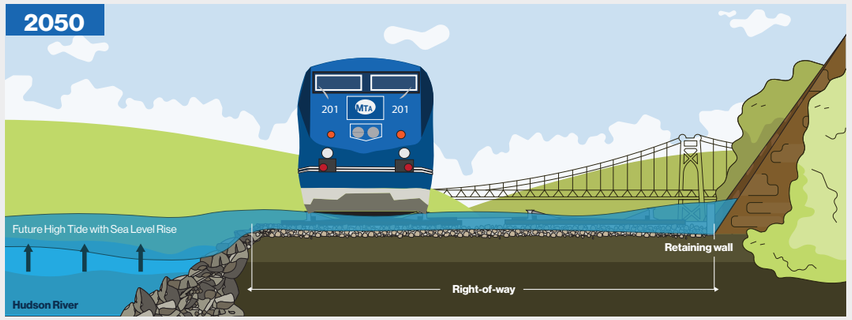
Post-Sandy Hudson Line resilience mitigations include elevated equipment platforms

Hudson Line Resilience Case Study

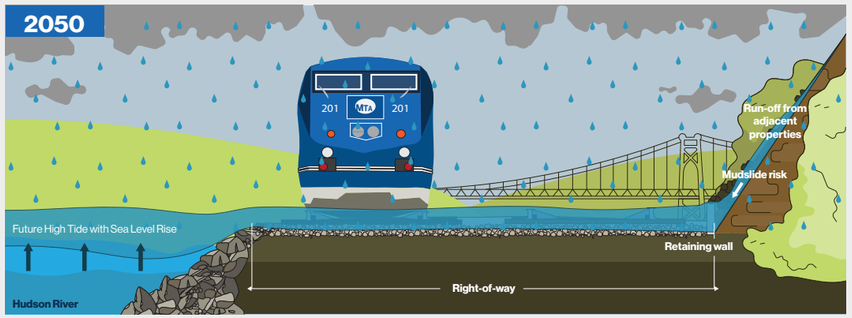
Sea level rise on Metro-North's Hudson Line



Current sunny day during high tide
The Hudson Line runs directly adjacent to the Hudson River. Much of the right-of-way is between the Hudson River and the foot of a steep embankment on the other. During high tide, portions of the right-of-way are just a few feet above the river.



Future sunny day during high tide
The Hudson River is a tidal estuary that experiences daily tidal shifts. Rising sea levels will lead to higher tides that cause flooding along the right-of-way. The New York City Panel on Climate Change estimates that sea levels could rise 2.5 feet by the 2050s and by 4.8 feet by the 2080s. Without action, entire low-lying segments of the Hudson Line will be subject to regular tidal flooding. Tidal floods will be salt water on this portion of the river, causing corrosive damage.



Future torrential rainfall during high tide
During torrential rainfall events, runoff flows down the embankments and into the Hudson Line right-of-way, gathering speed and carrying debris flows toward the river. With sea level rise, the rising tide of the Hudson River will meet runoff from the steep slopes within the Hudson Line right-of-way. The resulting floods can cause track washouts, erosion of shoreline and ballast, debris accumulation and other types of equipment damage that result in service impacts and repair expenses.

Responding to a changing climate requires significant planning and investment

A challenge of this magnitude requires a combination of near, medium, and long-term solutions. The portions of the Hudson Line right-of-way that will be exposed to imminent tidal flooding will be prioritized for capital improvements over the next 20 years.

As part of that plan, key near-term actions include the rehabilitation of shoreline structures, addressing erosion hot spots, stabilizing upland slopes, and upgrading undersized and underperforming drainage, where feasible.

We will also pursue a long-term resilience strategy that will include floodproofing and raising assets to safer levels to ensure that this line can continue to provide service throughout this century and beyond.

Washout of Hudson Line north of the Croton-Harmon due to severe weather, July 9, 2023

Sustainability

MTA transit is a climate solution. The typical subway commute is 10 times greener than the same commute by car. In 2019, MTA riders in aggregate avoided more than 20 million metric tons of greenhouse gas emissions, helping to earn New York one of the lowest statewide per capita greenhouse gas emission rates in the country.

Greenhouse gas emissions from the transportation sector are the largest source of national emissions and are on the rise. Retaining and growing transit ridership is the best way to fight transportation-related greenhouse gas emissions. The MTA stands ready to deliver on this critical mission as a partner in the climate fight.

But fighting climate change requires an all-hands-on-deck approach. Therefore, in addition to supporting the region with very low emissions transit services, we will cut our own operational emissions by at least 85% by 2040, from a 2015 baseline of 2 million metric tons. The result will be a reduction of at least 1.75 million metric tons of emissions per year by 2040.

Challenges

We must achieve our own operational emissions reduction goal **without compromising the safety, affordability, and reliability of our transit services**. There are three main challenges in realizing this goal:

Rising electricity demands

The MTA consumes a lot of electricity, mostly for traction power to move subways and commuter trains. Our electricity demand will increase as we expand service and transition existing fossil-fueled fleets and building systems to electric, elevating the importance of carbon-free energy sources.

LIRR substation

Emerging technologies

As we transition fleets we are encountering challenges associated with emerging technologies, including supply-chain constraints for zero-emissions buses and limited commercially viable options for low-emissions locomotives. In parallel, transitions to battery electric vehicles require significant investments in charging infrastructure and supporting building systems.

Complex building system updates

Most of our facilities, including stations, depots, and shops, rely on complex building systems powered by fossil fuels, including complex systems like HVAC (heating, ventilation, and air conditioning). Updating these systems is challenging due to the typical age, size, and function of our facilities.

Incorporating new renewable energy infrastructure in our facilities will require updates to building systems, particularly electrical utilities.

Energy-efficient HVAC equipment at Grand Central Terminal

What we've done

Zero-emissions buses

The pathway to 85% operational emissions reduction builds on multiple programs already in motion. Most significantly, we have initiated a transition of the entire bus fleet to zero emissions by 2040. Fifteen electric buses are already operational and an additional 60 electric buses are scheduled to start delivery this year.

In addition to initiating the transition of fleets, we have implemented a tremendous portfolio of energy efficiency projects in multiple facilities over the past several years. Examples include lighting upgrades, replacement of inefficient HVAC systems, and installation of automatic rolldown doors that keep heat in the building when buses or trains are not passing through.

These projects have reduced our total energy consumption and cut annual greenhouse gas emissions by 100,000 tons per year.

Our 20-year plan

Over the next 20 years, we will deepen our stakes in the regional climate fight.

Electric bus at Michael J. Quill Depot

Highlights Include:

Attract new riders by supporting sustainable transportation and transit-oriented development

We look forward to partnerships with local and county governments that bolster transit ridership by supporting new construction around transit stops, particularly new affordable housing opportunities, and improving adjacent properties and roadways for sustainable transportation, including exceptional bus service and dedicated bicycle, pedestrian, and micro-mobility infrastructure.

Metro-North Harrison Station

Cut agencywide operational greenhouse gas emissions at least 85% by 2040

We will achieve this goal by maintaining a focus on three strategies:

Transition fleets

Zero-emissions buses and accompanying charging infrastructure will be key components of our future capital programs and **our commitment to cut operational greenhouse gas emissions by 85% by 2040.** We are also transitioning other MTA fleets from fossil fuels:

Multiple types of fleets

Electric bus at Jamaica Depot

Buses
The purchase of zero-emissions buses and setting up charging infrastructure will be key components of our future capital programs, and they are crucial to our commitment to cut greenhouse gas emissions by 85% by 2040.

Metro-North locomotive

Locomotives
Locomotives move trains when there is no electric power available. They are the toughest type of vehicle to decarbonize given few commercially viable alternatives.

We will achieve significant emissions reductions as we replace existing locomotives with new dual-mode technologies. Going forward, we'll continue to survey the market for new technologies, with the ultimate goal of deploying low or zero emissions alternatives.

NYCT non-revenue vehicle

Non-revenue vehicles
Non-revenue fleet vehicles support our services and are not used to move passengers. Planning is underway to transition fossil-fueled non-revenue vehicle fleets to zero-emissions alternatives. Like buses, this transition will be accompanied by the installation of charging infrastructure at select facilities.

Update facilities

We will update fossil-fueled building systems to low- or zero-emissions alternatives and install renewable energy infrastructure, including solar panels, where feasible. These actions will advance our operational emissions reductions, unlock energy cost savings, and reduce demands on the electrical grid.

MTA building systems

We maintain over 16 million square feet in facilities such as train shops, bus depots, stations, and administrative buildings. Over the next 20 years, we will update these facilities as a part of the state-of-good-repair capital investment process.

As we replace aging building assets, we will prioritize sustainability as a guiding principle. By installing more efficient HVAC units, doors, and lighting systems, along with roofs that harvest solar power, we can save energy, decrease operational costs, and reduce emissions.

Improve energy efficiency

We will employ strategies, in particular emerging technologies, to reduce energy use. Since most of our electricity use is for traction power, we will investigate ways to capture and re-deploy regenerative braking energy from trains, which could allow us to utilize the stored energy during peak demand on the electrical grid.

Emerging technologies saving energy

We recently piloted wireless controls and sensors to reduce natural gas and oil consumption for HVAC systems and boilers in several facilities across the system.

The pilot project demonstrated fuel reductions of 33% to 66%, indicating potential to significantly reduce greenhouse gas emissions and save on energy costs.

To see the full plan, please visit future.MTA.info.

Zero-Emissions Fleet Transition Case Study

Zero-emissions bus charging

Transitioning to a zero-emissions bus fleet

In 2018, the MTA announced a commitment to transition the entire bus fleet to zero-emissions by 2040. This ambitious initiative is a core component of the MTA's goal to reduce agency-wide greenhouse gas emissions 85% by 2040. When completed, the transition will eliminate more than 500,000 metric tons of emissions annually.

Fossil-fueled vehicles have supported MTA bus operations since the mid-20th century. Until recently, MTA capital investments, operations, and workforce skills were oriented around fossil-fuel-based technologies. Converting to alternative technologies requires unprecedented investments in new types of vehicles, in workforce training, and, most consequentially, in new electric vehicle charging equipment to replace fossil fuel infrastructure.

The MTA's bus fleet transition is complicated by the fact that it is orders-of-magnitude larger than any other transit agency across the country. The transition will entail major challenges, including funding constraints, limited availability of suitable products, and uncertainties associated with rapidly emerging new technologies.

Committed to sustainability

MTA is ready to rise to the challenge and is committed to slashing the emissions of its bus fleets for the health of our customers, our workforce, and our planet. This commitment is bolstered by MTA's yearslong leadership in the use of low emissions fuels and technologies for its fleets, including renewable natural gas.

New bus fleet. New bus depots. A workforce with expanded skills.

The Zero-Emissions Bus Transition Plan will be guided by criteria such as equity and environmental justice, distribution across boroughs, construction feasibility, schedule feasibility, depot modifications and power supply availability. In consideration of these criteria, the transformation will be implemented across three areas:

Fleets: The MTA is transitioning its fleet of almost 6,000 buses to zero-emissions buses in four stages, closely aligned with the capital planning process.

- **Stage 1** (2015-2019 & 2020-2024) deploys 560 battery-electric buses to test infrastructure and operational feasibility.
- **Stage 2** (2025-2029) deploys over 100 buses at multiple depots while converting Jamaica Depot to 100% zero-emissions. All new bus orders become zero-emissions after 2029.
- **Stage 3** (2030-2034) converts about a third of the fleet to zero-emissions with a mixture of propulsion types that include battery-electric and some hydrogen fuel cell buses.
- **Stage 4** (2035-2039) will round out the transition to 100% zero-emissions bus service and retire all remaining non-zero-emissions buses.

Depots: The MTA will focus on in-depot charging, using high-capacity chargers with multiple dispensers and dedicated positions for each bus. This transition will require approximately 262 MW of new power supply across 28 bus depots. We are also exploring options like on-site battery storage and solar generation to reduce grid power demands. Many depots will need significant upgrades to accommodate zero-emissions buses, and some may even require expansion or acquisition of new facilities.

Workforce: Over the course of the transition, the MTA will develop workforce skills in four areas: safety, bus maintenance, facilities maintenance, and operations. Safety will require baseline awareness for all staff and more extensive training for those working with high voltage systems. Bus maintenance staff will need new skills for battery and electric propulsion systems. Facilities maintenance will involve troubleshooting and fixing charging equipment. Operations will require adapting to charging requirements and range limitations. The MTA is developing training programs and leveraging existing experience to prepare its workforce for these changes.

OMNY readers

Innovation and technology

We must continue to innovate to create a world-class 21st century transit system.

Innovations in technology and infrastructure are essential to enhance the efficiency, safety, and reliability of our vast network. That means constantly working to upgrade our system, experiment with new tools and processes, and incorporate the most promising solutions to improve service and rider experience.

Innovation is more than following trends. Rather, it means investing in foundational infrastructure that can be adaptable to increasingly advanced technology. Whether it's communications or artificial intelligence, when new technologies mature from the "next big thing" to "proven and scalable," we will have the backbone in place to take advantage of those developments.

Challenges

Aging technology

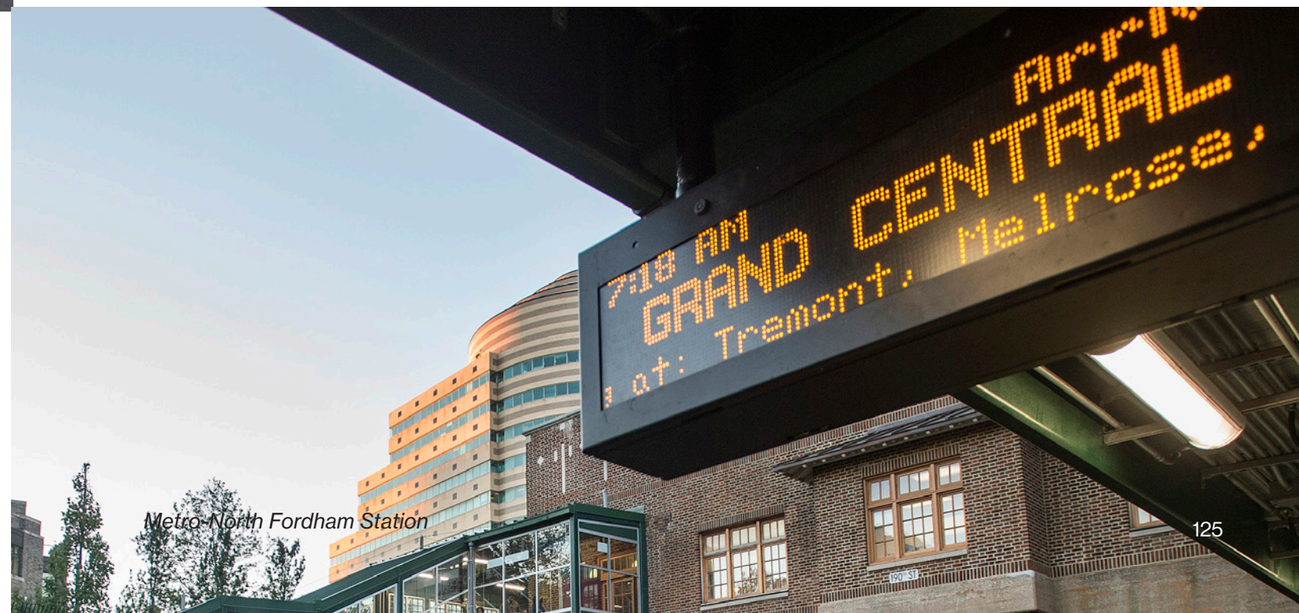
Much of the MTA's critical infrastructure was built over a hundred years ago, with technology modern for its time but antiquated today. This means that our systems are not as efficient or effective as they could be to deliver world-class service.

Difficulty to scale

Given our intricate and vast system, we must take a strategic approach when implementing new technologies at scale. While technological innovations have the potential to greatly enhance experiences when successful, their failure can be costly. Preparing our complex and interconnected system for change necessitates meticulous planning and testing, even for the most promising tools and technologies.

Unpredictable change

Predicting the exact trajectory of technological advancements is challenging due to the rapid and often unpredictable nature and pace of innovation.



Metro-North Fordham Station

What we've done

In recent years, the MTA has embraced innovative technologies and approaches to improve the customer experience.

OMNY

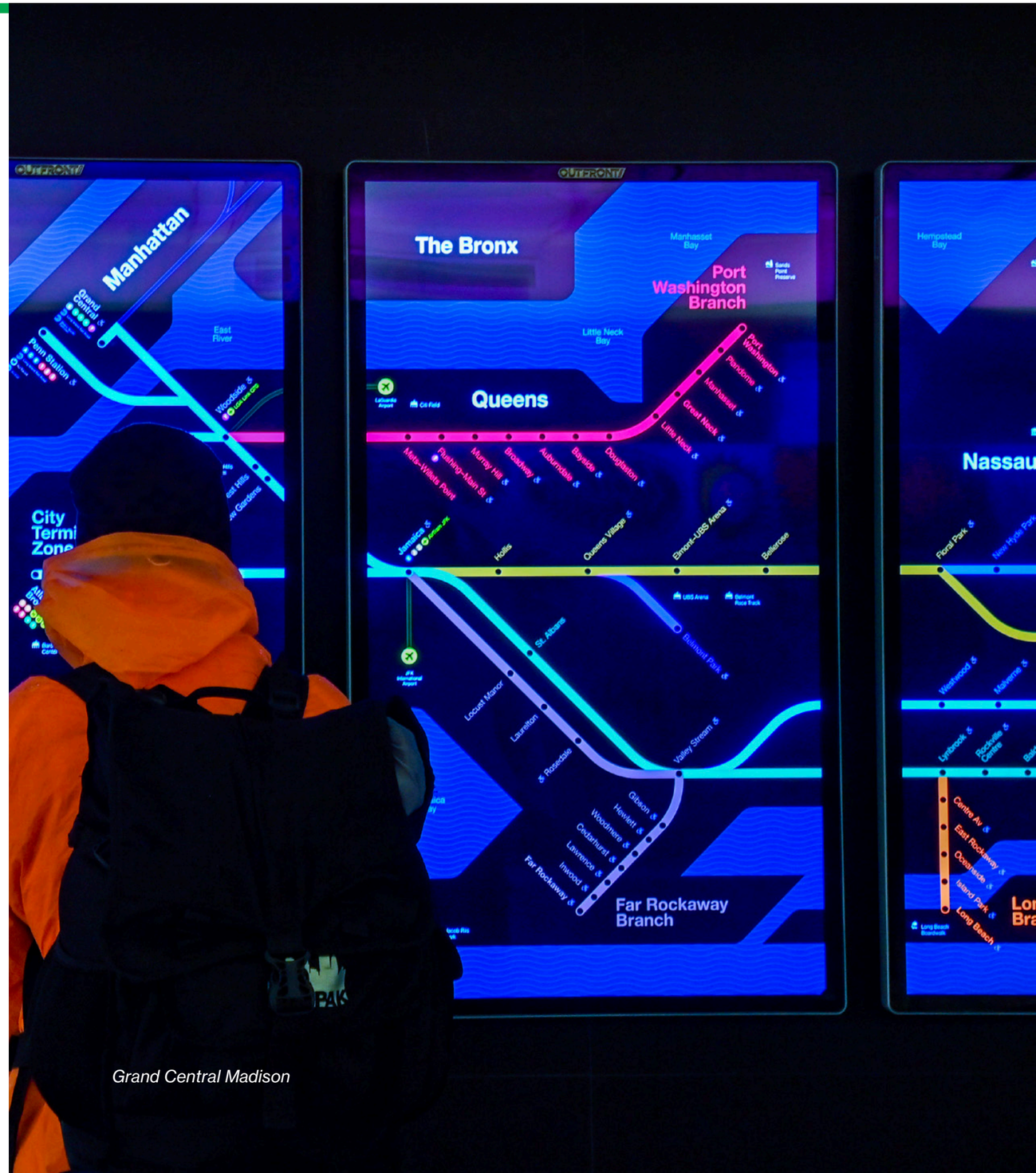
The transition to the OMNY contactless fare payment system represents a first-of-its-kind open loop system that allows riders to seamlessly travel throughout the New York region.

Apps and screens

A revolution in trip-planning ability for our customers, signal upgrades, and extensive investments into our communications systems enabled us to share real-time transit arrival updates through apps and nearly 10,000 screens in stations.

Industry partnership

The MTA has also formalized ways to stay on top of the latest technological innovations in industry, including launching the Transit Tech Lab, a public-private initiative with the Partnership for New York City to solicit and implement promising pilots from the tech sector.



Grand Central Madison

Our 20-year plan

We will invest in the assets that enable technological innovation in the system.

LIRR departures board

A seamless, upgraded experience for riders

» We aim to create an easier travel experience, where riders can smoothly tap in using OMNY and enter through a new generation of fare gates that accommodate mobility devices, luggage, and bicycles.

» We aim to limit fare evasion, with retrofits to existing fare lines and use of laser sensors, AI, and other technology that detect and prevent evasion.

» We aim to improve the experience in station with enhanced customer communication, allowing riders to receive live service updates from service supervision staff at our centralized train control centers and cellular service in stations and subway tunnels.

Safer, more reliable service

» We are developing our next generation of operational command centers, which are the critical nerve centers that ensure smooth and efficient operation of services. These new facilities have greater monitoring and management capabilities for higher-quality, safer, and more secure service to customers.

» We are using cutting-edge technology to combat track intrusion, keeping our riders safe and avoiding disruptions and delays. Through laser intrusion detection systems, video analytics, and AI-powered forward facing cameras, we can prevent track intrusion incidents and respond better to those that do occur.

Use of innovative tools in design and construction

» We are expanding use of Building Information Modeling (BIM) technology and digital twins to create a digital representation of assets, track changes, and perform analysis for more cost-effective, and accurate design, construction, and operations.

» We are expanding use of unmanned aerial systems and laser technology for inspection and surveying of difficult-to-reach infrastructure, significantly reducing time-intensive data collection and risks to worker safety.

To see the full plan, please visit future.MTA.info.

Equity

Equity is a key driver in our investment decisions. When we upgrade a station's accessibility, replace a route with emission-free buses, or enhance the resiliency of a subway line, historically underserved communities are at the forefront of our engagement, planning, and investment.

B44 bus arrives in Brooklyn

Examples of how equity is integrated into our plans to improve the MTA system:

Accessibility

Equity is an important consideration in our process for determining what subway stations should be prioritized for accessibility. Among other criteria, we consider community feedback, the number of people living in poverty near a given station, the number of reduced fare riders that station serves, paratransit use in the area, and the geographic proximity of other accessible stations, so that areas that might have been overlooked in the past now get priority.

Resilience

Some of the riders who are the most dependent on transit are the most vulnerable when extreme weather disrupts service. Climate change will disproportionately burden historically disadvantaged communities. Our data-driven approach to evaluating future climate risk considers the social implications of climate change and its impacts on the MTA and our customers, to ensure that resources allocated to climate resilience will address these burdens.

Sustainability

We've developed an environmental justice score that looks at both equity and air quality across the MTA bus service area for the zero-emissions bus fleet transition. Areas with higher environmental justice scores are prioritized for earlier and larger zero-emissions deployments to improve the health of our riders who have been most impacted by poor air quality.

EXPAND

LIRR New Hyde Park Station

Once our foundation is secure, we can pursue smart expansion projects to support our growing and changing region.

Construction on Phase 1 of Second Avenue Subway

Investments in our network provide the foundation for the region's economic growth and prosperity. As we look ahead 20 years, our most urgent priority is to secure the survival of our existing system by rebuilding its most imperiled infrastructure, renewing its outdated and broken parts, and implementing improvements that will deliver more inclusive, safe, and reliable service. To put it bluntly, **unless sufficient resources are made available to address the existing system's most urgent needs, there cannot be investment in expansion projects.**

At the same time, we must be prepared for future expansion that can address the challenges and opportunities of the coming decades. This includes planning for the additional 1 million residents and nearly 1 million jobs forecast in the region by 2045. We must also be ready to meet the evolving needs of our riders, including changes already underway regarding when they travel, why they travel, and what they expect from their experience.

We must be ready to invest any additional resources into projects that address these challenges most effectively and that will have the greatest regional impact. That is why we have developed the MTA's first-ever Comparative Evaluation, which weighs the costs and benefits of potential expansions to help us make smarter, more strategic choices to secure New York's future.

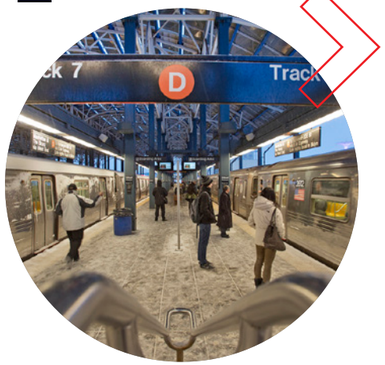
Challenges

We must be sure that any expansion projects provide cost-effective benefits that complement the existing network.

When considered in isolation, many potential expansion initiatives are appealing. But rebuilding our existing infrastructure—infrastructure that millions of people rely on everyday—must not get shortchanged at the expense of these projects.

These competing demands do not exist in a vacuum—choices to fund certain projects come at the expense of others. Once our system's most urgent needs have been met, if there are still resources available for expansion, it is critical that we consider our system holistically and make wise, strategic decisions about which projects could best support our region's future.

The region is changing, and we need to be responsive. As part of our ongoing long-range planning process, we continually monitor regional trends by analyzing changes in housing, work location, and other factors that affect travel patterns to better understand how regional changes will impact travel and the MTA network. We identified the following trends that will continue to develop and exert new pressures on our system over the next two decades:



Continued growth of industries associated with "non-traditional" travel patterns

Jobs in industries such as health care, hospitality and food services, and education have become some of the region's fastest-growing industries. Workers employed in these sectors tend to travel at all times of day and are usually required to work in-person, creating new patterns of commuting.

By 2045, projections show that non-office jobs like these will be growing more than three times faster than office jobs.

Coney Island–Stillwell Av Station

Emergence of new business districts around the region

Although Manhattan continues to have the highest concentration of jobs—and access to the city's Midtown core remains essential—the outer boroughs and suburbs are experiencing significant job growth with gains projected through 2045. This will result in changing travel patterns. For instance, inter- and intra-borough travel is growing, along with reverse commuting—a trend that will likely continue.

By 2045, the MTA service region is expected to gain nearly 1 million new jobs, with one out of three new jobs in the suburbs. In New York City, seven out of 10 new jobs are projected to be in the outer boroughs.

B52 bus

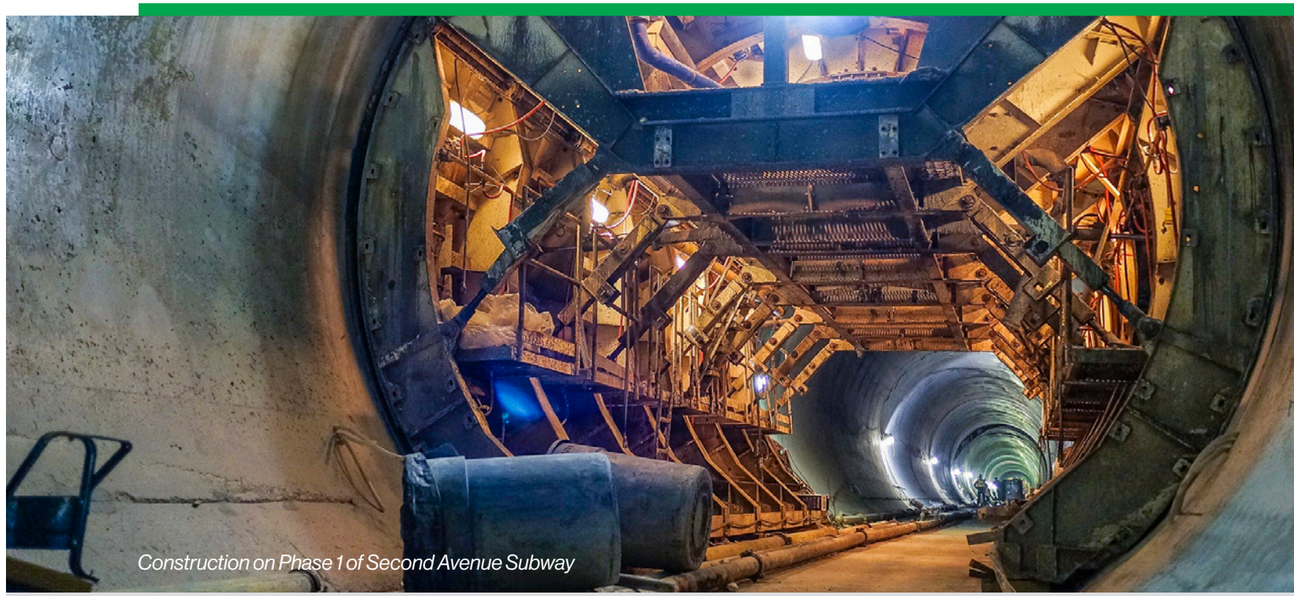
Increase in off-peak travel

The number of people traveling outside of the morning (6-10 a.m.) and evening (4-8 p.m.) peak times was growing in the years leading up to the COVID-19 pandemic, with increasing numbers of New Yorkers choosing transit for their travel. Subway off-peak ridership increased by 24% from 2001 to 2018. During that same time frame, off-peak LIRR ridership increased 18%, and Metro-North off-peak increased 24%.

The weekday peaks are returning; however, we are seeing a greater proportion of riders in comparison to pre-pandemic levels on weekends. New Yorkers are increasingly taking subways and buses during off-peak hours for health care, shopping, social gatherings, and recreational trips. This highlights the importance of off-peak travel, not only for the most transit-dependent individuals, but also for those who choose it for discretionary travel.

Grand Central Madison

What we've done



Construction on Phase 1 of Second Avenue Subway

New York City Transit
Second Avenue Subway

Phase 1 of the Second Avenue Subway, which extended the Q line from 63 Street to 96 Street, was completed in 2017 and has already reduced crowding on the 4 5 and 6 lines by an average of 40%.

Phase 2 will extend the Q line into East Harlem with three new stations between 106 Street and 125 Street, providing the first subway service to the neighborhood since the Third Avenue Elevated line stopped running there in the 1950s.

Other benefits of the ongoing Phase 2 expansion will include: three new ADA-accessible stations at 106 St, 116 St, and 125 St; increased transit connectivity at 125 St, with connections to the 4 5 and 6 lines, Metro-North, and M60 Select Bus Service to LaGuardia Airport; a one-seat ride from East Harlem to the Upper East Side, West Midtown, and Coney Island; even more reduced crowding on the 4 5 and 6 lines, as well as the 96 St Q and local bus service; and dramatically shorter commute times, with some passengers saving as much as 20 minutes.

Phase 1 and Phase 2 of the Second Avenue Subway will serve a combined

300,000 riders a day

Long Island Rail Road
Grand Central Madison

This historic expansion opened in early 2023, providing LIRR riders with 40 miles of new tracks, a new terminal beneath Grand Central, and the modernization of the busiest intersection of passenger train lines in North America. It has also unlocked reverse commuting potential for New York City residents and others around the region by providing better access to jobs on Long Island.

Grand Central Madison

Third Track

This project dramatically increased the capacity of LIRR's Main Line, adding a third track while upgrading stations, replacing substations, and eliminating grade crossings. Combined with Grand Central Madison, this enabled a 40% increase in overall LIRR service. The MTA's first design-build expansion project, it was delivered on time and under budget.


LIRR Third Track

Double Track

This project added a second track to LIRR's Ronkonkoma Branch, greatly increasing capacity and setting the stage for Third Track.

Elmont-UBS Arena Station

Constructed at zero cost to the MTA, this is the first new LIRR station in almost 50 years, serving the new arena.

Metro-North Railroad
Penn Station Access

This project will create direct service from Metro-North's New Haven Line into Penn Station, creating four new accessible stations, improving existing tracks and bridges, and cutting current travel times from the Bronx to Manhattan by as much as 50 minutes. It will give new access to 500,000 Bronx residents, 25% of whom are below the poverty line—and potentially eliminate 80,000 miles traveled by cars.

It will also create 19 miles of new and rehabilitated track along Amtrak's Hell Gate Line, which will improve reliability and on-time service for Amtrak customers.


Gov. Kathy Hochul at Penn Station Access groundbreaking

Our 20-year plan

Our process for evaluating potential projects

With limited resources and vast needs, it is essential that we prioritize projects that will have the greatest impact for our riders and the success of the region.

This is why for the 20-Year Needs Assessment, we conducted our first-ever Comparative Evaluation (available in full in the Appendix). Instead of assessing projects in isolation, this analysis evaluates all potential expansion projects against a consistent set of criteria.

The criteria include ridership, time savings, network resiliency and sustainability, capacity, equity, network leverage, geographic distribution, and cost.


Sutter Av L

Cost per minute saved

All of these metrics are important, but it's essential that the costs of a project are properly compared to the benefits.

While every metric matters, our limited resources mean that we can't simply support projects based on their benefits alone. All of these projects provide benefits. This tool enables us to make the smartest, most productive investments—in other words, it helps us evaluate how to bring the most benefits, to the most people, in the most cost-effective way.

The primary metric we used in this cost-benefit analysis is cost per minute saved. To determine this number, we evaluated:

Costs

A holistic calculation of the project cost, including the costs to build and operate the expansion project over the next 30 years.

Benefits

A calculation that accounts for the total time saved by the project riders compared to their regular trip before the expansion; and any ripple travel time impacts on the rest of the MTA system (for example, an infill station might add additional time to existing riders). This comprehensive approach enables us to prioritize projects that serve a lot of riders—and save a lot of time.

While other factors, especially equity and sustainability, also need to be taken into account, this cost-benefit ratio is an important indicator of which projects are a most responsible use of limited public dollars.

Comparative Evaluation

This transparent and systemic analysis is intended to provide a framework for understanding which proposed expansion projects or investments will best address our most pressing challenges, offer the solutions given limited resources, and generate the greatest benefit for customers. The most promising projects can be advanced for further study and possible inclusion in future capital plans.

Criterion	Metric	Description
Ridership	Total ridership	Number of riders using the project (in 2045)
	New riders	Number of riders (in 2045) using the project that shifted from the other non-MTA modes, usually auto
Travel time	Door-to-door travel time savings	Amount of time (in 2045) saved by users of the new project—it includes the time for travel to and from the transit stations or stops
Cost	Capital cost	Cost construction and fleet in 2027 dollars
	Operation and maintenance (O&M) cost	Annual cost to operate and maintain in 2027 dollars
Cost-effectiveness	Cost per minute of time saved (30 years)	Capital construction and vehicle costs, per time savings in 30 years (minutes saved on door-to-door travel)
Capacity	Change in network capacity	Change in the number of passenger hours (in 2045) in crowded conditions systemwide
Geographic distribution	Regional accessibility	Change in transit travel time (in 2045) from anywhere to anywhere in the region
Equity	Projected riders from Equity Areas	Total or percentage of projected riders (in 2045) from Equity Areas
Network leverage	Project right-of-way on MTA, public, or private land	Weighted average of right-of-way length by owner; measure of how each project utilizes the existing MTA-owned infrastructure and right-of-way
Sustainability and resiliency	Change in vehicle-miles-traveled	Change in vehicle miles traveled (in 2045)—reflects both the number of people shifting from auto to transit and the traveled distance
	Connections to other rail	Number of rail or subway stops within one-half mile from the project stations/stops in NYC, or within five miles in suburban areas

Results

We evaluated more than 20 potential enhancement and expansion projects.

Some of the evaluated projects were identified as particularly promising, including the Interborough Express, a new transit line between Queens and Brooklyn along an existing freight corridor that would connect up to 17 subway lines and the LIRR.

We will continue to evaluate promising projects so that, as we learn more about our available resources once the most urgent system needs have been met, we will be ready to act. The Comparative Evaluation process gives us the foundation to make smarter, better-informed choices about expansion possibilities for the region and how to best meet the public transportation needs of the future.

For further details on the process and outcomes of each potential project, see the Comparative Evaluation in the Appendix. A description of each project and preview of how they scored across the criteria is below.

All metrics for each project are converted to a scale 0-100 based on how they perform in relation to the other projects.

To see the full plan, please visit future.MTA.info.

Score	Icon
<20	○
20-39	◔
40-59	◑
60-79	◕
>=80	●

	Cost Effectiveness	Ridership	Equity		Geographic Distribution	Sustain-ability	Resiliency	Capacity	Network Leverage		
Projects	**Cost/Time Saved** (30 yrs) ($/min)	**Total Riders**	**Total Riders from Equity Areas**	**% Riders from Equity Areas**	**Regional Accessibility**	**Change in Vehicular Miles Traveled**	**Subway/Rail Services < 0.5 miles** (NYC) **< 5 miles** (suburbs)	**System Crowding - Passenger Hours in Crowded Conditions**	**% of Project ROW on MTA, Public or Private Land**	**Total Riders** (Daily 2045)	**Construction Cost** ($M 2027)
Danbury-Southeast Connection	$6.35	○	○	○	◕	◕	○	◔	◑	2,600	$820
Elmhurst Station (LIRR)	*No Time Saved**	○	○	●	○	○	○	○	●	3,100	$210
Harlem Line Capacity Improvements	$2.46	◕	◔	◑	◔	○	◕	○	●	83,700	$1000
Hudson Line to Penn Station	$4.54	○	○	◕	◔	◕	●	◕	●	18,900	$750
Inner New Haven Line Yard	$5.07	○	○	◔	○	○	○	○	●	6,000	$390
Interborough Express LRT (IBX)	$1.29	●	●	●	●	●	●	◑	●	118,700	$5,540
Lower Montauk Branch Reactivation	$62.41	○	○	◕	○	◑	◑	○	●	9,200	$4,230
New Lots Ave No 3 Line to Flatlands	$8.64	○	○	●	○	○	○	○	◕	8,600	$1,780
Port Jefferson Branch Capacity Improvements	$6.18	◔	○	◔	●	◑	○	◑	●	27,900	$3,120
Port Jervis Line Capacity Improvements (MP Yard)	$40.46	○	○	◕	○	○	○	○	○	11,000	$360
Ridgewood Busway	$0.0**	○	○	●	○	○	○	○	◔	8,900	$30
Rockaway Beach Branch (NYCT)	$6.72	◔	◔	●	○	◔	◔	○	◑	39,200	$5,940
Second Ave Subway South to Houston	$4.47	●	●	◑	○	○	●	◕	◔	230,400	$13,500
Second Ave Subway West to 125th/Bdwy	$1.43	●	●	●	○	◔	◕	●	◔	239,700	$7,550
Speonk-Montauk Capacity Improvements	$13.66	○	○	○	○	○	○	○	●	1,500	$260
Staten Island North Shore BRT	$1.46	◔	○	◕	◑	○	○	○	◔	32,000	$1,300
Staten Island West Shore BRT via Korean War Vet Pkwy	$1.95	○	○	○	●	◔	○	○	◔	16,900	$1,870
Stewart Airport Commuter Rail	$10.65	○	○	◕	○	●	○	○	○	4,300	$1,400
Sunnyside Station (LIRR)	*No Time Saved**	○	○	◑	●	◔	◔	○	○	7,900	$490
Tenth Ave Station on No 7 Line	$81.29	◑	○	◔	○	○	○	◔	●	55,000	$1,900
Utica - Nostrand Junction Capacity Improvements	$0.28	●	●	●	●	◕	○	●	●	319,900	$410
Utica Alt A - BRT	$0.32	◕	◑	●	◔	◔	◔	○	◑	71,900	$220
Utica Alt B - Subway to Kings Plaza	$4.80	◑	◔	●	◑	◑	○	●	◑	55,600	$15,860
Utica Alt C - Subway to Church Ave + BRT	$1.59	◕	◑	●	◑	◑	◔	●	◑	81,200	$6,780
W Line to Red Hook	$90.46	○	○	○	○	○	○	●	◑	7,600	$11,210

Notes: *Elmhurst and Sunnyside have no overall time savings due to increased travel time for existing customers.

**Ridgewood Busway operational savings over project lifetime exceed capital costs

IBX Case Study

Expanding service for wider reach in Brooklyn and Queens

Proposed IBX station platform rendering

The proposed Interborough Express (IBX) light rail service would offer nearly 1 million riders quicker transit options and expanded access to jobs and economic opportunities.

What is IBX?

IBX is a proposed light rail transit line that would travel a 14-mile route along an existing freight line to connect eastern Brooklyn and central Queens. This transformative rapid transit project would serve nearly one million people, many in historically underserved neighborhoods that offer limited transit options.

From Bay Ridge, Brooklyn to Jackson Heights, Queens, the IBX would create greater access to employment, healthcare, and other economic opportunities, while creating new affordable and sustainable travel options without the burden of lengthy commutes.

The proposed IBX route line and stops connecting Brooklyn and Queens

New transit connections

Today, the majority of Brooklyn- and Queens-bound work trips are made by car. Those who do travel by subway are often forced to take indirect routes to their destination: currently half of all subway trips between Brooklyn and Queens require an unnecessary detour through Manhattan.

IBX would eliminate this trip inefficiency, making transit a more convenient and attractive choice that saves time for riders, decreases crowding on Manhattan-bound subway service, and reduces traffic and vehicle emissions.

While many passengers will reach their destinations in a single IBX ride, the route also provides connections to 17 subway lines already serving Brooklyn and Queens, multiple bus routes, and an existing LIRR stop at the Atlantic Av-East New York Station.

The IBX will benefit traditionally underserved communities.

7 in 10
People of color

3 in 10
Households below 150% of the poverty line

1 in 2
Zero-car households

1 in 4
Residents with limited English fluency

Transformative transit connections for disconnected communities

IBX would connect adjacent neighborhoods that are inadequately linked by existing transit, even as the number of people traveling between them rises.

Today, it takes a Midwood resident a minimum of 40-50 minutes and multiple/various transit options to reach Broadway Junction—which is less than 6 miles away. Their trip begins on the Q train, which they can take to LIRR or to the Franklin Avenue Shuttle, which places them at the A train for the final leg. If connections between these services are out of sync, their trip could take longer than estimated.

The same trip on the IBX would provide a single train ride and cut travel time in half. Similar stories would be repeated across the entire 14-mile length of the line. Overall, the IBX would create a new transit option for close to 900,000 residents who live in the neighborhoods along the route, along with 260,000 people who work near the project corridor.

A significant portion of these residents would see their regular commutes transformed: more than 55% of Brooklyn residents and 40% of Queens residents who live within the IBX corridor currently commute within and between these boroughs.

IBX Case Study

IBX would support communities who need it most

IBX would support the MTA's goal of increasing equity in our transit system by targeting new investment and services in communities that need it most.

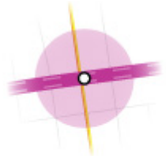
Almost three-quarters of the population served by the IBX are people of color and one in four people has limited fluency in English. One-third of these households are below 150% of the poverty line and half of them do not own a car. The neighborhoods along the proposed route also include high numbers of our most essential workers, who kept us going through the peak of the COVID-19 pandemic and work shifts throughout the day and night.

Providing these populations with additional reliable, high-frequency transit options would help increase their mobility and improve their access to economic opportunities.

Neighborhoods within .5 miles of the IBX line. Riders in these neighborhoods will no longer have to travel towards or through Manhattan to reach other parts of Brooklyn and Queens.

Some prospective transfer stations with highest projected IBX ridership

Roosevelt Avenue
10,500
E F M R 7



East 16th Street
11,700
Q

Flatbush Avenue
11,500
2 5

An efficient, cost-effective plan

The IBX project was designed to maximize efficiency and cost-effectiveness, while providing the most benefits. That includes using:

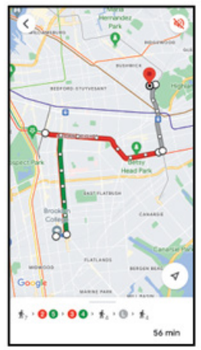
Existing infrastructure

The route runs along the LIRR-owned Bay Ridge Branch and CSX-owned Fremont Secondary freight line. Using existing infrastructure will result in lower construction costs and a shorter implementation timeline than if we built something from scratch.

Light rail

We selected light rail as the transportation mode after extensive planning, analysis, and public engagement determined that it would provide the best service for riders at the best value, and would be the most adaptable to the existing freight rail line. Light rail's faster implementation timeframe would also allow us to start service more quickly.

Today



Getting from home in east Bushwick to your class at Brooklyn college could take you and hour. You're routed with two transfers and one is out of system!

Wilson Avenue Station L

Flatbush Avenue - Brooklyn College 2 5

You could have a slightly faster route... but that requires transferring to an infrequent bus.

With the IBX

With a high-frequency transit line built along the IBX, you could have a one-seat rife from home to work, eliminating the time currently spent transferring between trains and reducing time spent waiting on the platform or in motion.

30	60	261
minutes saved per trip	minutes saved per day	hours saved per year

That's a week and a half work of travel time saved!

Substantial investments required for stations, railcars, and reconstruction

While the choices above have minimized the costs, the project still requires significant new infrastructure, including new track, new stations, and new light rail vehicles.

In addition, the IBX will require reconstruction of a substantial number of bridges throughout the corridor, as well as track widening and tunnel rehabilitation. We will also need to build traction power and distribution substations, state-of-the-art communications and signaling systems, and a new maintenance facility to store and maintain the new light rail vehicles.

It's a complex project, but one that will deliver a better quality of life to hundreds of thousands of riders.

Equity

Expansion projects can be key drivers of mobility, actively addressing past injustices. Our current capital program features two great examples of this—Second Avenue Subway Phase 2, which will finally deliver on a decades-old promise to the East Harlem community, and Metro-North's Penn Station Access, which will provide new service on the New Haven Line to the East Bronx in communities that have long been divided, but not served, by an active intercity railroad.

Going forward, we will continue to prioritize cost-effective projects that deliver for historically underserved communities where high concentration of minority, low-income, and transit-dependent populations live.

NEXT STEPS

Jackson Hts-Roosevelt Av Station

The 20-Year Needs Assessment underscores the urgency of investing in our region's transportation network, especially our core infrastructure, and outlines what capital investments are needed over the next 20 years to keep New York moving.

F train in Brooklyn

A new perspective

This 20-Year Needs Assessment differs from previous reports in fundamental ways.

First, unlike previous plans that were constrained by anticipated budget allocations, we have used the data to generate a comprehensive and transparent analysis of need. This unconstrained assessment provides a more robust and clear-eyed outlook on the vulnerabilities our system will face over the next 20 years, including the dire state of some of its most essential infrastructure—as well as the opportunities ahead.

This is also the first 20-Year Needs Assessment conducted by MTA's newly formed and centralized capital planning department, which examines all agency needs from a holistic perspective.

Unlike previous iterations of these plans, this report is intended to communicate more directly with the people who have the most at stake—the riders of our system. As a result, it connects our asset needs to the performance of our system and level of service for our riders.

It lays out the broader implications of investment—and disinvestment—in the system and describes what it will take to meet performance goals for riders regarding reliability, speed, accessibility, safety, and other priorities.

It underscores what's at stake—and what is possible to achieve.

A data-driven approach

Hundreds of expert staff from across every MTA agency have spent the past two years examining every element of the MTA's $1.5 trillion worth of assets, using a robust combination of new groundbreaking tools, agency data, customer surveys, and long-established inspection protocols, to provide unprecedented insight into the state of our system. Highlights of our sources of data include:

1

Our agencies perform regular and comprehensive **inspections of the conditions of the assets**. These inspections and engineering insights underpin all our findings. Without it, it would be impossible to know the condition of the system.

2

Our **Enterprise Asset Management (EAM) system** provides us with the capability to track the status of each individual system part. For example, systems like EAM help us to gain insight on where some assets have a pattern of many corrective work hours.

3

Our **customer surveys** help us to understand what customers care about most, particularly reliability, safety, and on-time performance.

4

Our new **climate planning division used geospatial analysis** to identify emerging threats.

5

Our comprehensive **analysis of regional trends** and emerging pressures helps us to anticipate where new demands will be made on the system.

6

Our first-ever **Comparative Evaluation** systematically compares the merits of every potential new project to help us identify the wisest investments with the greatest impacts.

This 20-Year Needs Assessment is ...

Comprehensive

We are providing an unfiltered view of our needs, unconstrained by budget. While prior iterations of 20-year needs assessments have outlined a circumscribed set of needs constrained by anticipated funding, this 20-Year Needs Assessment offers a comprehensive examination of all asset needs across the system.

Construction on Rutgers Tunnel

Transparent

An important first step in planning is to understand the condition of our assets; that's why we have focused on making the "state of our system" easier to understand. As a second step, we need to plan for how we will get it done with the resources that are allocated. That second step is the five-year capital plan.

Grand Central Terminal

Responsible

Budgets over a 20-year period are difficult to create with any level of precision. Rather than give a false impression of precision, this document recognizes that:

- Costs and timeframes for specific investments will—and should—be shaped by our approach to planning and executing the projects. This involves numerous defining decisions about how projects are bundled, sequenced, designed, value-engineered, and delivered. Projecting these costs and schedules without further project development would be premature and misleading.
- Many factors that influence cost are simply beyond the control of the MTA—and not just at the margins. Especially when planning for a 20-year outlook, this often leads to projections that can be vastly different than actual costs, as recently observed with the tremendous unanticipated fluctuations in inflation.

NYCT bus and train at Williamsburg Bridge Plaza

Our next step is the five-year capital plan

Over the next year, we will be refining, prioritizing, and packaging these needs into a five-year capital plan. This allows us to group needs based on anticipated schedules and resources—and to bundle projects strategically to minimize impacts to riders. The five-year horizon provides a more informed and reasonable time period for projecting budget requirements

The 2025-2029 Capital Plan will be released in fall 2024

A new capital agency is ready to deliver

In 2019, the MTA created C&D as a single, unified agency to oversee its capital program. Whereas historically, MTA's capital program was drafted on an agency-by-agency basis, MTA C&D's integrated approach has allowed innovations and best practices to be used across the program.

Since its creation, MTA C&D has ramped up the pace of capital investment. The 2020-2024 Capital Program is the most ambitious in MTA history, and MTA C&D is delivering results. In 2022, MTA C&D committed a historic $11.4 billion in new projects, with projects coming in $345 million under estimate. That year, the agency completed $6.2 billion of projects, including bolstering the Verrazzano-Narrows Bridge, upgrading accessibility at multiple stations, opening a storm-resilient Clifton Car Maintenance Shop, and much more vital state-of-good-repair work across the system. MTA C&D is currently executing a record-setting number of accessibility projects at 76 stations, advancing an unprecedented level of signal modernization (182 miles), and delivering on the generations-long promise to bring the Second Avenue Subway to East Harlem.

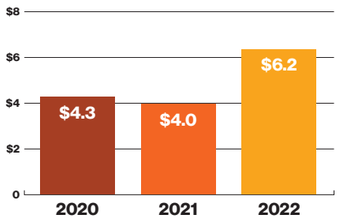
As a new agency, MTA C&D is taking a new approach to capital delivery to ensure projects are planned and constructed better, faster, and cheaper. In recent years, MTA C&D has implemented major improvements in project design and delivery, including implementing recommendations from the 2019 Crowe Forensic Audit, as well as initiatives in the agency's inaugural Strategic Plan. These efforts have already brought significant improvements, from bringing costs of state-of-good-repair projects in line with peer agencies despite New York's high construction costs, to completing major improvements like LIRR's Third Track and the repair of the L Train Tube on schedule and under budget. Additional efforts include, advancing significant regional improvements like creating four new Metro-North stations in the East Bronx.

2022 completions

$6.2B

2020-2022 Completions

Billions

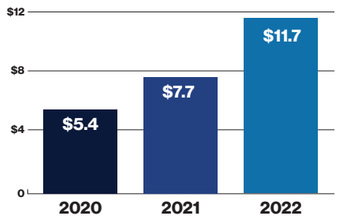


2022 commitments

$11.7B

2020-2022 Commitments

Billions



Construction savings

$345M Combined savings on construction contracts, compared to estimate

Audit of MTA capital planning

In 2019, Crowe conducted and published the "Forensic Performance Audit of Metropolitan Transportation Authority's Capital Planning Process" as required by the Public Authorities Law. The audit assessed the performance of the MTA's capital program development processes, specifically evaluating the project selection for the five-year capital plan. The audit provided nine recommendations for improvement in the MTA's capital planning processes:

Cost estimates

1. MTA can improve cost estimates with more formal, standardized, and consistently applied cost estimating procedures and agency documentation requirements.

2. MTA's budgeted costs exceed comparative benchmarks for various reasons and the MTA should consider a range of alternative management approaches to control future costs.

Asset inventories and conditions

3. MTA can enhance linkages between capital projects included in the 2020-2024 Five-Year Capital Plan and assets targeted for repair/ replacement within agency asset inventories.

4. MTA has comprehensive asset condition databases which reflect existing conditions; however, MTA should supplement its asset condition database contents to better support asset condition determinations.

Capital planning processes

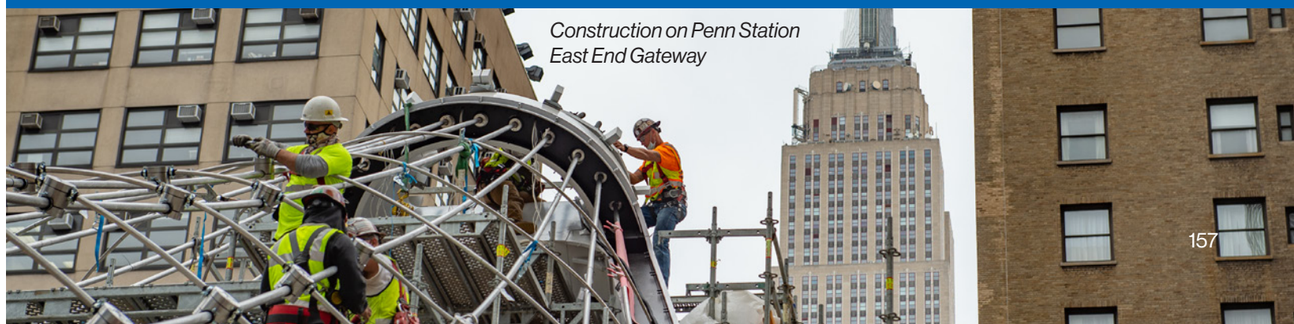
5. MTA has yet to realize significant MTA level capital planning benefits from EAM.

6. MTA's largely manual 20-year needs assessment and five-year plan processes and disparate data platforms make it difficult for the MTA and agencies to assess priorities, backlogs, and alternative scenarios.

7. The MTA can improve the transparency of performance measures and dashboarding to more closely monitor five-year plan and project outcomes.

8. There are some limitations in the MTA's capital planning review and approval processes.

9. MTA and agencies do not have comprehensive and fully documented capital planning policies and procedures.



Construction on Penn Station East End Gateway

MTA response to 2019 audit

Cost estimates

Accounting for—and ultimately reducing—the cost of capital projects is a high priority for the MTA. MTA's core infrastructure projects, which make up over 80% of the 2020-2024 Capital Program, are cost-competitive with similar projects in peer agencies like Barcelona, Boston, Philadelphia, and Chicago. While expansion projects are expensive in the New York region, recent MTA expansion projects—such as the Second Avenue Subway—have significantly lower costs per rider compared to peer agencies in the U.S. and internationally.

Cost drivers unique to the New York region do have inflationary impacts on MTA capital projects. To reduce these drivers, the MTA has undertaken a breadth of cost containment measures, including implementing innovative contracting strategies and incentives, bundling projects to take advantage of economies of scale, reducing customization and simplifying specifications, and aggressive project management.

The MTA is also focused on improving and standardizing cost estimation. As standard practice, MTA uses Federal Transit Administration's estimating guidelines and develops cost estimates based on historical data from past projects of comparable scale, inflation adjustments, prevailing labor wage rates, and standard contingency based on the stage of design development. Estimates are prepared utilizing industry best practices and standard templates. In addition, C&D is undertaking a systematic review and improvement of our cost controls MTA process, including developing a new cost estimating procedure and engaging an external expert cost and controls team to advise and train MTA C&D staff.

Construction on East Side Access tunnels

Asset inventories and conditions

To better inform investments in the next capital plan, the MTA has undertaken a thorough effort to modernize and standardize its asset inventories. The planning process for the 20-Year Needs Assessment has involved extensive work and cooperation in establishing detailed inventories of all MTA capital assets, including asset age and surveyed condition. As part of the assessment, we incorporated additional essential metrics including performance, criticality, parts obsolescence, and compatibility with modern systems. Using this more complete understanding of asset condition and future needs allows the MTA to target investment priorities that more strategically address capital needs and deliver improvements to service reliability and overall passenger experience.

Construction on LIRR girders

Capital planning processes

The MTA has made significant changes to the capital planning process since the recommendations from the Crowe Audit. In 2019, the MTA formed C&D with the express purpose of creating an integrated, streamlined capital planning, development, and delivery arm. Historically, the MTA's capital program was delivered on an agency-by-agency basis, with each wing of the MTA running its own capital division. The unified approach, bringing together New York City Transit, Bus Company, LIRR, Metro-North, and B&T, provides efficiencies in management and allows innovations and best practices throughout the system.

As a newly unified agency, MTA C&D is working to implement comprehensive procedures that address all aspects of project planning and delivery. MTA C&D is in the process of adopting a new baseline procedure that standardizes the methodologies by which all projects will be executed to increase accuracy in cost estimations, establish risk profiles and mitigation strategies, and develop project performance estimates. In addition, MTA C&D is incorporating other procedures such as change order management procedures, to establish common processes for all agency projects.

The MTA has been implementing an EAM program since 2018 to create a comprehensive, unified, and transparent information technology strategy and database for managing and maintaining each of the operating agencies' assets. An EAM program will enable the MTA to optimize resources and lower operational costs, while enhancing the safety, reliability, and customer satisfaction of the system. To institutionalize the use of EAM, the MTA established a program management office to set strategic directions and support operating agencies' digitization efforts.

The MTA is committed to public engagement and transparency throughout the planning, development, design, and delivery of capital projects. To allow public input in long-term MTA planning, each 20-year needs assessment is submitted to the New York State Capital Program Review Board (NYS CPRB), which includes representatives of the governor, senate, assembly, and mayor. The 20-year needs assessments then inform the five-year capital plans, which also are submitted to the NYS CPRB for review and approval the following year.

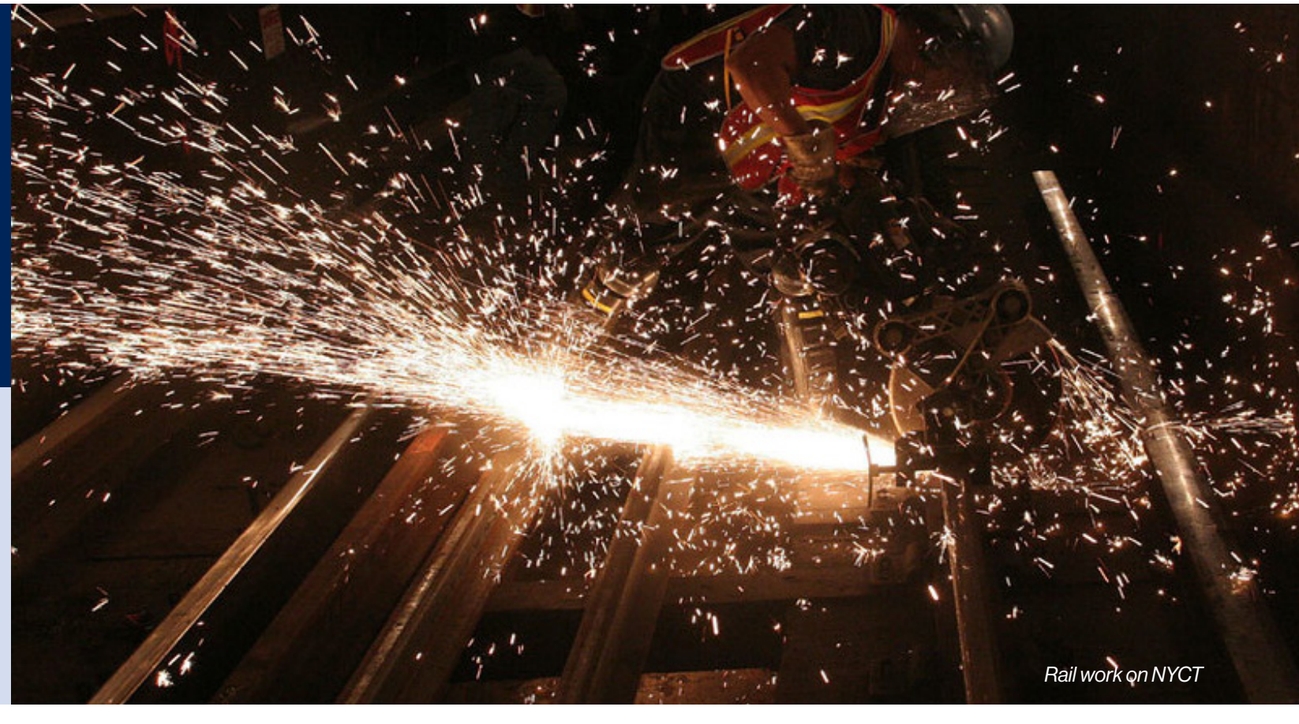
The MTA also maintains and publishes a capital program dashboard, which tracks progress on the MTA's five-year capital plans. The dashboard is a public tool intended to increase transparency and awareness of the MTA's capital process and project outcomes. To engage community members, the MTA dedicates outreach personnel to serve as day-to-day points of contact for projects, and hosts meetings and workshops to solicit input from elected officials, stakeholders, and the general public on priorities throughout the system and their neighborhoods.

Keys to success

Over the course of the next year, in collaboration with our regional partners, we will take this 20-Year Needs Assessment and use it to guide the creation of a five-year capital plan. In order to begin translating these needs and opportunities into an initial set of concrete projects, we will consider the system's needs holistically and identify opportunities to bundle projects together to create the most efficient and cost-effective approach. The five-year capital program will be presented on Oct. 1, 2024.

Success will depend on resources

Our ability to address the needs identified in the 20-Year Needs Assessment will depend on the resources we have available. These include:



Rail work on NYCT

Sufficient funding

The vision that we establish for our system relies on adequate—and timely—funding. Without this support from our critical partners in the city, state, and federal government, we will not be able to meet the ambitious goals we have set for ourselves.

Different funding scenarios will yield different results. Our top priority must be rebuilding the critical aging infrastructure at risk for catastrophic breakdown without intervention.

A low funding scenario would require us to spend the vast majority of our resources on these urgent projects, with far less funding available for improving and expanding the system.

Public engagement and support

Our work is done to benefit the public—so that the trains, buses, bridges, and tunnels the public relies on continue to be there for them. That construction work, though, can be disruptive, especially in old and constrained spaces. We need the public to be patient as we get past short-term disruptions in order to generate long-term benefits.

But it's not enough to simply expect that of riders. We will continue to do our part, communicating directly and honestly with customers about impacts, and, just as crucially, helping them understand the reasons we're doing the work in the first place. This partnership—between us and our riders—is absolutely essential to delivering on the promise of this plan. Our partners in the advocacy community, at organizations both large and small, will be essential in forging this link.

Strong partnerships

In addition to funding partnerships with the city, state, and federal government, we must also work together to ensure the system's success.

Our construction projects require close coordination and collaboration with local planning and transportation departments, utility companies, local businesses, and residents. By working efficiently and collaboratively, we can minimize costs, reduce red tape, and deliver benefits to the region.

We also depend on our partners to keep the system running smoothly. Stormwater is managed separately by each municipality. The future of the MTA depends on long-term planning by the relevant municipalities to reduce the threat of flooding.

Con Edison provides the electrical capacity for us to transition our bus fleets to more sustainable designs and the power we need to keep our subways and trains running.

Successful collaborations can also yield major breakthroughs, like when the MTA and the New York City Department of City Planning worked together in 2021 on a zoning amendment that offers developers building over subway stations a density bonus if they fund accessibility upgrades. Industry partnerships are also creating jobs, building capacity in the system, and encouraging innovation.

These kinds of creative partnerships will be crucial to achieving the goals we share for our system.

Over the next 20 years, we will deliver the modern, reliable system riders deserve.

LIRR Mid-Day Storage Yard

If given the resources, we can transform our vital, but aging, system into a modern transportation network that positions the region for the next 100 years.

To see the full plan, please visit future.MTA.info

ACKNOWLEDGEMENTS

This report was made possible by the hard work and dedication of countless staff across the MTA. The research and analysis conducted within MTA Construction & Development and the MTA's operating agencies over the last two years has been critical in ensuring the MTA continues to move forward strategically and responsibly.

Stormwater vent construction

The 20-Year Needs Assessment provides the path toward a resilient, reliable, and modern transit system that is safer and more efficient. These investments will unlock a new generation of prosperity for the region.

To see the full plan, please visit
future.MTA.info