

# Northeast Corridor Five-Year Capital Plan Fiscal Years 2016 - 2020

April 2015





Congress established the Northeast Corridor Infrastructure and Operations Advisory Commission (the Commission) to develop coordinated strategies for improving the Northeast's core rail network in recognition of the inherent challenges of planning, financing, and implementing major infrastructure improvements that cross multiple jurisdictions. The expectation is that by coming together to take collective responsibility for the NEC, these

disparate stakeholders will achieve a level of success that far exceeds the potential reach of any individual organization.

The Commission is governed by a board comprised of one member from each of the NEC states (Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, and Maryland) and the District of Columbia; four members from Amtrak; and five members from the U.S. Department of Transportation (DOT). The Commission also includes non-voting representatives from four freight railroads, states with connecting corridors and several commuter operators in the Region.



# Contents

<b>Executive Summary</b>	<b>4</b>
<b>Introduction</b>	<b>8</b>
<b>The Plan</b>	<b>18</b>
Basic Infrastructure	22
Mandated Projects	24
Major Backlog Projects	26
Service Preservation and Improvement Projects	28
<b>Benefits of Investment</b>	<b>30</b>
Grow Our Economy	32
Modernize Our Infrastructure	34
Prepare For Our Future	38
<b>Plan by Geography</b>	<b>40</b>
Washington, DC to Philadelphia, PA	42
Philadelphia, PA to New Rochelle, NY	50
New Rochelle, NY to New Haven, CT	58
New Haven, CT to Boston, MA	64
Harrisburg Line	72
Albany Line	76
Springfield Line	80

# Executive Summary

## A Vital National Asset at Risk

The NEC Five-Year Capital Plan is a joint effort among eight states, the District of Columbia, the U.S. Department of Transportation (U.S. DOT), Amtrak, eight commuter rail agencies, and other stakeholders to sustain a national asset that carries 750,000 passengers each day, moves a commuting workforce that contributes \$50 billion annually to the gross domestic product, and transports more intercity passengers within the Northeast than all airlines combined. The loss of the NEC for a single day could cost the country \$100 million in added congestion, productivity losses, and other transportation impacts.

This scenario becomes more real with each passing day. The NEC is composed of many assets that date back to the period between the Civil War and the New Deal. As infrastructure deteriorates and service levels reach the NEC's practical capacity, we must choose between declining reliability and limited economic growth or building the next generation of the railroad.

## National Benefits

The NEC Five-Year Capital Plan — if fully funded — would provide benefits that reach across the country. The Plan would employ an average of 42,200 workers per year, mostly in manufacturing and construction, in at least 22 states ranging from South Dakota to South Carolina (see page 33). Another 22,700 jobs per year would be supported across all economic sectors as these workers spend their incomes and return dollars to the economy. Commuter and intercity rail passengers would suffer fewer delays and enjoy better service. Residents of the Northeast would see new or improved station facilities in the hearts of their hometowns and key job centers, supporting the economic vitality of their surrounding communities.



# Ready to Invest

Partners with a stake in the future of the Northeast Corridor (NEC or the Corridor) are united and ready to reverse decades of deterioration and rebuild the nation's busiest and most important passenger rail network. This document is a region-wide action plan that — if fully funded — would begin a modernization and improvement program to enhance mobility and boost economic growth.

## Grow Our Economy



### Economic Development

Invest in more than 30 stations in communities housing 7 million jobs, or 1 out of 3 in the Northeast



### Jobs

Support 42,200 direct jobs per year in construction, manufacturing, and related industries in as many as 22 states

## Modernize Our Infrastructure



### Reliability

Reduce malfunctions where single points of failure can delay thousands of riders and cost millions of dollars



### Efficiency

Automate outdated manual tasks to maximize the productivity of each operating and maintenance dollar

## Prepare For Our Future



### Resiliency

Reduce vulnerability to mobility failures and economic disaster in the face of extraordinary events



### Growth

Lay a foundation for rail service expansion



## Shovel Ready or Funded for Construction, FY16-20



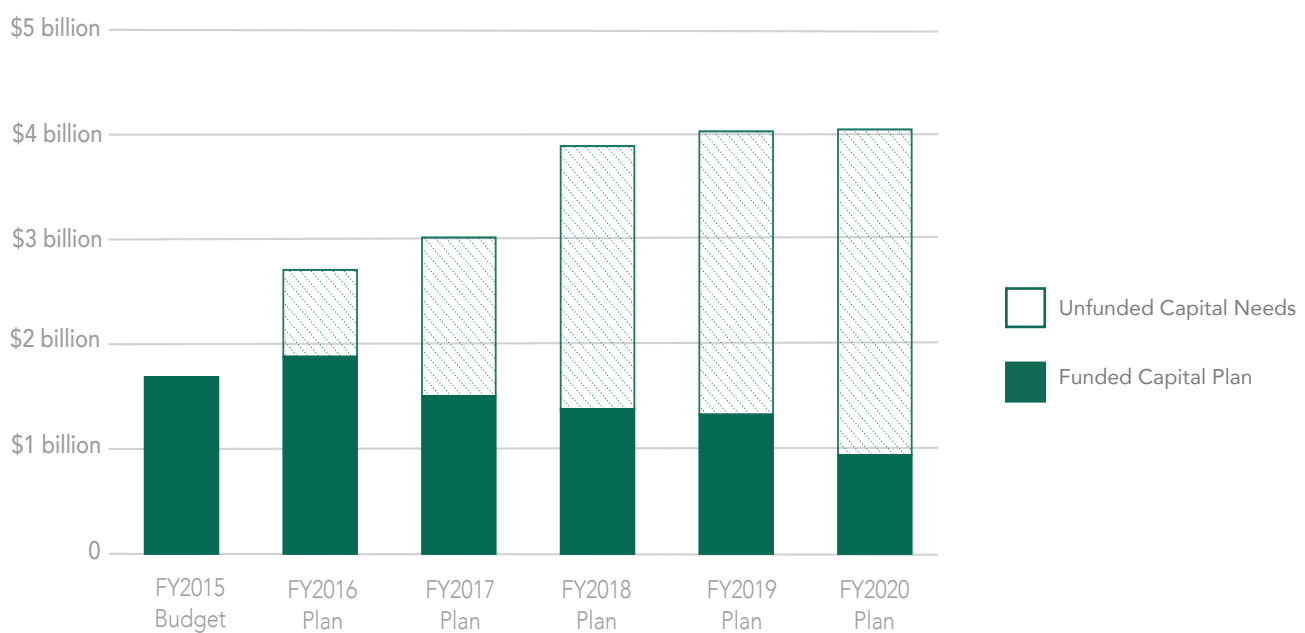
## A Comprehensive Plan

The NEC Five-Year Capital Plan integrates all categories of capital investment from all owners of and operators on NEC infrastructure, from the routine swapping of old rail ties for new, to the replacement of generations-old major bridges and tunnels. The Plan is a consolidated statement of proposed action over the next five years if adequate funding were available. However, it does not represent a funding commitment or an agreement among agencies regarding how individual projects will advance. The Plan is an assessment of how much funding is available and how much additional funding is needed to implement key state-of-good-repair, system modernization, resiliency, and chokepoint mitigation projects to relieve today's most unreliable and overcrowded trains. The Plan will require far higher levels of investment than traditional funding sources have provided.

## A Path Forward

The NEC Five-Year Capital Plan is a first-of-its-kind region-wide effort to chart a common course for feasibly ramping up capital investment. In December 2014, the Commission approved the NEC Commuter and Intercity Cost Allocation Policy (the Policy) which establishes a new framework for regional collaboration. The Policy includes consistent, transparent, and equitable methods for sharing operating and baseline capital costs according to each railroad's relative use. However, this agreement alone will not fully fund the NEC Five-Year Capital Plan. It has been the long-standing position of NEC stakeholders that the federal government has primary responsibility for eliminating the backlog of deferred maintenance and restoring the infrastructure to a state-of-good-repair. The Policy proposes that the federal government use the NEC Five-Year Capital Plan to steer its investment in the Corridor.

NEC Five-Year Capital Plan: FY2016-2020, Funded Plan vs. Unfunded Capital Needs





# Introduction



# New Era for the Northeast Corridor

The Northeast Corridor railroad network is at an historic turning point. The decades since stewardship of the NEC was placed in public hands have been marked by record-breaking commuter and intercity rail ridership growth — and insufficient capital investment. However, unprecedented collaboration is underway to take responsibility for this vital asset and position the Northeast for a globally competitive economic future. The NEC Five-Year Capital Plan is a central component of a broad strategy to modernize the NEC (see page 12).

## Unified and Coordinated Plan for the Northeast Corridor

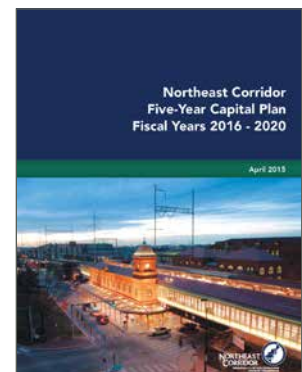
The NEC Five-Year Capital Plan is a first-of-its-kind joint effort among eight states, the District of Columbia, the federal Department of Transportation (U.S. DOT), Amtrak, eight commuter rail agencies, and other stakeholders to identify and integrate the infrastructure investments required over the next five years to reverse decades of deterioration and modernize our shared national asset for future economic growth.

### Action Plan

The NEC Five-Year Capital Plan builds on prior efforts, like the NEC Infrastructure Master Plan, to translate long-term capital needs into a near-term investment strategy



2010-2030



2016-2020

## Funding Needs

Funding availability is the largest obstacle to implementing the NEC Five-Year Capital Plan. NEC infrastructure is the beneficiary of investment from many different federal, state, and local sources. However, aggregate funding levels from these traditional sources are far below those required to stabilize the infrastructure's condition and prepare it for the future. The NEC Five-Year Capital Plan identifies these funding gaps and defines how additional resources would build a stronger railroad.



# Northeast Corridor: An Economic Engine



**1 of 5 dollars in GDP;**  
a \$3T economy, fifth  
largest in the world  
ahead of France



**1 out of 3 Fortune**  
100 headquarters



**20 percent of U.S.**  
patents granted  
since 2000; more  
than Silicon Valley



**6 of the 10 top U.S.**  
universities



**10 of the 28 top**  
U.S. adult and  
children's hospitals



**31 percent of U.S.**  
venture capital  
deals in 2012; equal  
to Silicon Valley

## Shared Asset

Eight commuter agencies, Amtrak, and four freight railroads operate on the NEC. Its daily users include workers, students, business travelers, families, and tourists. The NEC serves over 700,000 passengers each day from 39 commuter rail lines that operate all, or in part, on the NEC and fan out into communities across the NEC Region. Amtrak moves over 40,000 passengers on Acela, Northeast Regional services, and longer distance trains that reach destinations across the country. Four freight railroads share portions of the NEC, providing some communities (Delmarva Peninsula) and ports (New Haven, New London, Davisville, and Providence) their only access to the national freight rail network.

## Vital Asset

The NEC carries a workforce that contributes \$50 billion annually to the national gross domestic product. Amtrak serves more intercity travelers within the Northeast than all airlines combined. An unexpected loss of all NEC service for one day alone could cost the nation nearly \$100 million in added congestion, productivity losses, and other impacts.

## Aging Asset

Many critical NEC assets date back to a period between the Civil War and the New Deal. As infrastructure deteriorates and service levels reach the NEC's practical capacity, we must choose between declining reliability and limited economic growth or building the next generation of the railroad.



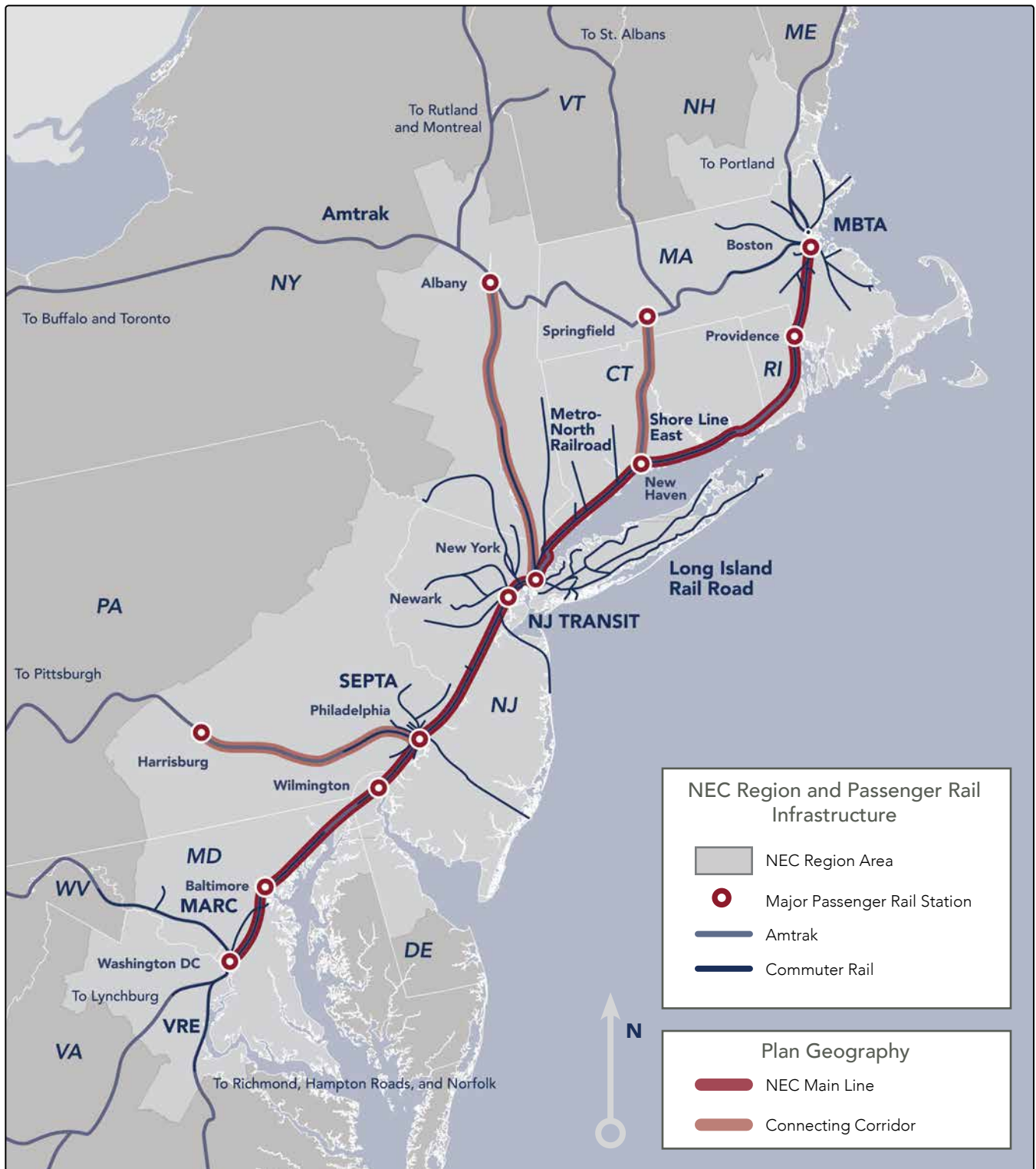
**Ten movable bridges: 1890-1910.**



**Hudson and East River**  
Tunnels: 1900-1910.  
**Baltimore & Potomac Tunnels:**  
1873.



**Key components of electrical**  
and signal system: 1930s.



Map files: National Transportation Atlas Database.

---

# New Level of Coordination

## Comprehensive Planning Process

Care for NEC infrastructure is the responsibility of several agencies, whose individual plans are the basis for the NEC Five-Year Capital Plan. This first-ever region-wide capital plan reflects an unprecedented level of collaboration in setting mutual goals and sharing information. NEC stakeholders are committed to further integrating work programs and prioritizing investments in a coordinated manner in future iterations of the Plan. The NEC Five-Year Capital Plan was also created in close coordination with the development of a long-term vision for the NEC, led by the Federal Railroad Administration (FRA), named NEC FUTURE.



**NEC FUTURE**  
A long-term vision for service  
and infrastructure in 2040 and  
beyond  
[www.necfuture.com](http://www.necfuture.com)



**NEC Cost Allocation Policy**  
An historic agreement  
for sharing operating and  
baseline capital costs  
[www.nec-commission.com](http://www.nec-commission.com)

## Collaborative Approach to Funding

The NEC has many committed funding partners at the federal, state, and local level. In December 2014, the Commission approved the Northeast Corridor Commuter and Intercity Rail Cost Allocation Policy (the Policy) that establishes methods for sharing NEC infrastructure costs among members and provides national and regional policy recommendations to support them, as required by Section 212 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA). Cost-sharing under the Policy will begin at the start of federal fiscal year 2016. The Policy includes a formula that focuses state and Amtrak capital contributions towards basic infrastructure projects. While the Policy will result in additional funding for the NEC, it still does not provide enough funding to cover all the projects included in the Plan. Higher levels of NEC investment require a partnership with the federal government. In particular, it has been the long-standing position of NEC stakeholders that the federal government has primary responsibility for eliminating the backlog of deferred maintenance to restore the infrastructure to a state-of-good-repair.

## Foundation of Past Investment

Investments over the next five years will build on significant recent commitments. States and transit agencies have invested approximately \$2.4 billion in NEC infrastructure over the last ten years, paired with approximately \$2.6 billion in Amtrak investment and over \$1 billion in federal American Recovery and Reinvestment Act (ARRA) and High-Speed Intercity Passenger Rail (HSIPR) program grants.

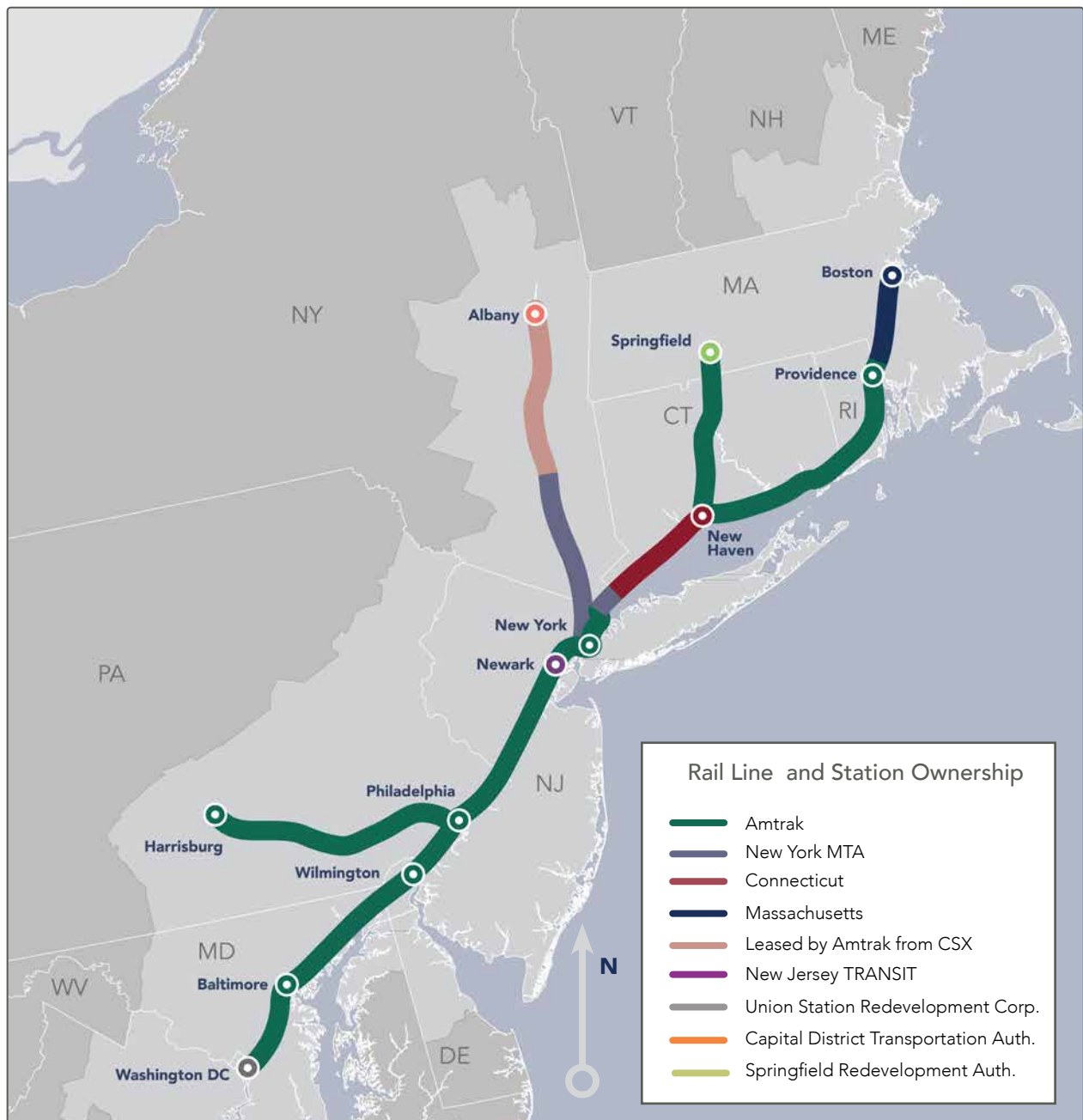
Recent Investment in the NEC Main Line & Connecting Corridors, FY2004-FY2013

**States/agencies: \$2.4 billion**

**Amtrak: \$2.6 billion**

**ARRA/HSIPR: \$1 billion**

Data: Amtrak and state agencies. Analysis: NEC Commission.



Map files: National Transportation Atlas Database.



### Nine Passenger Rail Operators



# Funding Needs

## Capital Needs Rise as Funding Availability Falls

The NEC Five-Year Capital Plan features two components:

-  Documentation of planned capital investments from anticipated sources of funding, and
-  Identification of additional unfunded but feasible investments over the next five years to advance projects that would improve reliability, reduce the state-of-good-repair backlog, and relieve capacity chokepoints.

While necessary and feasible capital investment levels in the Plan grow over the next five years, levels of available funding are actually set to decline. The NEC has benefited from one-time special federal grants through the ARRA and HSIPR programs, but those funds will run out by 2017. For many capital projects, ARRA and HSIPR funds will only cover the costs of planning and design. These initiatives require additional resources to bring construction over the finish line so they can start paying dividends for taxpayers.

Furthermore, historic levels of investment from traditional sources of funding for NEC infrastructure outside of one-time special federal grants have been far below the annual amount required to simply maintain existing assets within a state of good repair. Insufficient capital investment at the federal level over several decades has resulted in a huge backlog of assets aged well beyond their useful life but still in operation today — everything from rail, ties, and electric wire to major bridges and tunnels.

### Traditional Funding Sources

- Amtrak investments supported by Amtrak’s annual federal General Capital Grant
- Ongoing state investments as supported by state and local dollars and federal transit formula funding
- Contributions from operating agencies to the respective infrastructure owners

### Special Funding Sources

- Federal grants from the ARRA, HSIPR, and TIGER programs
- State contributions or matches to projects funded by special federal grants

### State-of-Good-Repair Backlog

Estimate of capital investment needed to replace all assets currently in use but beyond their design life — prone to failure with service reliability impacts

**\$21.1 billion**



**Basic Infrastructure Backlog  
\$7.3 billion**

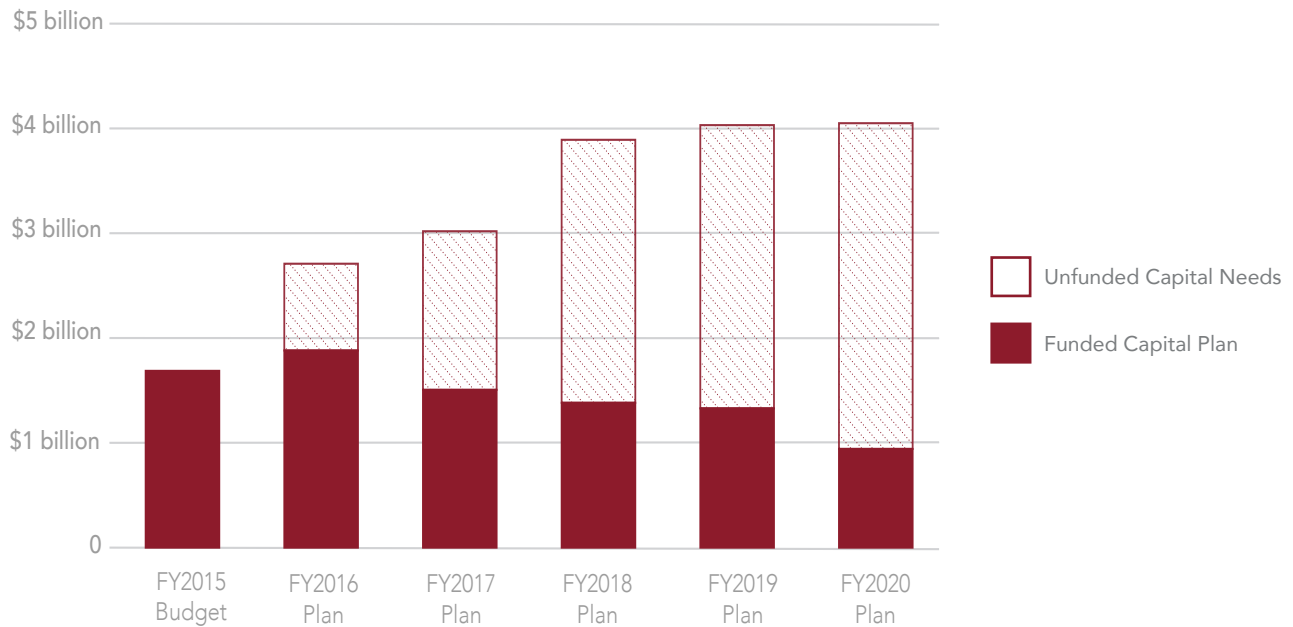


**Major Project Backlog  
\$13.8 billion**

Data: Amtrak and state agencies. Analysis: NEC Commission.



## NEC Five-Year Capital Plan: FY2016-2020, Funded Plan vs. Unfunded Capital Needs



## Comparison: Historic Funding Levels vs. Funding Needs



Data: Amtrak and state agencies. Analysis: NEC Commission.

---

# Funding the Plan

## A Federal, State, Amtrak, and Agency Partnership

The Northeast Corridor Commuter and Intercity Rail Cost Allocation Policy proposes a framework for a federal, state, Amtrak, and local agency partnership to fund the NEC Five-Year Capital Plan. The Policy’s primary achievement is an historic agreement between commuter and intercity rail operators to share operating and baseline capital costs according to relative use, employing consistent and transparent methods. Under the Policy, operators will share approximately \$500 million in operating costs and \$425 million in capital investments annually starting in federal fiscal year 2016.

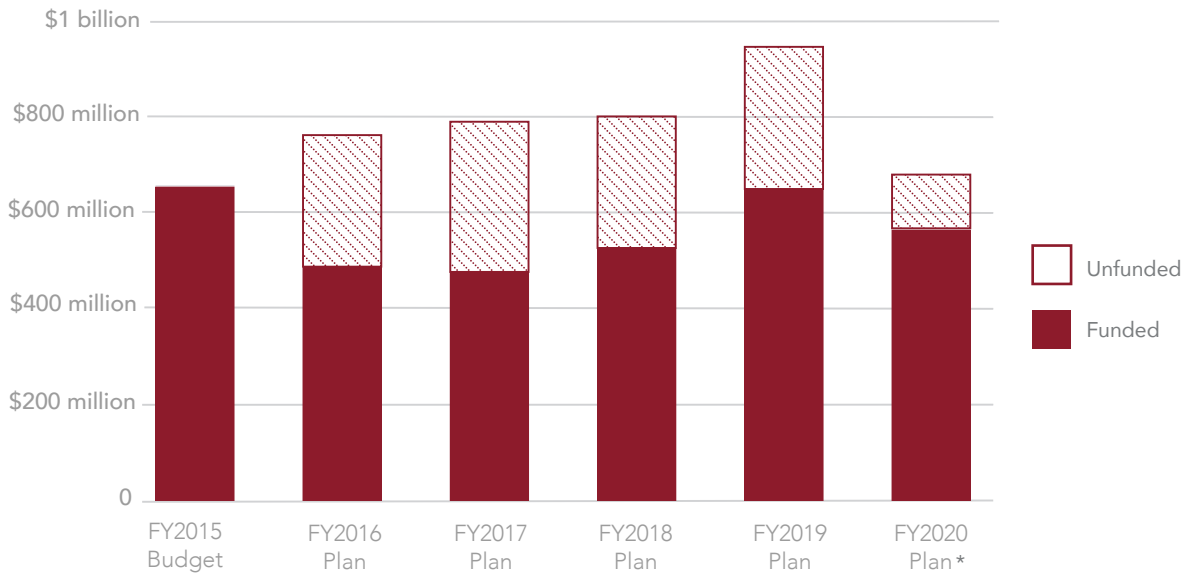
Over the course of a five-year ramp up, the Policy calls on operators to fully fund the normalized replacement of shared basic infrastructure, as defined in the table below. To fill the gap in funding required to eliminate the state-of-good-repair backlog and modernize the NEC, the Policy proposes two partnership programs:

- **Transition Assistance Matching Program:** The Commission recommends that the federal government demonstrate the federal-state partnership that is essential to the NEC’s success by providing a capital funding match that bridges the funding gap as operators ramp up capital contributions over five years.
- **NEC Federal Investment Program:** The Commission recommends that the federal government create a new funding program to provide 80 percent of funding for the Plan above normalized replacement of basic infrastructure (described below), with operators contributing the remaining 20 percent.

Together, these collaborative funding programs would generate the investment necessary to achieve a state-of-good-repair, modernize the system, and build a foundation for economic growth.

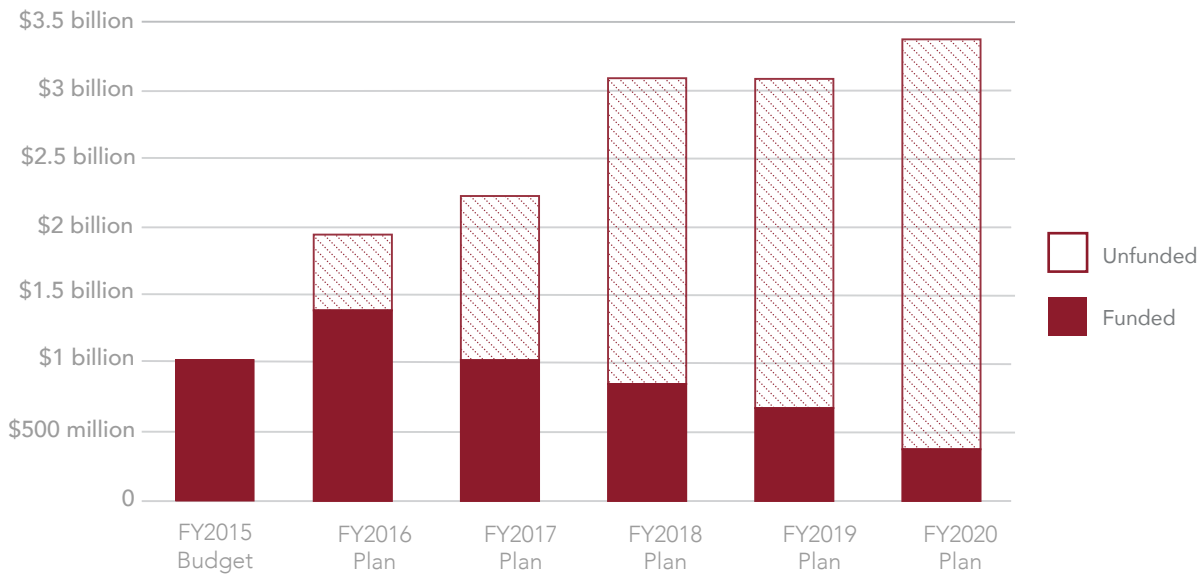
Investment Level	Definition	Established/Proposed Funding Sources
<b>Basic Infrastructure: Normalized Replacement</b>	Level of ongoing investment required to maintain and replace basic infrastructure assets to keep them within their designed useful lives (i.e., to maintain a state-of-good-repair)	<ul style="list-style-type: none"><li>– <b>Shared Benefit:</b> Shared by operators per the Policy (plus Transition Assistance Matching Program)</li><li>– <b>Sole Benefit:</b> Individual operator responsibility to identify funds</li></ul>
<b>Basic Infrastructure: Backlog Elimination</b>	Level of additional investment required to replace basic infrastructure assets already outside their designed useful lives (i.e., to eliminate the state-of-good-repair backlog)	<ul style="list-style-type: none"><li>– <b>Shared Benefit:</b> NEC Federal Investment Program and match</li><li>– <b>Sole Benefit:</b> Individual operator responsibility to identify funds</li></ul>
<b>All Other Projects: Mandated, Major Backlog, and Service Preservation and Improvement Projects</b>	Additional investment required to satisfy legislative mandates, replace major assets already outside their designed useful lives (i.e., to achieve a state-of-good-repair), and modernize and improve train services	<ul style="list-style-type: none"><li>– <b>Shared Benefit:</b> NEC Federal Investment Program and match</li><li>– <b>Sole Benefit:</b> Individual operator responsibility to identify funds</li></ul>

### Basic Infrastructure and Mandated Projects FY2015-2020



\*Basic infrastructure for FY20 primarily consists of Amtrak projects as Metro-North Railroad and the Connecticut Department of Transportation's capital programs run through 2019. Amtrak's FY20 plan is also still incomplete and under development.

### Major Backlog and Service Preservation and Improvement Projects FY2015-2020



# The Plan



# Comprehensive Investment Strategy

The NEC Five-Year Capital Plan integrates all types of capital investment from all owners of and operators on NEC infrastructure, from the mundane swapping of old rail ties for new, to the replacement of generations-old major bridges and tunnels. The Plan categorizes investments in four groups: basic infrastructure, mandated projects, major backlog projects, and service preservation and improvement projects. Many projects and programs share elements of one, two, three, or even all four categories. However, these categories are useful as illustrations of what types of investments are included in the Plan.

NEC Five-Year Capital Plan, Total Investment by Project Category





---

# Investment Categories

The categories of investment defined below and on the next several pages are meant to illustrate the types of projects included in the NEC Five-Year Capital Plan. Each category can also be characterized by the goals achieved through investment: maintenance of safe and reliable service, reduction of assets in the state-of-good-repair backlog, increases in service, improvements in travel time, etc. Though all projects have been put into one of these four categories, in reality many projects achieve goals associated with more than one category.

## Basic Infrastructure

These projects comprise routine capital investments that keep structures and systems functioning properly and in a state of good repair for safe and reliable train operations. These investments fund the ongoing maintenance of existing assets, as well as the replacement of aging components to reduce the state-of-good-repair backlog of basic infrastructure assets.

## Mandated Projects

These projects focus on improving safety or are required by law or regulation to protect public security, safety, and health. These projects include Positive Train Control (PTC) communications systems, Americans with Disabilities Act (ADA) investments at stations, environmental remediation, right-of-way fencing, and other safety projects.

## Major Backlog Projects

These projects advance the replacement or rehabilitation of major backlog infrastructure assets, the largest bridges and tunnels on the NEC rail network, most of which are at least a century old. These large-scale investments each take many years to design and construct. Replacement projects do not simply aim to reconstruct what was built generations ago. These investments will modernize the NEC with infrastructure assets that employ the latest in railroad and construction technology and meet tomorrow's needs. As with service preservation and improvement projects described below, major backlog projects are required to sustain today's service and improve reliability. Some projects may also offer potential improvements like increased service and reduced travel time.

## Service Preservation and Improvement Projects

These projects offer mobility and operational flexibility benefits beyond what the NEC can deliver today, often while supporting ongoing maintenance of existing assets and reducing the number of assets in the state-of-good-repair backlog. These investments are needed to preserve current train services and will lay a foundation for new infrastructure above and beyond the existing NEC to significantly improve reliability, increase service, and reduce travel time.

## Benefits Across Categories: New Jersey High-Speed Rail Improvement Program

The investment categories at left are useful illustrations of the types of projects included in the NEC Five-Year Capital Plan. However, many projects contain elements of multiple categories. Though the New Jersey High-Speed Rail Improvement Program (NJHSRIP) is defined in the Plan as a service preservation and improvement project, its investments also address a large-scale replacement of basic infrastructure assets, many of which are in the state-of-good-repair backlog category. The geographically targeted nature of this basic infrastructure replacement will yield greater benefits than are typically achieved when limited funding requires investment to be spread across the NEC simply to maintain safe operations.

NJHSRIP will overhaul a 24-mile segment of the NEC between New Brunswick and Trenton, N.J. This initiative is fully funded through a \$450-million ARRA grant, but is emblematic of the type of investments that could be made throughout the NEC if the Plan is fully funded.

NJHSRIP covers a portion of the NEC that was initially constructed by the Pennsylvania Railroad in the early 1900s and electrified with overhead catenary wires in the 1930s. Elements of the original signaling and catenary system still exist and are in operation along the line. The aging catenary system is fixed-wire, which means that wire tension varies in reaction to temperature. They expand and sag in hot temperatures and tense up when cold. Both conditions make them prone to snapping, causing serious service disruptions. Variable-tension wires also limit top train speeds.

NJHSRIP will install 16 miles of constant-tension catenary, which will dramatically improve reliability for NJ TRANSIT's busiest commuter rail line while also allowing Acela trains to operate at 160 mph, the fastest passenger rail speed in the Western Hemisphere. Additional investments will include rebuilt track and interlockings, a new signal system, and new or upgraded power supply assets. NJHSRIP is an example of how additional funding for the NEC Five-Year Capital Plan would achieve goals that span many categories and provide benefits to all users.



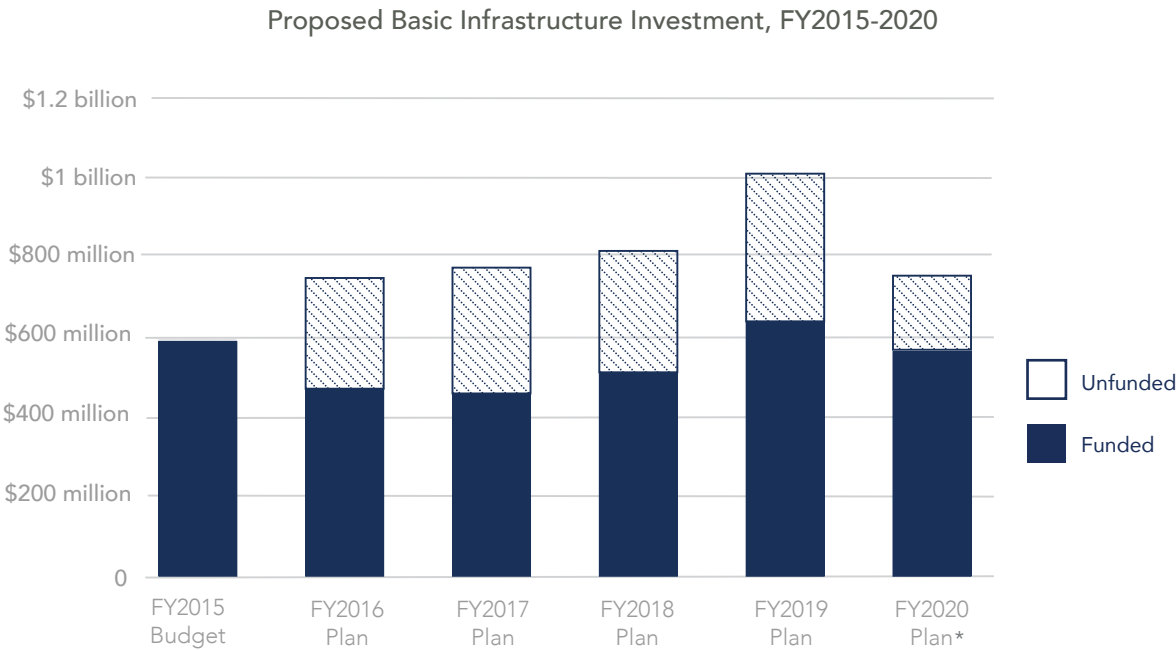
# Basic Infrastructure

## Maintaining and Repairing the NEC

Just like an automobile requires regular maintenance — tune-up’s, brake checks, and oil changes — the NEC rail network requires ongoing work to ensure that trains run safely and reliably. Each asset has a useful life, the period of time that engineers reasonably expect it can remain in operation. Due to inadequate funding over the past several decades, an increasing number of assets have remained in operation too long, entering into the state-of-good-repair backlog. These aging assets are susceptible to failure, creating delays for riders with economic consequences for the Region.

Basic infrastructure investments represent ongoing activities to maintain and renew existing NEC infrastructure and to replace aging assets in the backlog. The NEC Commuter and Intercity Rail Cost Allocation Policy is an historic commitment among rail service operators to fund basic infrastructure renewal at a rate called “normalized replacement” (see table on page 16). The Policy calls for an NEC Federal Investment Program to fund the additional investments required to eliminate the backlog of basic infrastructure assets outside their useful life and achieve a state-of-good-repair.

The Plan proposes to increase investment in basic infrastructure over time, ultimately fully funding annual normalized replacement and eliminating most of the state-of-good-repair backlog for basic infrastructure in fifteen years. In FY16, the Plan proposes a \$725 million investment in basic infrastructure with \$254 million in unfunded capital needs.



\*Basic infrastructure for FY20 primarily consists of Amtrak projects as Metro-North Railroad and the Connecticut Department of Transportation’s capital programs run through 2019. Amtrak’s FY20 plan is also still incomplete and under development.

# Understanding Basic Infrastructure



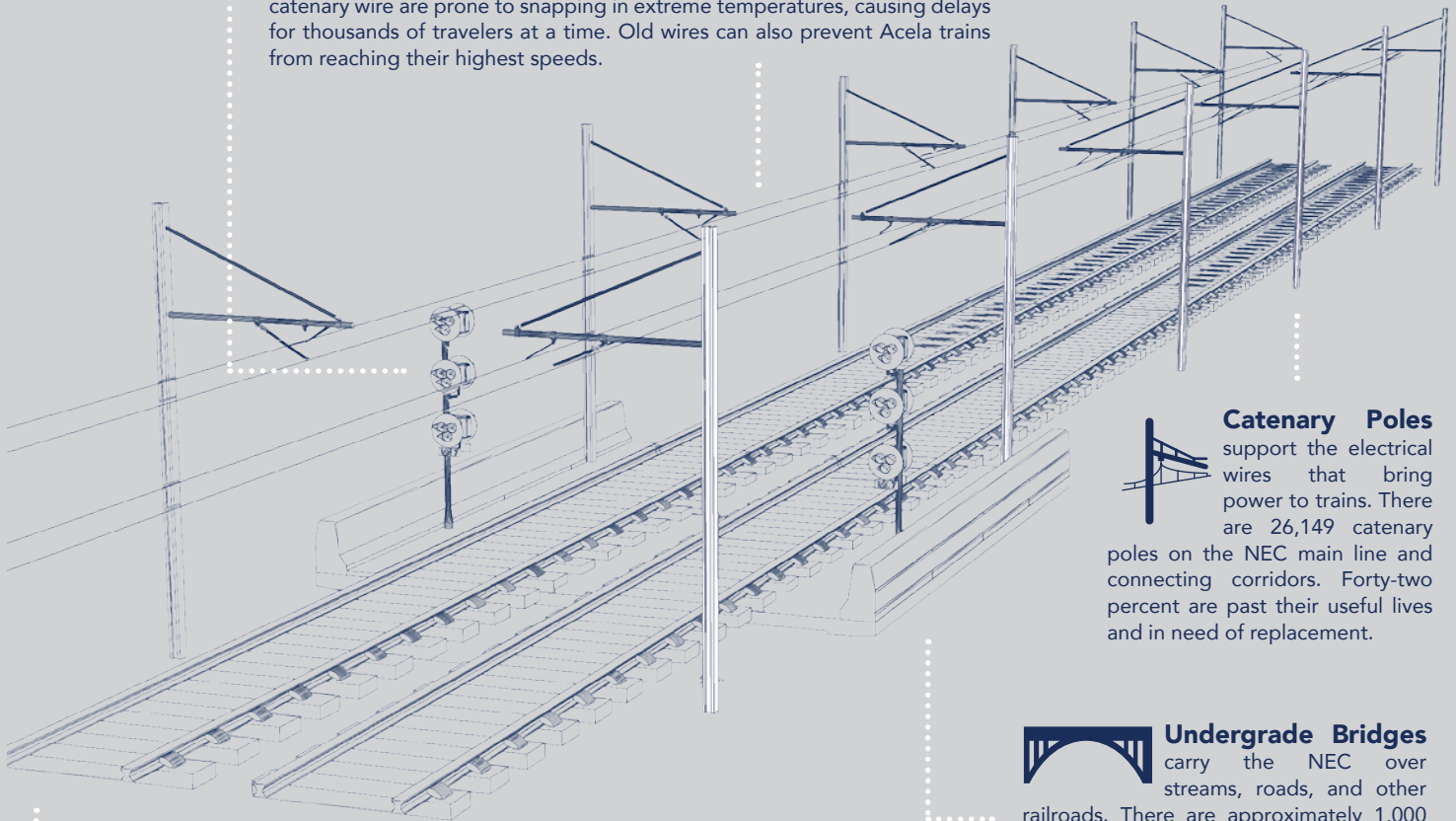
**Signals** are part of the communications system that controls the movement of trains. The signal system consists of components at interlockings which control the movement of trains from one track to another and automatic block signals that control the movement of trains between interlockings. The signal system is among the most outdated of NEC assets as communications technology has rapidly developed over the last several decades. See page 21 for a description of new train control investments on the NEC.



**Interlockings** are special areas of track where turnouts and crossovers enable trains to move from one track to another. Interlockings are highly complex assets involving specialty track, catenary, and signal infrastructure. With insufficient resources, interlocking work has typically been limited to tactical repairs aimed at short extensions of useful life. The Plan includes a more ambitious replacement program to take advantage of technological advances over the last few decades that would improve performance, prolong the useful life, and reduce maintenance costs.



**Catenary Wire** distributes energy from the region's power grid to train equipment that runs on electricity through a complex system of frequency converters and substation facilities. There are 1,563 miles of catenary wire on the NEC main line and the connecting corridor to Harrisburg. Large parts of the NEC's electrical system were constructed in the 1930's and 62 percent of all catenary is in need of replacement. Outdated catenary wire are prone to snapping in extreme temperatures, causing delays for thousands of travelers at a time. Old wires can also prevent Amtrak trains from reaching their highest speeds.



**Catenary Poles** support the electrical wires that bring power to trains. There are 26,149 catenary poles on the NEC main line and connecting corridors. Forty-two percent are past their useful lives and in need of replacement.



**Track** is the foundation of the railroad. It is comprised of steel rail fastened to wood or concrete ties, nestled in a trackbed composed of crushed stone, or ballast, followed by subgrade layers constructed above the natural ground. The trackbed prevents rail and ties from shifting under train traffic and enables proper drainage to slow the rate of deterioration of the track structure. With insufficient resources, track work has frequently been limited to cyclical replacement of rail and ties. Such repairs temporarily permit safe and comfortable travel but can fail to address more serious degradation within the foundation. Underinvestment in the track structure eventually results in substandard conditions that cause trains to reduce their speed along sections of track, increasing delays and decreasing ride comfort. The Plan includes full replacement of the track structure, called undercutting, which is now necessary across much of the NEC.



**Undergrade Bridges** carry the NEC over streams, roads, and other railroads. There are approximately 1,000 such bridges on the NEC, hundreds of which date back to 1880 or earlier, with nearly half built between 1900 and 1920. Though these assets can have useful lives lasting 100 years or more, the fact that so many were built in a small window of time means that large numbers of them now or will soon require major rehabilitation or replacement. At the current rate of available funding, it would take over 300 years to replace all of these bridges, well beyond the timeframe in which such assets would simply be shut down, disrupting continuous service along the NEC.

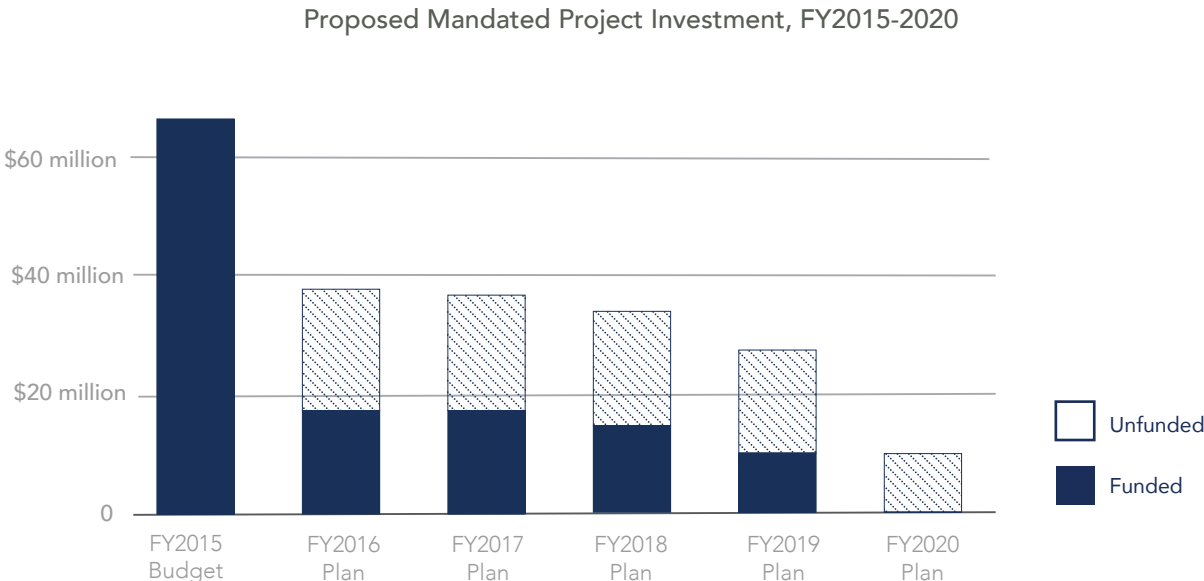
# Mandated Projects

## Promoting Safety, Security, and Accessibility

All investments in the NEC Five-Year Capital Plan are aimed at ensuring the safety of riders and local communities. While many of the Plan’s investments promote a broad range of goals, mandated projects are targeted primarily at promoting safety and ensuring compliance with federal regulations.

Through FY20, the Plan’s largest investment in mandated projects is PTC, a special signaling technology designed to prevent collisions and ensure safe operating speeds. Regulations published by the Federal Railroad Administration (FRA) require PTC to be implemented on any railroad main lines that carry regularly scheduled passenger rail services, including the NEC main line and connecting corridors.

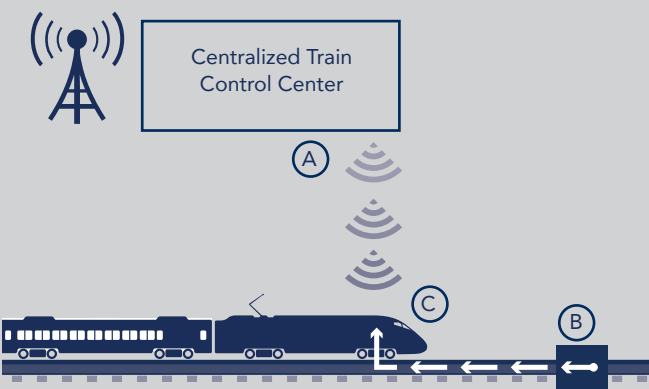
Other investments include electronic equipment and fencing to improve security; improvements to rail stations to ensure accessibility compliance with ADA; and environmental remediation to address contamination and other environmental hazards from past decades, which, left unaddressed, could pose health and safety risks for railroad workers and local communities. In FY16, the Plan proposes a \$38 million investment in mandated projects with \$21 million in unfunded capital needs.





# Understanding Positive Train Control

Railroad systems send train engineers a constant stream of information regarding safe operations. In a PTC system, if the train engineer does not comply with all directions, the train automatically stops. A limited form of PTC, called Automatic Train Control (ATC), has been in use on the NEC Region’s passenger rail lines for decades. For the launch of the Acela service in 2001, Amtrak installed additional systems that resulted in a full form of PTC on the Amtrak-controlled portions of the NEC main line. In the NEC Five-Year Capital Plan, the region’s stakeholders are investing to expand full PTC to all rail lines, including the entire length of the NEC main line and connecting corridors.



## How PTC works on the Northeast Corridor

A. Dispatchers at a **Centralized Electrification and Traffic Control Center** (CETC) use a radio network to send information about temporary speed restrictions and special speeds at curves and other areas.

B. Signals along the railroad, called **Automatic Block Signals** (ABS), use the metal tracks to send information about the maximum authorized speed in a given area and conditions in the track up ahead.

C. Inside the train, if the **engineer** does not follow an order, a warning sounds. If the engineer still does not follow the order, the train comes to an automatic stop.

## 1. PTC prevents collisions between trains

**Current status: Installed 1920s-1950s**

Early technology, called **Automatic Train Control** (ATC), was implemented in the mid-20th Century and utilizes Automatic Block Signals to prevent collisions. The Five-Year Plan includes maintenance and upgrades to ATC as part of implementation of full PTC.



## 2. PTC ensures that trains brake at “Stop Signals”

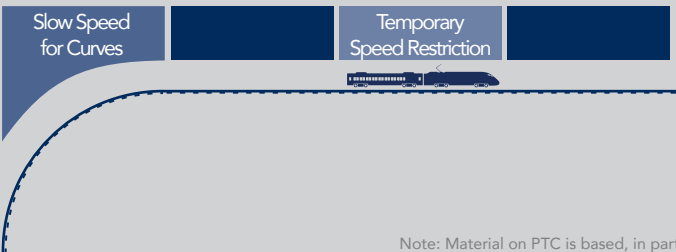
**Current status: Partially installed**

**Stop Signals**, controlled by dispatchers at CETCs, prevent trains from entering an interlocking without permission.



## 3. PTC prevents derailments due to unsafe speeds

**Current status: Partially installed**



Note: Material on PTC is based, in part, on a presentation by the NY Metropolitan Transportation Authority, January 2014.

# Major Backlog Projects

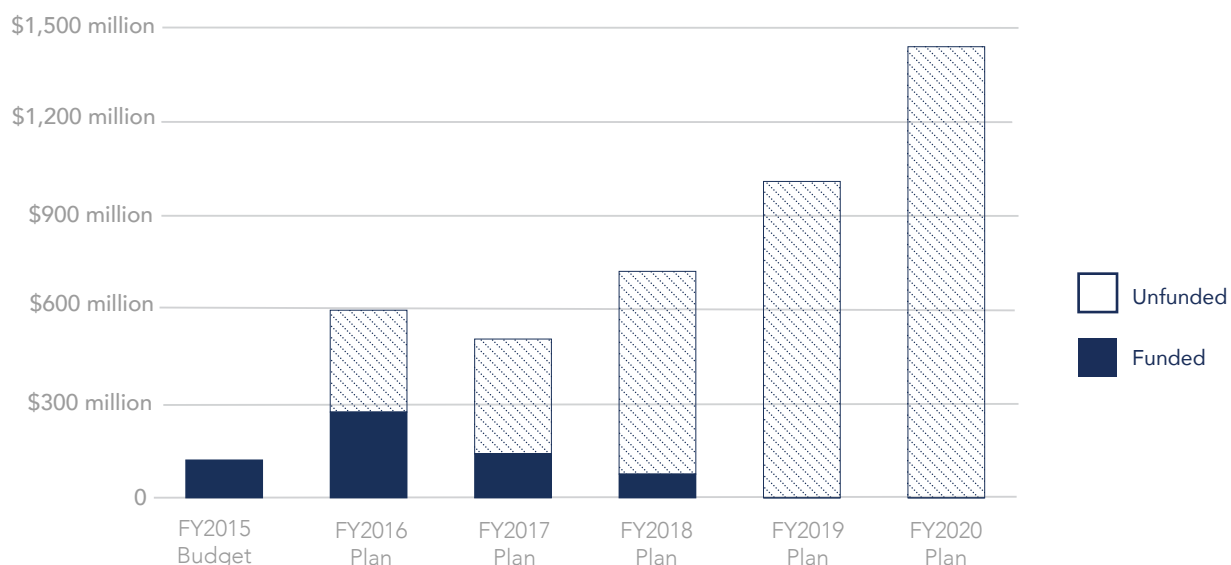
## Replacing Century-Old Assets

Much of the NEC we know today was built in a series of major investments by various private railroads around the turn of the 20th Century. NEC passengers continue to rely on bridges, viaducts, and tunnels constructed over a century ago. The largest and most critical of these assets make up the major project backlog: ten movable bridges, three sets of tunnels, and one viaduct, that are all in need of full-scale replacement. Dating from as far back as 1873, these assets have remained in service beyond their designed useful lives. They require extensive maintenance and malfunction frequently, causing delays throughout the NEC.

Replacement projects are major investments intended to support generations of future passengers. Therefore, the goal is not simply to rebuild what was possible or appropriate a century ago. These projects are designed to take advantage of the latest in railroad and construction technology and to anticipate the needs of the railroad decades in the future. Additionally, projects of this scale and duration require sizable and predictable funding streams if they are to be executed efficiently and extensive regional coordination to minimize construction impacts on operations across NEC.

The Plan combines funded activities with unfunded needs, including construction on currently shovel-ready projects and pre-construction activities (planning, design, permitting, etc.) for others depending on what phase they are today in the project development process. In FY16, the Plan proposes a \$599 million investment in major backlog projects with including \$325 million in unfunded needs. Some projects in the Plan were funded for pre-construction activities by ARRA, HSIPR, and other publicly funded programs. Without additional funding, these taxpayer investments run the risk of being wasted on designs that never get built or have to be redone. The longer a project sits on the shelf, the higher the likelihood work must be repeated as field conditions require reverification and designs require updates.

Proposed Major Backlog Project Investment, FY2015-2020



# Understanding Major Backlog Projects



**Average age of major backlog asects: 111 years old**



**Corridor-wide delays and capacity bottlenecks**



**Expensive maintenance and operating costs**

Boston

Providence

**Needs Constant Repair**

Hartford Viaduct, 1888  
Connecticut River Bridge at Windsor Locks, 1904

New Haven

**3,000 Openings per Year**  
Connecticut River Bridge, 1907

**Delays from Bridge Deterioration**

Devon Bridge, 1905  
Saugatuck River Bridge, 1904  
Norwalk River Bridge, 1896  
Cos Cob Bridge, 1904

New York City

Newark

**Tunnels Suffered Damage from Superstorm Sandy**

Hudson River Tunnels, 1910  
East River Tunnels, 1910

**Must be Manned Daily by a Bridge Operator**

Pelham Bay Bridge, 1907

**Malfunction Delays**

Portal Bridge, 1910

**30 Workers Required to Open the Bridge**

Susquehanna River Bridge, 1906

**Two Track Bottleneck**

Bush River Bridge, 1913  
Gunpowder River Bridge, 1913

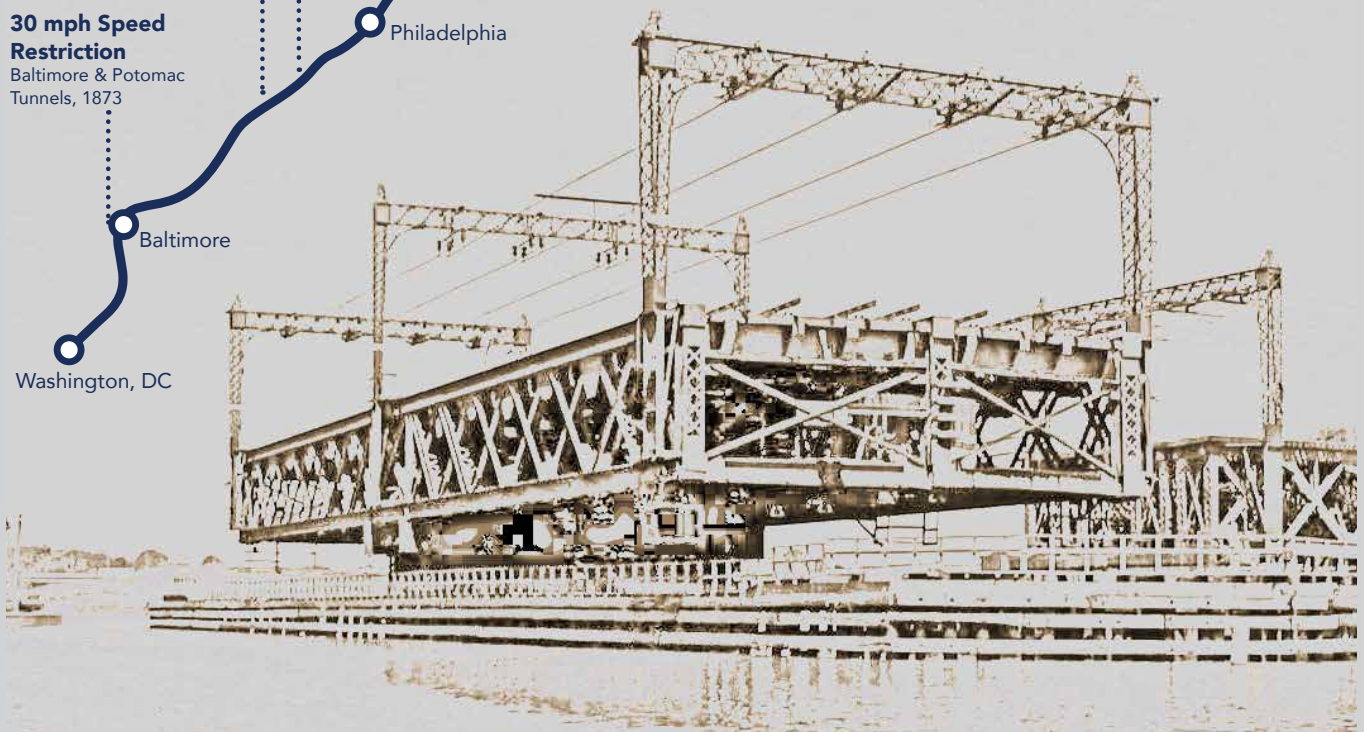
Philadelphia

**30 mph Speed Restriction**

Baltimore & Potomac Tunnels, 1873

Baltimore

Washington, DC



Norwalk River Bridge, Connecticut

# Service Preservation and Improvement Projects

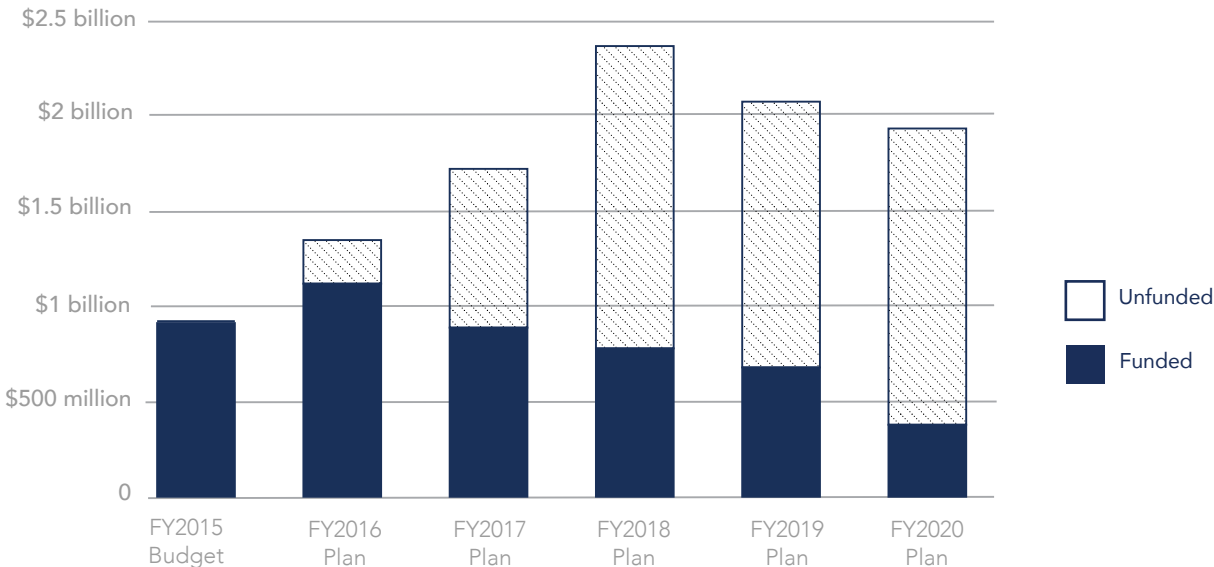
## Modernizing Existing Infrastructure & Building for the Future

Despite its deteriorating condition, the NEC has experienced tremendous growth in service and ridership over the past thirty years. During that time, corresponding increases in infrastructure capacity have not been built, resulting in capacity bottlenecks. These chokepoints diminish the reliability of today’s services and limit the region’s ability to add more trains and serve even modest projections of travel demand growth.

Service preservation and improvement projects aim to improve the quality and efficiency of today’s rail service needs and lay a foundation for increased service to support projected growth. Investments include projects to modernize outdated and inefficient systems, increase track capacity at critical chokepoints, and build new or upgraded stations to grow ridership and spur economic development. Such projects frequently include the installation of new basic infrastructure assets, supporting general state-of-good-repair and backlog reduction. What separates these projects from those classified as basic infrastructure is the scale of the effort — comprehensive replacement of systems, as opposed to the incremental swapping of old components for new ones.

The Plan includes investments in all phases of project development. As with major backlog projects, these investments include a number of partially funded projects, for which ARRA, HSIPR, and other funds will advance pre-construction activities during the FY16-20 time frame, but not put shovels in the ground. Additional funding must be identified to fully take advantage of the investments already underway by advancing these projects through construction. In FY16, the Plan proposes a \$1.34 billion investment, including \$223 million in unfunded capital needs.

Proposed Service Preservation and Improvement Project Investment, FY2015-2020





# Understanding Service Preservation and Improvement Projects



## Modern Systems and New Technology

The international railroad industry has decades worth of innovations that are not yet utilized by NEC agencies. The rapid advancement of technology has especially influenced the field of railroad communications and signaling. The signal system in use today on the New Haven Line dates back to the early 1980s and has an expected lifespan of 30 years. The state of Connecticut is in the process of installing a modern system that will improve the efficiency, reliability, and capacity of the railroad, in addition to providing the safety benefits required by the PTC mandate from Congress (see page 25). This is an example of a cross-cutting service preservation and improvement project, with elements related to basic infrastructure, backlog reduction, mandate compliance, and service improvement.



## Comprehensive Basic Infrastructure Investments

Today's NEC is limited in terms of reliability, capacity, and speed by several factors including poor track condition and outdated infrastructure systems. However, comprehensive investments in specific segments can create the conditions for higher capacity, better on-time performance, and faster speeds all at once. NJHSRIP (see page 21) is an example of a service preservation and improvement project with comprehensive basic infrastructure investments across an entire 24-mile stretch of the NEC for increased reliability and speed. The New Haven-Hartford-Springfield Rail Program (NHHS) is similarly overhauling dozens of miles of railroad with new and refurbished track, structures, signals, and stations to support increased service reliability and frequency. The Plan requires additional funding to complete similar investments north of Hartford.



## Eliminating Capacity Chokepoints

There are many locations along the NEC where existing track infrastructure impedes reliability today and prevents service expansion in the future. The most problematic capacity chokepoint on the NEC exists between Newark, NJ and New York Penn Station (see page 37). This two-track stretch is the most densely trafficked railroad in the Western Hemisphere. The NEC must grow to a minimum of four tracks, both to accommodate growth and to create the redundancy necessary to rehabilitate existing tunnels under the Hudson River which, in addition to being over a century old, were badly damaged during Superstorm Sandy. This immense undertaking, called the Gateway Program, requires construction of multiple tunnels and major bridges but has only a fraction of the needed funding. The Plan lays out funding requirements for the concerted advancement of the Gateway Program between FY16-20.



## Station Investments

Many stations along the NEC are either deteriorating in condition, suffering from overcrowding, or, in some cases, both. One partially funded station improvement is the construction of Moynihan Station, an expansion to relieve congestion at New York Penn Station. State, local, and federal funds, including ARRA funds, are supporting the construction of Phase 1 of the project, which will build a new passenger concourse under the existing Farley Post Office building, adjacent to NY Penn Station. The Plan proposes to advance Phase 2 to convert the post office building into a grand station hall, with ticketing, waiting areas, retail, and other amenities, promising to dramatically improve the passenger experience for thousands of NEC riders.



# Benefits of Investment



# Broad National Impact

The NEC Five-Year Capital Plan — if fully funded — would advance construction of a more efficient, more reliable, and higher capacity railroad. Passengers would feel the benefits of investment primarily in fewer delays and better service. Residents of the Northeast would see new or improved station facilities in the hearts of their hometowns and key job centers, supporting the economic vitality of their surrounding communities. But the benefits of investment would reach deeper into the economy and more broadly across the country. The NEC Five-Year Capital Plan — if fully funded — would employ 42,200 manufacturing and construction jobs on average per year in as many as 22 states ranging from South Dakota to South Carolina. Those workers would build a foundation for modernizing and preparing the nation's most important passenger railroad for future generations.

## Grow Our Economy



### Economic Development

Invest in more than 30 stations in communities housing 7 million jobs, or 1 out of 3 in the Northeast



### Jobs

Support 42,200 direct jobs per year in construction, manufacturing, and related industries in as many as 22 states

## Modernize Our Infrastructure



### Reliability

Reduce malfunctions where single points of failure can delay thousands and cost millions of dollars



### Efficiency

Automate outdated manual tasks to maximize the productivity of each operating and maintenance dollar

## Prepare For Our Future



### Resiliency

Reduce vulnerability to mobility failures and economic disaster in the face of extraordinary events



### Growth

Lay a foundation for rail service expansion

# Grow Our Economy

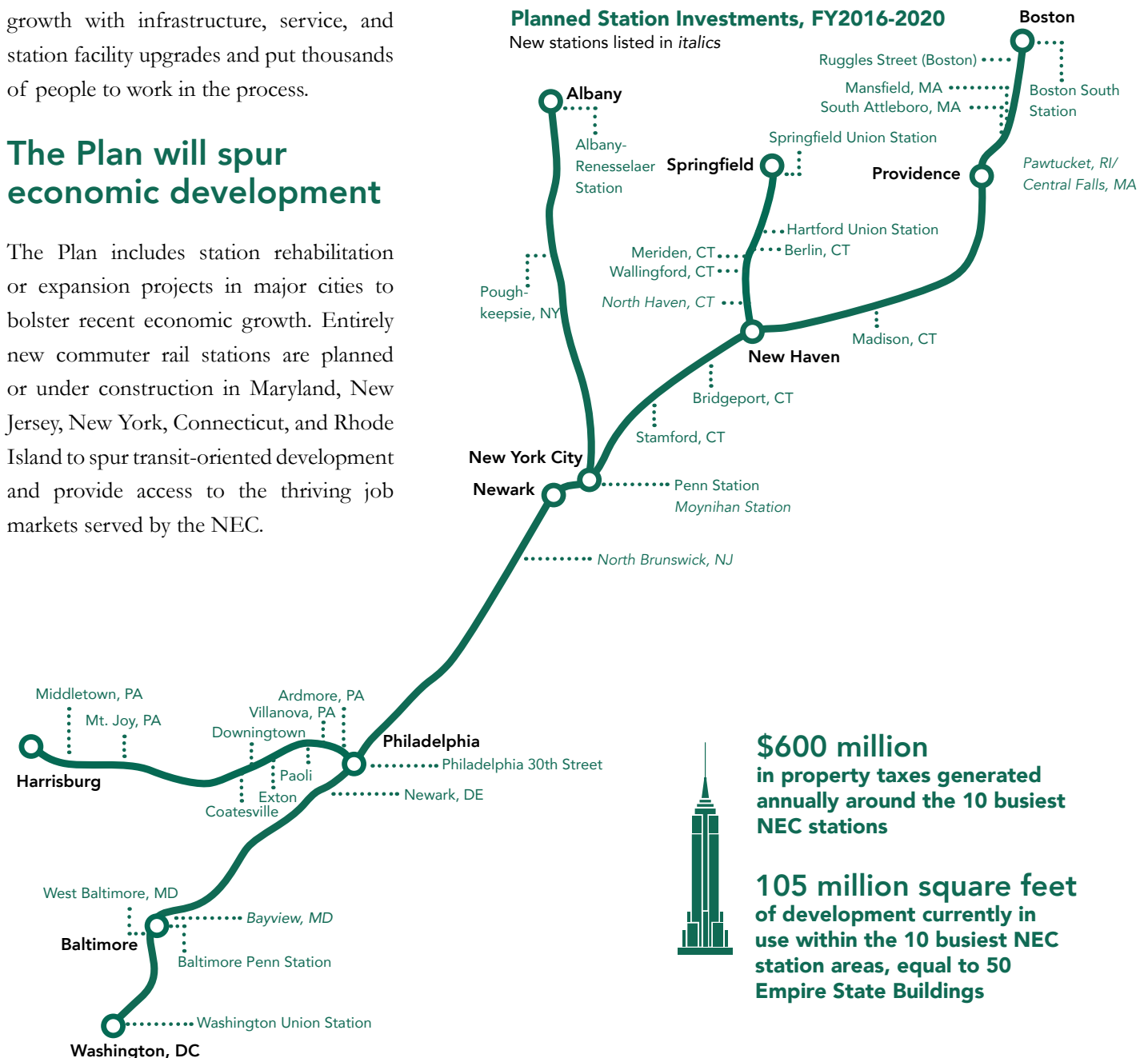
The NEC provides a critical connection for hundreds of thousands of workers into the heart of some of the nation's strongest job markets. This workforce contributes \$50 billion each year to the United States gross domestic product. Seven million jobs, or one out of three jobs in the NEC Region, are within 5 miles of an NEC station. That proportion may grow as billions of dollars of real estate development projects have recently been completed or are under construction within walking distance of stations like Washington, Baltimore, Wilmington, Philadelphia, Newark, New York, Stamford, New Haven, Providence, and Boston. The Plan will support this growth with infrastructure, service, and station facility upgrades and put thousands of people to work in the process.

## The Plan will spur economic development

The Plan includes station rehabilitation or expansion projects in major cities to bolster recent economic growth. Entirely new commuter rail stations are planned or under construction in Maryland, New Jersey, New York, Connecticut, and Rhode Island to spur transit-oriented development and provide access to the thriving job markets served by the NEC.

### Planned Station Investments, FY2016-2020

New stations listed in *italics*



**\$600 million**  
in property taxes generated  
annually around the 10 busiest  
NEC stations

**105 million square feet**  
of development currently in  
use within the 10 busiest NEC  
station areas, equal to 50  
Empire State Buildings





## The Plan will create jobs

Implementation of the Plan itself will create and support thousands of jobs in the fields of engineering, planning, design, manufacturing, and construction. The Plan — if fully funded — would employ 42,200 workers on average per year, mainly in manufacturing and construction. Jobs would be created through a combination of new hires at existing agencies and contracts with private engineering and construction firms. Another 22,700 jobs would be supported annually across all sectors of the economy as these workers spend their incomes and return dollars to the economy.



**42,200 jobs per year**  
Jobs in engineering,  
manufacturing, construction,  
and other supporting industries



**22,700 jobs per year**  
Additional jobs across all sectors  
as a result of increased earnings  
and spending

## The Plan will benefit workers across the United States

In addition to creating jobs within the NEC Region, the Plan will also drive economic growth across the United States. Amtrak and Metro-North Railroad work with material suppliers throughout the country to procure the raw steel, wood, concrete, and granite that become the rails, ties, and ballast of the NEC. Companies that manufacture components used in the NEC's power and signal systems are also located across the United States. Construction materials and manufacturing are sourced from companies located in as many as 22 states.

The Plan — if fully funded — would support jobs in these communities and grow the number of firms and workers across the United States that benefit from investment in the NEC.

- NEC Main Line
- Material Supplier



Source: Amtrak, Metro-North

---

# Modernize Our Infrastructure

The NEC is a nineteenth- and early twentieth-century railroad, in places still hand-operated with levers and cranks. The backlog of assets still in operation that are well beyond their useful life is staggering. Such infrastructure components are failing at increasing rates, with major impacts on service reliability and ongoing maintenance costs. The Plan will make progress toward reducing this backlog over five years, replacing older assets with advanced railroad technology that improves performance and minimizes cost.

## The Plan will increase operations and maintenance efficiency

Operating assets over one hundred years old is an expensive business. Some components have long ceased to be manufactured by the private sector. Without full scale replacement, spare parts must be custom ordered or patched together by resourceful engineers from recycled pieces. Other assets, like large moveable bridges, routinely require crews of dozens of workers to complete tasks where a modern replacement would be operated remotely at the touch of a button. The upfront investments in the Plan will pay long-term dividends by making ongoing operations and maintenance more cost-efficient.

Pelham Bay Bridge, NY

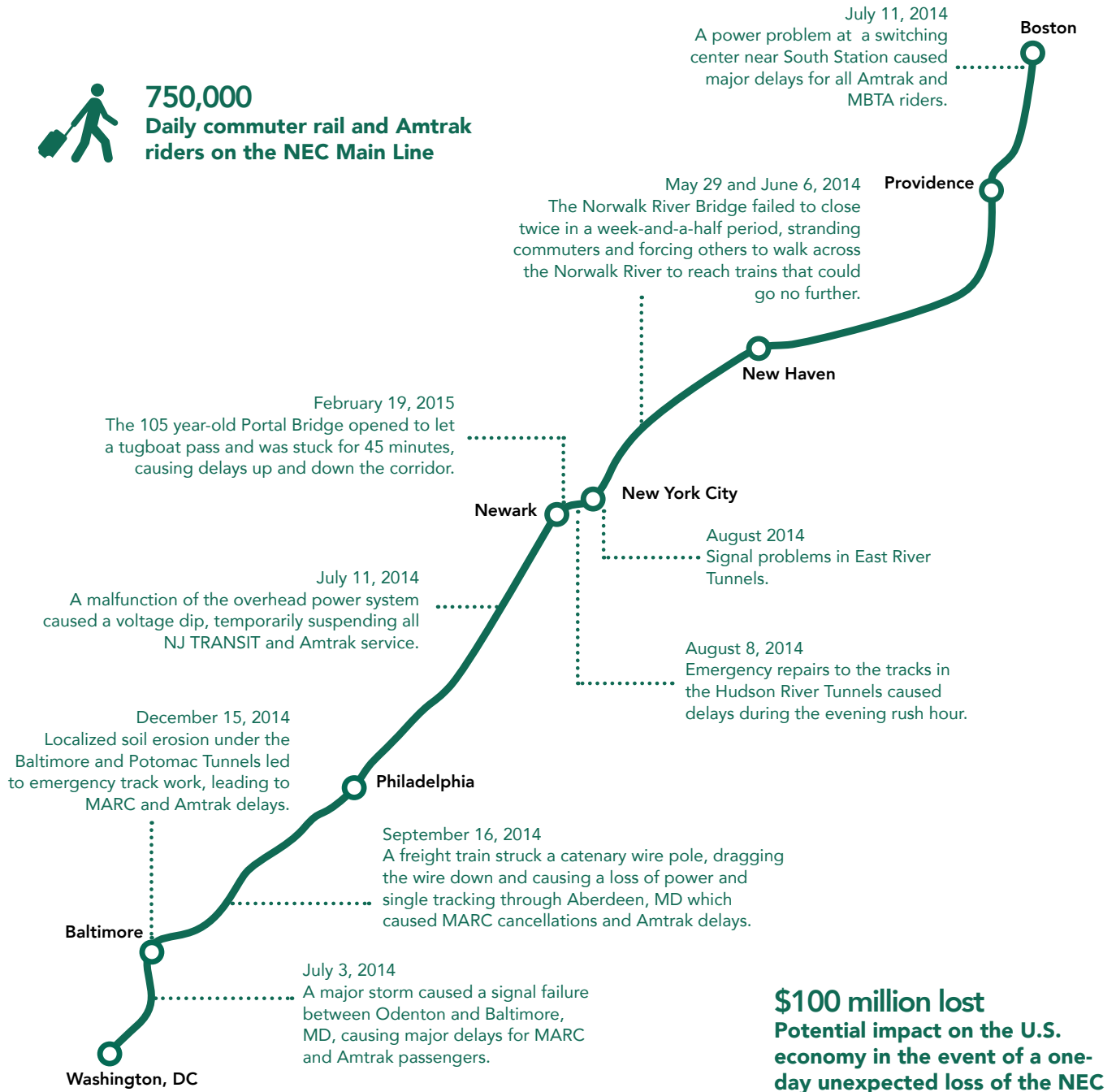




## The Plan will increase service reliability

Some infrastructure failures trap passengers on trains for hours. In the fall of 2013, a power supply failure along the New Haven Line stopped service on the NEC for nearly two weeks. An unexpected loss of the entire NEC for just one day could cost the nation \$100 million in additional highway congestion, lost productivity, and other transportation impacts. The Plan is driven by infrastructure failure rate data and targets those investments that will have the greatest impact on improving system performance.

### Infrastructure failures create delays for commuter rail and Amtrak riders across the NEC Region.



## Shovel Ready in 2015: Portal Bridge North, NJ

Portal Bridge stands apart as the most emphatic example of where additional capital funding is needed on the NEC. Not only is it one of the most severe sources of service disruptions across the network, but fully completed designs for a new bridge – completed in 2013 at a taxpayer expense of \$69 million, including a \$38 million HSIPR grant – sit on a shelf gathering dust. Delays in securing funding for construction risk requiring designs to be revisited at additional expense.

Portal Bridge is a two-track, moveable bridge that was completed in 1910 as part of the Pennsylvania Railroad's effort to link its vast rail network to Midtown Manhattan. The bridge lies between Newark, NJ and New York, NY along the most densely trafficked segment of the NEC with approximately 450 daily trains and 180,000 daily passenger trips on NJ TRANSIT and Amtrak. In recent years, Portal Bridge has grown in importance for NJ TRANSIT as its train traffic across the bridge has more than doubled over the last 20 years. Today approximately 58 percent of NJ TRANSIT rail passenger trips cross Portal Bridge.

The existing bridge is the source of serious reliability problems and is speed-restricted to 60 miles per hour, compared to 90 miles per hour on adjacent sections of track. It consists of seven spans totaling 961 feet, with a 300-foot middle span that swivels 90 degrees to accommodate maritime traffic on the Hackensack River. The clearance of the bridge is only 23 feet at high tide, requiring that it open for water traffic around 100 times each year for an average of 15 minutes per opening. In each of the last two years, 94 percent of openings caused train delays.

More serious delays occur when the bridge fails to lock back into place after opening. In 2014, 15 of the 99 openings resulted in a malfunction where the bridge failed to close properly. On average, malfunctions took 72 minutes to repair. Between 2009 and 2013, NJ TRANSIT reports that over 2,000 trains were delayed as a result of Portal Bridge openings and malfunctions.





If constructed, the new fixed-span Portal Bridge North is designed to provide higher clearance for maritime traffic. Trains would no longer encounter bridge-related speed restrictions or delays from bridge openings and malfunctions. The Portal Bridge North project would immediately improve reliability and build redundancy at this critical NEC capacity chokepoint. Though the Plan proposes to invest approximately \$1 billion to complete this project by 2020, none of that funding has yet been secured.

## The Trans-Hudson Bottleneck

At the height of the morning rush hour on September 2, 2014, a train became disabled in the south tube of the two Hudson River tunnels, closing it for several hours. A total of 61 NJ TRANSIT trains were delayed and its passengers experienced a collective productivity loss of over \$1 million, according to agency estimates. On Friday, February 20, 2015, ice build up knocked out power in the tunnels 12 times in one day, including one two-hour delay during the evening rush. Amtrak must employ ice patrols during extreme low temperatures to remove icicles that form on or around the overhead catenary wire, disrupting the delicately choreographed movement of trains in and out of Manhattan.

These same century-old tunnels experienced significant damage during Superstorm Sandy and must each be taken out of service for up to a year for extensive rehabilitation. If capacity between New York and New Jersey is reduced from two tracks to one, peak-hour service might have to be cut by as much as 75 percent.

Portal Bridge North is just the first in a much larger series of necessary investments to relieve the two-track chokepoint between Newark and New York. This coordinated set of projects is referred to collectively as the Gateway Program. These longer-term plans call for the construction of four continuous tracks along this most densely-trafficked segment of the NEC, including two new tunnels under the Hudson River and a Portal Bridge South to allow for decommissioning of the existing bridge.

Implementation of the entire Program will take many years to complete. The Plan proposes a practical strategy for its development over the next five years. Though it is critical to advance the Program as quickly as possible to avoid a nightmare scenario in which service under the Hudson River is cut by as much as 75 percent, only a fraction of the necessary funding for FY16-20 has been secured.



---

# Prepare For Our Future

The investments required simply to preserve today's NEC train services are immense. The bulk of investments in the Plan, across all four project categories, are focused on this need. However, in building to preserve today's train service, the NEC must also prepare for the future. Recent history demonstrates the need to plan for two key trends: increases in extreme weather events and growth in travel demand. The Plan addresses these trends with infrastructure projects that will reduce vulnerability to changes in temperature, protect against flooding, and add capacity both for maintaining service during emergencies and growing service to meet demand forecasts.

## The Plan will improve system resiliency

Superstorm Sandy most vividly demonstrated the need for resilient and redundant infrastructure. Tunnel flooding under the Hudson and East Rivers caused hundreds of millions of dollars in damage. Without additional capacity between New York and New Jersey, future closures for those repairs could reduce capacity by as much as 75%. The Plan accounts for fixing damaged assets while building to protect assets at risk. These projects will improve reliability, reduce the severity of service impacts during emergencies, and reduce the costs of recovering from future disasters.

**MTA workers repair damage on the Metro-North Hudson Line following Superstorm Sandy in 2011.**

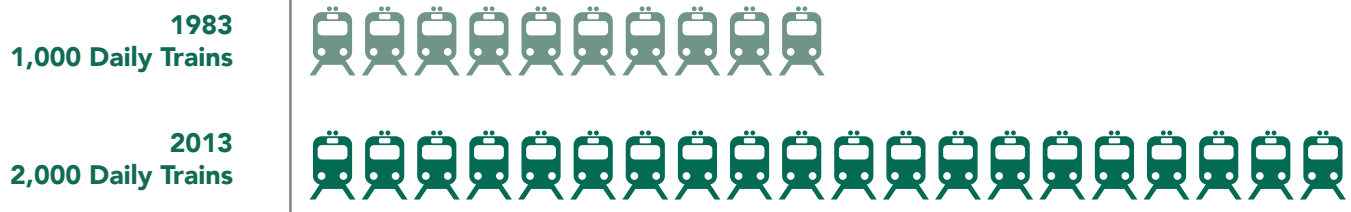


## The Plan will lay a foundation for growth

Over the last three decades, commuter rail ridership in the Northeast has essentially doubled, far outpacing the overall growth in employment and population. Since the launch of the Acela service in 2000, annual Amtrak ridership on the NEC has grown by 5 million riders, a 50% increase. However, investments in capacity have not kept pace with the growth in ridership. Several stretches, most notably the stretch of bridges, tunnels, and tracks between Newark and New York, are now operating at capacity and will not be able to accommodate even modest growth projections. The Plan — if fully funded — would invest in projects to relieve the most serious bottlenecks that restrict additional service on the NEC and lay a foundation for growth.

**Rail service on the NEC has effectively doubled over the past thirty years, creating capacity constraints that limit the ability to add more trains and meet the projected growth in future travel demand.**

Daily Weekday Trains, NEC Main Line



Annual Ridership, Northeast Commuter Rail Systems (On and Off NEC)



Data: Amtrak and state agencies. Analysis: NEC Commission.



# Plan by Geography



# Investments in Your Community

The NEC operates as a system, where problems in a single location can have ripple effects across the Northeast. However, the nature of its operation and the condition of its infrastructure can vary considerably across its hundreds of miles of railroad. What every region has in common is a gap between available funding and investment needs.

## Key



**Funded projects**



**Partially funded projects**



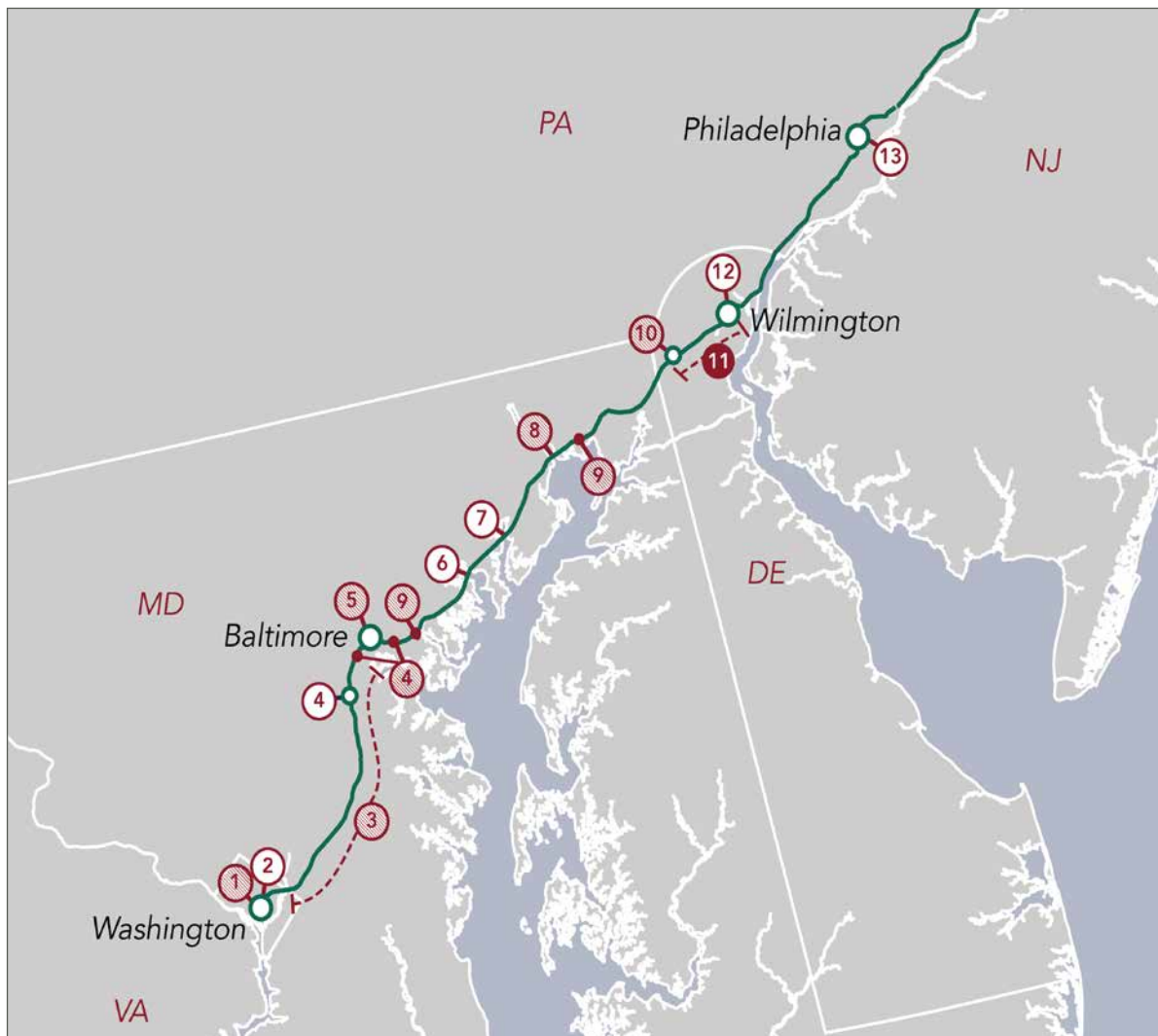
**Unfunded projects**



**Shovel Ready**

**Projects that could begin construction by 2020 if additional funding were available**

# Washington, DC to Philadelphia, PA



- |   |   |
|---|---|
| 1. Washington Union Station Master Plan                             | 8. Susquehanna River Bridge Replacement   |
| 2. Train Storage and Service Facilities at Washington Union Station | 9. MARC Storage Facility Improvements     |
| 3. Baltimore to Washington Section Improvements                     | 10. Newark Regional Transportation Center |
| 4. MARC Station Improvements  | 11. Delaware Third Track Program          |
| 5. Baltimore & Potomac Tunnels                                      | 12. Delaware DOT Station Improvements     |
| 6. Gunpowder River Bridge Replacement                               | 13. Zoo Interlocking                      |
| 7. Bush River Bridge Replacement                                    |   |

## Overview

The segment of the NEC from Washington, DC to Philadelphia, PA is approximately 130 miles long and owned entirely by Amtrak. Three commuter agencies operate passenger service along with Amtrak. Maryland Area Regional Commuter (MARC) operates between Washington, DC and Perryville, MD and Virginia Railway Express (VRE) operates service into Washington Union Station from points south for a combined 26,300 daily users. At the northern end, the Southeastern Pennsylvania Transportation Authority (SEPTA) operates between Philadelphia and Newark, DE serving over 9,600 daily riders. CSX Transportation and Norfolk Southern both operate freight service along portions of the segment and provide critical access to the ports of Baltimore and Wilmington, DE.

The Maryland segment is home to several of the oldest major assets on the NEC. In Baltimore, the NEC travels through the Baltimore & Potomac (B&P) Tunnels, a series of three sequential two-track tunnels that opened in 1873, and bridges over the Bush, Gunpowder, and Susquehanna Rivers that date back to the early 1900s. These assets constrict railroad capacity down to two tracks, limit train speeds, increase maintenance burdens, and are the cause of frequent service disruptions. Other track capacity chokepoints exist in Maryland, Delaware, and Pennsylvania.

Projects funded for construction by FY20 include investments in stations and storage yards. The B&P Tunnels and the Susquehanna River Bridge will be the beneficiaries of millions of dollars in federal grant funding over the next several years for the planning and preliminary engineering of replacement projects. However, additional funding is required to turn those designs into reality. Other partially funded initiatives include projects in Maryland, Delaware, and Pennsylvania to relieve track capacity chokepoints by building out a primarily three- and four-track railroad. Stations and storage facilities comprise the bulk of the remaining partially funded or unfunded projects in FY16-20.

Union Station, Washington, DC





# Basic Infrastructure

For the FY16-20 Plan, Amtrak has identified approximately \$1.3 billion over five years in feasible basic infrastructure investments in the territory between Washington, DC and Philadelphia, PA. These investments are required for annual maintenance and will begin to address the state-of-good-repair backlog for basic infrastructure assets. Key maintenance and repair programs include the replacement of aging and defective railroad ties, the construction of new catenary poles, and upgrades to three undergrade bridges, all constructed over 100 years ago.

Improving the condition of the track structure, particularly the subgrade ballast, is one of the largest projects planned for FY16-20 in the Washington, DC to Philadelphia territory. Approximately 75 to 100 miles of undercutting, the complete removal of old ballast and replacement with new material, is included in the Plan, at the rate of about one mile of undercutting per week. Full undercutting is a complex process that requires extensive coordination for track outages, but the investment improves reliability, speed, and ride quality.









In addition to undercutting, Amtrak plans to replace concrete ties between Washington, DC and Philadelphia through the use of a Track Laying System (TLS). A TLS is a machine that rides on top of the existing rails, removes old ties, cleans ballast, and installs new concrete ties. A TLS is expected to remain in this region through 2018.














# Mandated Projects

For the FY16-20 Plan, Amtrak and its state partners aim to further improve safety on the line, while advancing compliance with federal regulatory requirements. Key funded investments include expansion and upgrades for Amtrak’s existing PTC system. Additional investments include security improvements, like right-of-way fencing, police facilities, and security cameras at key stations.

# Major Backlog and Service Preservation & Improvement Projects

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>1. Washington Union Station Expansion</b>  <p>The Washington Union Station Master Plan released in 2012 called for a comprehensive expansion and improvement initiative to allow for the tripling of passenger capacity by modernizing and expanding station facilities over the next 20 years.</p> <p><b>Funding Needs.</b> Funding of \$632M within the five-year time frame would allow Amtrak to advance preliminary engineering, final design, and initial construction of projects described in the Master Plan, including expansion of passenger waiting areas, concourse upgrades, and platform renewals.</p>		\$198M	\$424M	Amtrak	
<b>2. Train Storage and Service Facilities at Washington Union Station</b>  <p>There are three principal train yards immediately north of Washington Union Station that service and store a combination of Amtrak, MARC and VRE trains. All of these storage and maintenance facilities are approaching maximum capacity and Amtrak, with input from the commuter authorities, plans to design new yards and train traffic upgrades. There is currently no funding available for this project in FY16-20.</p> <p><b>Funding Needs.</b> If additional funding were available for FY16-20, Amtrak could initiate design and construction for this project.</p>		\$0	\$255M	Amtrak	
<b>3. Baltimore to Washington Section Improvements</b>  <p>Amtrak and the state of Maryland are partnering to expand the majority of the railroad from Washington, DC to Baltimore, MD to four tracks. The project includes installation of a new Hanson Interlocking and station enhancements at New Carrollton and BWI Marshall rail stations to accommodate additional track. In FY16-20, Amtrak and Maryland DOT will complete the design phase of the project, and Maryland has programmed initial funding for the construction of Hanson Interlocking. Amtrak and Maryland DOT will complete planning and preliminary engineering for the BWI Station and Track Improvements by FY16.</p> <p><b>Funding Needs.</b> Additional funding would enable the partners to complete construction of Hanson Interlocking and begin final design activities for the BWI Station and Track Improvements.</p>		\$16M	\$50M	Amtrak, Maryland DOT	
<b>4a. MARC Station Improvements: BWI Marshall Airport</b>  <p>The BWI Marshall Airport rail station is a key intermodal hub on the NEC, serving over 5,000 daily Amtrak and MARC riders. Maryland DOT plans to improve the existing station, provide new canopies for passengers, and a new pedestrian bridge from the north garage to the existing pedestrian bridge. These near-term improvements will serve passengers while larger plans for rehabilitating the station are under development (see project no. 3).</p> <p><b>Funding Needs.</b> Additional funding of \$6M would allow Maryland DOT to complete construction of the interim repairs at BWI Marshall Airport Station.</p>		\$0	\$6M	Maryland DOT	



Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>4b. MARC Station Improvements: Bayview</b>		\$2.6M	\$79M	Maryland DOT	
<p>Maryland DOT has identified the Bayview area of Baltimore as a location for a new commuter rail station. This new station in East Baltimore will support local economic development efforts and connect to a major employment center at Johns Hopkins Bayview Medical Center. In FY16-20, Maryland DOT will complete the planning and design for this station.</p> <p><b>Funding Needs.</b> The construction of Bayview station could be completed in FY16-20 with an additional \$79M.</p>					
					
<b>4c. MARC Station Improvements: West Baltimore</b>		\$5.1M	\$83M	Maryland DOT	
<p>Maryland DOT has identified West Baltimore Station as a location for upgraded passenger facilities. This effort will also be in concert with local economic development efforts. In FY16-20, Maryland DOT will complete the planning and design for this improved station.</p> <p><b>Funding Needs.</b> An additional \$30M in funding over the five-year period would allow Maryland DOT to complete the first phase of construction at West Baltimore Station and an additional \$53M would allow completion of the second and final phase of construction.</p>					
					
<b>5. Baltimore &amp; Potomac Tunnels</b>		\$25M	\$310M	Amtrak, Maryland DOT	
<p>The B&amp;P Tunnels are a primary chokepoint along the Corridor as train volume is constricted from four to two tracks and the tunnels' tight curvature and poor condition require trains to reduce speeds to 30 mph. The tunnels date back nearly to the Civil War and are in need of constant monitoring and maintenance at high cost. In FY16-20, preliminary engineering and environmental documentation for the replacement tunnels will be completed with a \$60 million HSIPR grant that was awarded to Maryland DOT in 2010.</p> <p><b>Funding Needs.</b> With \$310M of additional funding, Amtrak and Maryland DOT could complete final design and initiate construction within the FY16-20 period.</p>					
					
<b>6. Gunpowder River Bridge Replacement</b>		\$0	\$11M	Amtrak, Maryland DOT	
<p>The Gunpowder River Bridge, completed in 1913, consists of only two tracks and is badly deteriorating, which limits capacity on the NEC and drives up maintenance costs. Amtrak would like to partner with the state of Maryland to conduct planning and preliminary engineering for a replacement bridge; however, there is currently no funding available for this project in FY16-20.</p> <p><b>Funding Needs.</b> If \$11M in additional funding were available, Amtrak could begin planning and preliminary engineering for the Gunpowder River Bridge replacement within the five-year timeframe.</p>					
					

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By
<b>7. Bush River Bridge Replacement</b>		\$0	\$11M	Amtrak, Maryland DOT

The Bush River Bridge, a two-track bridge completed in 1913, requires extensive ongoing maintenance, undermines service reliability, and limits capacity for intercity, commuter, and freight railroads. Amtrak would like to partner with the state of Maryland to conduct planning and preliminary engineering for a replacement bridge; however, there is currently no funding available for this project in FY16-20.

**Funding Needs.** Additional funding of \$11M could allow Amtrak to begin planning and preliminary engineering for the Bush River Bridge replacement within FY16-20.



## 8. Susquehanna River Bridge Replacement



\$10M

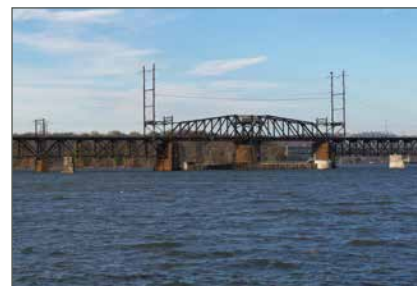
\$405M

Amtrak,  
Maryland DOT



Of the two moveable bridges in Maryland, the Susquehanna River Bridge is perhaps the worst bottleneck and the most badly in need of replacement. The bridge constricts the NEC down to two tracks and restricts train speeds for almost a mile. In addition to commuter and intercity rail, the bridge is a key freight connection between Norfolk Southern's large rail network and the Port of Baltimore. The state of Maryland and Amtrak are planning to replace the bridge with a modern high-level, fixed structure. Amtrak and Maryland DOT are currently undergoing preliminary engineering and environmental review, funded through a \$22M HSIPR grant awarded in 2011.

**Funding Needs.** Subject to additional funding, the schedule calls for the start of final design in 2017 with construction starting at the end of the FY16-20 timeframe.



## 9a. MARC Storage Facility Improvements: Martin State Airport



\$4.1M

\$6M

Maryland DOT



MARC trains lack adequate storage along the Penn Line and often are required to run empty trains between Perryville and Baltimore, MD, using up track capacity and increasing operating costs. Maryland DOT has proposed the construction of additional storage tracks and related infrastructure at the Martin State Airport Facility.

**Funding Needs.** If additional funding of \$6M were available in FY16-20, Maryland DOT could complete the final design and construction at the Martin State Airport storage facility.



## 9b. MARC Storage Facility Improvements: Northeast Maintenance Facility



\$7.2M

\$366M

Maryland DOT









To address the same challenges as project no. 9a, Maryland DOT has proposed the construction of a new storage yard outside Perryville to increase storage capacity and prevent unnecessary train moves. Current funding is providing for project planning, environmental review, and right of way acquisition.

**Funding Needs.** If additional funding of \$100M were available in FY16-20, Maryland DOT could complete the first phase of construction at the Perryville storage facility. If an additional \$266M in funding were available, Maryland DOT could complete the second and final phase of construction at the storage facility.





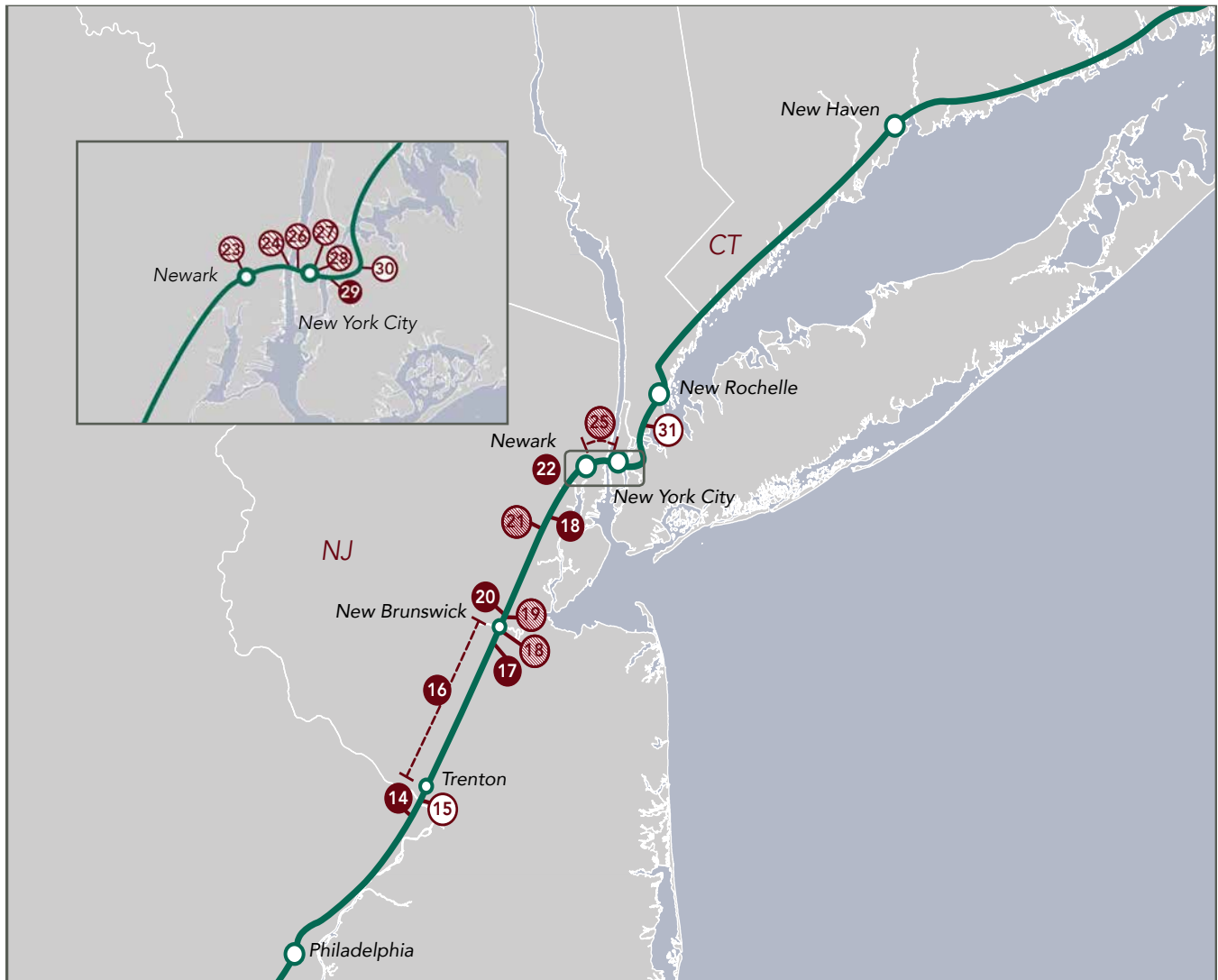
Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By
<b>10. Newark Regional Transportation Center</b>  Delaware DOT plans to construct an updated Regional Transportation Center in Newark, DE that will increase capacity and support additional SEPTA service between Newark and Wilmington, DE. The project includes construction of a new station house, a new platform serving track A along the NEC, a new freight track connection, and a new pedestrian bridge.  <b>Funding Needs.</b> With an additional \$30M in funding, Delaware DOT could complete design, engineering and construction.		\$15.5M	\$30M	Delaware DOT 
<hr/>				
<b>11. Delaware Third Track Program</b>  Amtrak and Delaware DOT are partnering on a project to increase capacity between Wilmington and Newark, DE. The project aims to eliminate current two-track bottlenecks with a nearly continuous three-track railroad in the state of Delaware. Construction of 1.5 miles of new main line third track between Yard and Ragan interlockings is estimated to be completed in 2017.		\$23M	\$0	Amtrak, Delaware DOT
<hr/>				
<b>12. Delaware DOT Stations: Claymont, DE</b>  SEPTA provides commuter service to approximately 1,100 weekday passengers at the Claymont, DE rail station. Though ridership at the rail station has increased, the layout and facilities have not been modernized and need investment to return to a state-of-good-repair. The current station is not completely ADA accessible. A large industrial site adjacent to the existing station has been targeted for redevelopment. Conceptual designs are underway to relocate the station on or near that site.  <b>Funding Needs.</b> With \$18M of funding in FY16-20, Delaware DOT could complete the design phase of the Claymont station improvements.		\$0	\$18M	Delaware DOT
<hr/>				
<b>13. Zoo Interlocking</b>  At Zoo Interlocking in Philadelphia, Amtrak, New Jersey Transit, and SEPTA trains are constrained to a one-track chokepoint for 400 feet. Pennsylvania DOT plans to replace the interlocking with an improved track structure, new overhead catenary, and upgraded communications and signal system components to eliminate the chokepoint, improve reliability, increase capacity, and reduce travel time. A preliminary design of potential capacity improvements is currently under development.  <b>Funding Needs.</b> Funding of \$18M over the five-year period is needed to permit preliminary engineering and initial construction to begin at the interlocking.		\$0	\$18M	Pennsylvania DOT 



30th Street Station, Philadelphia, PA



# Philadelphia, PA to New Rochelle, NY



- 14. SEPTA Station Improvements
- 15. SEPTA Layover Facility
- 16. New Jersey High Speed Rail Program
- 17. Delco Lead Safe Haven Storage and Reinspection Facility
- 18. NJ TRANSIT Station Improvements
- 19. Mid-Line Loop
- 20. County Yard
- 21. Hunter Flyover
- 22. NJ TRANSITGRID

- 23. Newark Penn Station Platforms
- 24. Portal Bridge North
- 25. Gateway Program
- 26. River-to-River Rail Resiliency Projects
- 27. Moynihan Station
- 28. Penn Station, NY Improvements
- 29. Harold Interlocking
- 30. Penn Station Access - Hell Gate Line
- 31. Pelham Bay Bridge Replacement



## Overview

The NEC from Philadelphia, PA to New Rochelle, NY is approximately 80 miles long and is owned by Amtrak. This segment includes the most densely traveled stretch of railroad in the Western Hemisphere and Penn Station, the busiest passenger rail station in North America in terms of both passengers and train volumes. SEPTA operates trains into Trenton from points south. New Jersey Transit (NJ TRANSIT) operates north from Trenton into Penn Station and MTA Long Island Rail Road (LIRR) operates on a brief stretch east out of Penn Station. Together, these agencies serve over 345,050 daily riders on the NEC. Conrail Shared Assets Operations, CSX, and Providence and Worcester Railroad operate freight service on parts of the line.

The combination of many aging assets and extremely high train and passenger volumes makes this segment particularly susceptible to reliability problems. Electrical infrastructure from the 1930s fails frequently, especially during extreme heat or cold, grinding service to a halt. The 1910 Portal Bridge across the Hackensack River and 1907 Pelham Bay Bridge over the Hutchinson River routinely break down during openings for marine traffic. Service is forced down to one track in each direction under the Hudson River, and service under the East River is limited by interlocking configurations, platform capacity, and an outdated signal system. Superstorm Sandy in 2012 flooded tunnels under both rivers, causing damage to structural, mechanical, and electrical components that will require eventual replacement. If new tunnel capacity is not constructed under the Hudson River, passengers could face a nightmare scenario of service cuts by as much as 75 percent for a year or more while rehabilitation takes place.

The Plan lays out a path forward that, with additional funding, would replace and/or expand these assets for improving reliability, increasing resiliency, and growing service to keep pace with demand. Additional funding for these projects would complement already funded initiatives like the New Jersey High Speed Rail Program which is investing \$450 million by FY17 to replace, among other things, a 24-mile stretch of the outdated 1930s electric power supply system to reduce delays for NJ TRANSIT and Amtrak passengers and allow Acela to reach its top speed of 160 mile per hour.

Penn Station, New York





## Basic Infrastructure

For the FY16-20 Plan, Amtrak has identified approximately \$1 billion in feasible basic infrastructure investments between Philadelphia, PA and New Rochelle, NY. These investments are required for annual maintenance and will reduce the state-of-good-repair backlog for basic infrastructure assets. Planned basic infrastructure investments will include the replacement of railroad ties, upgrades to electrical substations, enhancements to signaling systems, and ongoing investments at existing stations. The NJ High-Speed Rail Improvement Program (NJHSRIP), though categorized as a service preservation and improvement project, will replace and modernize many basic infrastructure assets along this segment as well.

Basic infrastructure investments include maintenance and repair of components of existing major assets. Flooding from Superstorm Sandy in 2012 left mineral deposits in both the East River and Hudson River tunnels that are exacerbating the initial damage with continued deterioration. Amtrak will advance replacement of the full track structure in these tunnels during FY16-20. Track replacement in the East River Tunnels, constructed in 1910, will be completed during 55-hour outages on weekends to minimize service impacts. The Hudson River Tunnels, also originally opened in 1910, will undergo rail replacement and curve patch rail replacement during FY16-20, but the priority will be on the immediate replacement of stick rail. Both projects are estimated to be completed in 2018.

### Basic Infrastructure Highlights, FY16-20

Total track replacement in the East River and Hudson River Tunnels



Upgrade 17 Electrical Substations



Replace all catenary and signals from Trenton to New Brunswick



Replace one escalator per year at NY Penn Station



## Mandated Projects

For the FY16-20 Plan, Amtrak and its state partners aim to further improve safety on the line, while advancing compliance with federal regulatory requirements. Key funded investments include expansion and upgrades for Amtrak's existing PTC system and key safety systems in the East River and Hudson River Tunnels that connect the NEC to Manhattan.

## Major Backlog and Service Preservation & Improvement Projects

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By
<b>14. SEPTA Station Improvements: Levittown</b>		\$27M	\$0	SEPTA

The Levittown rail station is a key station along SEPTA's Trenton Line and the NEC, and serves over 1,000 daily riders. SEPTA will construct a new station building, a pedestrian overpass, and high-level platforms, transforming the 1950s era station into a state of the art intermodal transportation facility. This project, scheduled for completion in 2018, will improve the passenger experience and make the station ADA compliant.



<b>15. SEPTA Layover Facility: West Barracks Yard</b>		\$0	\$28M	SEPTA 
---	---	-----	-------	---

Without a Trenton storage facility, SEPTA currently stores trains on station tracks and runs empty trains between Trenton and Philadelphia. SEPTA plans to design and construct a storage yard, the West Barracks Yard, near Trenton Station for SEPTA equipment. A yard would increase storage capacity, reduce operating costs, and open track and platform space for SEPTA, New Jersey Transit, and Amtrak.

**Funding Needs.** If \$28M of additional funding were available, SEPTA could complete the construction of the yard in FY16-20.



<b>16. New Jersey High-Speed Rail Program</b>		\$150M	\$0	Amtrak
---	---	--------	-----	--------







Amtrak is upgrading 24 miles of rail infrastructure to support faster, more reliable, and more frequent service for all NEC users. The project will overhaul power supply systems, signal systems, track infrastructure, and overhead catenary wire between Trenton and New Brunswick, NJ. Modern infrastructure will allow Acela services to reach 160 mph, their highest speed anywhere on the NEC. The most significant benefits of this investment across all users of the NEC will be greatly increased reliability with the installation of constant-tension catenary and related power distribution systems, and enhanced capacity gained by signal system upgrades. NJHSRIP is described in greater in detail on page 21.














<b>17. Delco Lead Safe Haven Storage and Re-inspection Facility</b>		\$184M	\$0	NJ TRANSIT
---	---	--------	-----	------------

NJ TRANSIT plans to construct a safe haven storage facility for rail rolling stock located along the NEC south of New Brunswick Station. The Delco Lead is located adjacent to the Conrail Delco Secondary. The Safe Haven Storage will provide resilient storage that will protect equipment against damage resulting from a storm. A service and inspection facility will facilitate the rapid return of equipment to service following a storm event. In 2014, NJ TRANSIT received \$184M in FTA Public Transportation Emergency Relief Program Funds for this project.






















Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>18a. NJT Station Improvements: New Brunswick Enhancements</b>		\$10M	\$10M	NJ TRANSIT	
<p>NJ TRANSIT, in cooperation with the New Brunswick Development Corporation (DEVCO), will be extending the current eastbound platform. Additional funding is required to design and construct an extension of the westbound platform and upgrade customer amenities at the station. The longer platforms will provide more passenger-handling capacity and reduce train dwell time at the station.</p> <p><b>Funding Needs.</b> If additional funding of \$10M were available, NJ TRANSIT could advance the design and construction of New Brunswick improvements within the five-year period.</p>					
<b>18b. NJT Station Improvements: Elizabeth Station Reconstruction</b>		\$30M	\$0	NJ TRANSIT	
<p>NJ TRANSIT plans to reconstruct the Elizabeth, NJ commuter rail station with needed upgrades, including ADA compliance and accommodation of a proposed future fifth track along the NEC. The upgraded rail station, with an estimated completion date in 2018, will address needed repairs and provide longer platforms for NJ TRANSIT trains.</p>					
<b>19. Mid-Line Loop</b>		\$20M	\$309M	NJ TRANSIT	
<p>NJ TRANSIT is planning to construct a new above-grade connection between existing and planned storage facilities (see project no. 20) and the New York-bound local track of the NEC. The crossover will eliminate at-grade movements that create conflicts between commuter and intercity trains. In doing so, this new infrastructure will open up capacity for all users while improving reliability for NJ TRANSIT services that today must wait for a slot to open before they can cross tracks to begin New York-bound service. The capacity created will help enable the NJHSRIP's goal of 160-mph speeds on Acela, as well as support future express service patterns planned by NJ TRANSIT. Preliminary engineering is currently underway.</p> <p><b>Funding Needs.</b> With an additional \$309M, NJ TRANSIT could begin construction on the Mid-Line Loop within the five-year time frame.</p>					
<b>20. County Yard</b>		\$225M	\$0	NJ TRANSIT	
<p>County Yard is both supportive of the interrelated investments described for the NJHSRIP and the Mid-Line Loop, and is a key resiliency project designed in response to the devastating effects of Superstorm Sandy in 2012. The project will expand an existing storage yard from its current footprint to include an unused part of an adjacent rail freight yard. The Delco Lead project, with County Yard improvements, will provide safe storage capacity for up to 444 rail cars in the event of flooding at other locations. The project also supports future service expansion by providing additional train storage.</p>					



Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>21. Hunter Flyover</b>		\$2M	\$214M	NJ TRANSIT	
<p>Currently, eastbound (Newark-bound) Raritan Valley Line trains must travel along the westbound local track or cross the NEC at grade to reach the eastbound local track. NJ TRANSIT identified the need for a flyover that will eliminate at-grade crossings, thereby reducing conflicts between trains, increasing capacity for NJ TRANSIT and Amtrak, and enabling NJ TRANSIT to improve Raritan Valley Line service.</p> <p><b>Funding Needs.</b> If \$214M of additional funding were available, New Jersey could begin construction on the flyover with the five-year timeframe.</p>					
					
<b>22. NJ TRANSITGRID</b>		\$410M	\$0	NJ TRANSIT	
<p>NJ TRANSIT plans to create a microgrid power generation and distribution system as a backup to the regional power network, allowing transit systems to function during storms or other times when the centralized power grid is compromised. NJ TRANSITGRID will be capable of supplying highly-reliable power during storms or other times when the centralized power grid is compromised. NJ TRANSITGRID will incorporate renewable energy, distributed generation, and other technologies to provide resilient power to key NJ TRANSIT stations, maintenance facilities, bus garages, and other buildings. NJ TRANSITGRID will also provide resilient electric traction power to allow NJ TRANSIT trains on critical corridors, including portions of the NEC, to continue to operate even when the traditional grid fails. This project will directly benefit NJ TRANSIT and Amtrak.</p>					
					
<b>23. Newark Penn Station Platforms</b>		\$5M	\$95M	NJ TRANSIT	
<p>The five boarding platforms shared by Amtrak and NJ TRANSIT at Newark Penn Station require significant work to correct structural issues, provide ADA access, and add customer amenities including signage, public address systems, and waiting areas. The current platforms have cracks, are uneven, and have some sections which are crumbling. NJ TRANSIT has repaired all of these conditions on Platform 5 of Newark, plus upgraded the lighting. Similar repairs are programmed for the other platforms which will address passenger safety, improve boardings and alightings, and improve vertical access.</p> <p><b>Funding Needs.</b> If \$95M of additional funding were available, NJ TRANSIT could complete construction on the platforms in FY16-20.</p>					
					
<b>24. Portal Bridge North</b>		\$0	\$1.02B	Amtrak, NJ TRANSIT	
<p>Portal Bridge, completed in 1910, carries the NEC over the Hackensack River between Kearny and Secaucus, NJ, using only two tracks, which creates a significant capacity bottleneck. Openings for marine traffic and failures to close are frequent, creating one of the most persistent reliability challenges for commuter and intercity services on the entire NEC, along this most densely trafficked segment of railroad in the Western Hemisphere. NJ TRANSIT and Amtrak have partnered to design two new two-track bridges that will be higher to eliminate openings of the bridge for river traffic. The design of the first bridge, Portal Bridge North, was completed in 2013. Portal Bridge is described in greater detail on pages 36-37.</p> <p><b>Funding Needs.</b> The fully designed Portal Bridge North at right needs \$1.02 billion over the five-year period to fund and complete construction.</p>					
					



Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>25. Gateway Program</b>		\$11M	\$610M	Amtrak	
<p>The Gateway Program is a series of investments that would transform the existing two-track railroad between Newark, NJ and New York into a four-track railroad. Full implementation would stretch well beyond the FY16-20 timeframe. The Program's largest element is the construction of two new tunnels under the Hudson River and, ultimately, reconstruction of the existing tunnels. The second largest component of the program would be the construction of two new Portal Bridges, addressed separately here in project no. 24. The overall program would nearly double rail capacity and address necessary repairs to the existing aging tunnels which were badly damaged by Superstorm Sandy.</p> <p><b>Funding Needs.</b> If \$352M were available in FY16-20, Amtrak could advance design and initiate construction for select elements of the overall Program.</p>					
					
<b>26. River-to-River Rail Resiliency (R4) Project</b>		\$108M	\$213M	Long Island Rail Road, Amtrak	
<p>The River-to-River Rail Resiliency (R4) Project is a comprehensive effort by the LIRR and Amtrak to protect the East River Tunnels and the West Side Yard against flood hazards. The goal of the project is to harden and protect assets to ensure connectivity at New York Penn Station, the busiest on the NEC. In 2014, LIRR received \$81M in FTA Emergency Relief grants for this project. Design and planning of the perimeter walls and dewatering systems will be completed during FY16-20.</p> <p><b>Funding Needs.</b> If additional funding of \$213M were available, the effort to design and install high density signaling in the East River Tunnels could progress in FY 16-20. This investment would improve train throughput and make Penn Station operations more resilient.</p>					
					
<b>27. Moynihan Station</b>		\$558M	\$51M	PANYNJ, MSDC, Amtrak	
<p>The Port Authority and New York and New Jersey (PANYNJ) and the Moynihan Station Development Corporation (MSDC) are partners in redeveloping the James A. Farley historic post office building into a new intermodal transportation facility to serve Amtrak passengers. The new rail station, which will be called Moynihan Station, will relieve congestion and overcrowding at Penn Station. MSDC received TIGER and HSIPR grant funding for the first phase of the station redevelopment, which focuses on below-grade transportation investments and will be completed in FY16-20.</p> <p><b>Funding Needs.</b> With \$51M in additional funding, MSDC could complete the second phase of this project, the redevelopment of the building into a rail station, by FY20.</p>					
					
<b>28a. Penn Station Improvements: NJ TRANSIT</b>		\$10M	TBD	NJ TRANSIT	
<p>NJ TRANSIT plans to initiate improvement projects at New York Penn Station. Some planned investments are targeted at improving safety and capacity regarding vertical access between platforms and other levels of the station. Other projects at the station level include extending the Central Corridor, improving the Hilton Corridor, and upgrading wayfinding signage, in efforts to increase capacity and improve the passenger experience. NJ TRANSIT currently has \$10M programmed for investments in Penn Station between FY16-20.</p> <p><b>Funding Needs.</b> NJ TRANSIT's plans for improvements at Penn Station are still under development. Projects that require additional funding may be proposed during FY16-20, though the detail and scope of these projects is still to be determined.</p>					
					

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By
<b>28b. Penn Station Improvements: Long Island Rail Road</b>		\$0	\$80M	Long Island Rail Road 
<p>LIRR has identified several improvements needed in its operating areas of New York's Penn Station. These projects include replacing elevators and escalators, and upgrading customer service facilities. There is currently no funding available for this project in FY16-20.</p> <p><b>Funding Needs.</b> If \$80M in funding were available, LIRR could complete construction of its improvement projects within the five-year timeframe.</p>				
<b>29. Harold Interlocking</b>		\$471M	\$0	New York State DOT, MTA Capital Construction
<p>Harold Interlocking is the busiest track switch point on the NEC, used to sort Amtrak, LIRR, and NJ TRANSIT trains as they travel north and east of Penn Station or access Sunnyside Yard for service and storage. The Harold Interlocking Northeast Corridor Congestion Relief Project will construct new conflict-free train routes through this interlocking in Queens, NY. In 2011, New York State DOT received a \$368M HSIPR grant to complete this project, including matching funds from New York MTA. The project is estimated to be completed in 2022 and will greatly improve reliability, on-time performance, and travel time for all rail services.</p>				
<b>30. Penn Station Access (Hell Gate Line)</b>		\$0	\$698M	Metro-North Railroad 
<p>Penn Station Access is an MTA project that would bring New Haven Line Metro-North Railroad trains into Penn Station using the Amtrak-owned Hell Gate Line in addition to its existing terminal at Grand Central. Using primarily existing tracks, Penn Station Access would establish a new direct link from the New Haven Line, the nation's largest single commuter rail line, to Manhattan's West Side and establish markets for commuter rail growth at four new stations in underserved areas of the Bronx. The project would also increase redundancy in the overall rail network.</p> <p><b>Funding Needs.</b> The Proposed MTA Capital Program allocates \$40 million in FY15 and \$698 million in FY17 (Jan. – Dec. 2017) to Penn Station Access, some of which may be expended beyond FY20.</p>				
<b>31. Pelham Bay Bridge Replacement</b>		\$0	\$165M	Amtrak 
<p>Completed in 1907, Pelham Bay Bridge creates a bottleneck crossing the Hutchinson River in the Bronx, NY by constricting traffic down to speeds of 45 mph. The aging bridge still opens frequently for marine traffic and occasionally fails to properly close, creating a block for Amtrak service between Boston and New York. Amtrak plans to replace the bridge with a new high-level fixed bridge that will offer enough clearance for marine traffic to pass below. There is currently no funding available for the Pelham Bay Bridge replacement in FY16-20.</p> <p><b>Funding Needs.</b> Amtrak could advance the environmental review process and final design of a replacement bridge with additional funding of \$165M during FY16-20.</p>				



# New Rochelle, NY to New Haven, CT



- 32. Cos Cob Bridge Replacement
- 33. Norwalk River Bridge Replacement
- 34. Saugatuck River Bridge Replacement
- 35. Devon Bridge Replacement
- 36. New Haven Yard Master Complex Improvements

- 37. New Haven Line Station Improvements
- 38. New Haven Line Signal System and Network Infrastructure Upgrades
- 39. New Haven Line Catenary Replacement Project
- 40. New Haven Line Undergrade Bridge Replacement Program



## Overview

From New Rochelle to New Haven, NY, the NEC travels along the New Haven Line, which is controlled and dispatched by Metro-North Railroad (MNR), a division of the New York MTA. Ownership of the New Haven Line is split between the MTA and Connecticut at the state line. The segment is approximately 56 miles and is primarily four tracks, with a short three-track section in Milford, CT. The New Haven Line is the busiest single commuter rail line in the United States, with Metro-North serving over 80,000 daily customers. In 2013, Metro-North ridership on the New Haven Line was approximately 40 million passengers. Both CSX and Providence & Worcester operate freight trains on the segment.

The New Haven Line has over 100 bridges and other structures that carry trains over roadways, rivers, inlets, and streams. This number includes five major movable bridges in Connecticut, four of which are over 100 years old and in critical need of replacement or rehabilitation. This segment also suffers from aging electrical and signal components, many of which were constructed before 1950. These aging infrastructure assets are unreliable, technologically obsolete and increasingly prone to failures that create delays for riders. In 2014 the Norwalk River Bridge experienced a series of repeated failures that created massive rush-hour delays for Metro-North and Amtrak passengers.

In recent years, the Connecticut Department of Transportation (CTDOT) has opened new stations and made significant investments in state of good repair, while both MTA Metro-North and Connecticut have continued to perform ongoing maintenance. The Plan includes track, station, and infrastructure investments that will advance state-of-good-repair, improve reliability, and support future service expansion. In a series of fully-funded projects, CTDOT will complete the replacement of the overhead catenary wire and fully modernize the line's signal system. With additional funding, CTDOT proposes to continue to advance the replacement of the major movable bridges, including the replacement of the Norwalk River Bridge, funded in part by a \$160 million grant from the FTA's Emergency Relief Program.

Metro-North Train on Approach to Bridgeport, CT





# Basic Infrastructure

CTDOT and MNR are pursuing major investments in the basic infrastructure systems along the New Haven Line territory of the NEC (between New Rochelle, NY and New Haven, CT). For the FY16-20 Plan, they have identified approximately \$1.2 billion over five years in feasible basic infrastructure investments along the New Haven Line. These investments are required for annual maintenance and to address the state-of-good-repair backlog for basic infrastructure assets. Due to their size, several of these investments are categorized as service preservation and improvement projects, but will yield significant benefits for basic infrastructure assets. By 2017, CTDOT will complete its Catenary Replacement Program, which will fully modernize the line’s electrical system. During FY16-20, CTDOT will also advance the Undergrade Bridge Replacement Program, replace six electrical substations, and complete the modernization of the signal system.

## Basic Infrastructure Highlights, FY16-20

Upgrades and repairs at 4 stations



Complete replacement of the overhead catenary wire



Complete replacement of the signaling system



Upgrades and repairs of 11 overhead and undergrade bridges



# Mandated Projects

For the FY16-20 Plan, CTDOT and MNR plan to complete the installation of Positive Train Control on the New Haven Line. Additional activities include investments in Metro-North’s Emergency Operations Control Center, which serves all Metro-North lines east of the Hudson River, and upgrades to the New Haven Rail yard to ensure compliance with key safety codes.

## Major Backlog and Service Preservation & Improvement Projects

Title	Status	Available/ Programmed Funding (FY16-20)	Unfunded (FY16-20)	Submitted By
<b>32. Cos Cob Bridge Replacement</b>		\$0	\$50M	Connecticut DOT

The Cos Cob Bridge carries four tracks over the Mianus River in Greenwich, CT, and is the busiest movable bridge on the New Haven Line. Despite some rehabilitation in 1989, this bridge still faces serious challenges caused by aging components and deferred maintenance. There is currently no funding available or programmed for the Cos Cob Bridge replacement project in FY16-20.

**Funding Needs.** If additional funding of \$50M were available in FY16-20, CTDOT could begin the design and preliminary engineering of the proposed Cos Cob Bridge replacement. The total construction cost for a replacement bridge is estimated at \$800M, but construction would not commence until after FY20.



### 33. Norwalk River Bridge Replacement



\$215M/\$250M

\$0

Connecticut DOT

Constructed in 1896, the Norwalk River Bridge has experienced increasing deterioration of the electrical and mechanical components of the bridge. In 2014, CTDOT was awarded a \$160M grant from the FTA's Emergency Relief Program, which is supporting investments in repairs and resiliency following Superstorm Sandy. The funding will go towards replacing the bridge, which has caused periodic serious service disruptions for Amtrak and MNR services and is vulnerable to additional damage from a storm surge. CTDOT has programmed sufficient funding on top of the FTA grant to construct a \$465M replacement bridge.



### 34. Saugatuck River Bridge Replacement



\$20M

TBD

Connecticut DOT

The Saugatuck River Bridge is a set of parallel bascule bridges constructed in 1904 that carry four New Haven Line tracks. Like the Norwalk River Bridge, age and deferred maintenance have caused deterioration affecting both its electrical and mechanical components. In FY16-20, CTDOT has programmed \$20M for interim repairs until a replacement bridge can be designed and built. The latest construction cost estimate for a new Saugatuck River Bridge is \$350M.



### 35. Devon Bridge Replacement



\$15M/\$30M

\$800M

Connecticut DOT



Devon Bridge carries four New Haven Line tracks over the Housatonic River. Completed in 1905, the bridge has experienced serious deterioration. CTDOT has initiated work on short-term repairs, but the entire structure needs to be replaced. CTDOT has identified Devon Bridge as the next most critical movable bridge replacement after the Norwalk River Bridge. CTDOT has \$45M in available and programmed funds to complete the design for the replacement bridge.

**Funding Needs.** The latest total construction cost estimate for a replacement bridge is between \$850M and \$1B.



Title	Status	Available/ Programmed Funding (FY16-20)	Unfunded (FY16-20)	Submitted By	
<b>36. New Haven Yard Improvements</b>		\$118M	\$200M	Connecticut DOT	

The New Haven Rail Yard Facilities Improvements Program is a multi-year project that receives funding on an annual basis and has been continually evolving as operations, needs and technologies change. Through the FTA's Emergency Relief Program, CTDOT will receive almost \$9M in funding to install a backup feeder as an alternative power source at the New Haven Rail Yard as a resilience project in response to Hurricane Sandy. CTDOT has programmed additional funding for work on a maintenance-of-way facility and other projects.

**Funding Needs.** If \$200M of additional funding were available, CTDOT could begin design and construction on the next round of improvement projects.



### 37. New Haven Line Stations Improvements



\$95M

\$0

Connecticut DOT

Several New Haven Line commuter rail stations along the NEC are in need of upgrades to improve passenger experience. Ongoing work at other stations is funded by CTDOT's Station Improvement and Parking Program. These ongoing station improvements will ensure ADA compliance and improve the passenger experience.



### 38. New Haven Line Signal System Replacement and Network Infrastructure Upgrades



\$80M/\$270M

\$0

Connecticut DOT

The state of Connecticut is leading a program to upgrade communications and signal system on the New Haven Line. This work will replace existing signals inside the engineer's cab with a technology-driven solution that is upgrade-able in the long term. The signal upgrades, which replace the current 35-year-old system, are a modern, high-density system that will support service increases by 2030 and allow a 33% increase in throughput. This improvement will increase the efficiency of train operations, increase train speeds, and add capacity to the railroad.



### 39. New Haven Line Catenary Replacement Project



\$100M

\$0

Connecticut DOT

CTDOT is completing the final phases of a multi-year \$350M project to replace the overhead catenary wire on the New Haven Line in Connecticut. The original catenary wires, some constructed as far back as the 1930s, are susceptible to fluctuating temperatures. Under high heat, the aging wires can sag and occasionally get caught in moving trains, causing expensive damage and major delays for riders. CTDOT launched this multi-phase project in the late 1990s and had replaced 79% of the catenary wire by 2014. The state expects to complete all work in 2017, resulting in a fully modernized catenary wire system that will reduce maintenance costs and improve reliability for Amtrak and MNR riders.



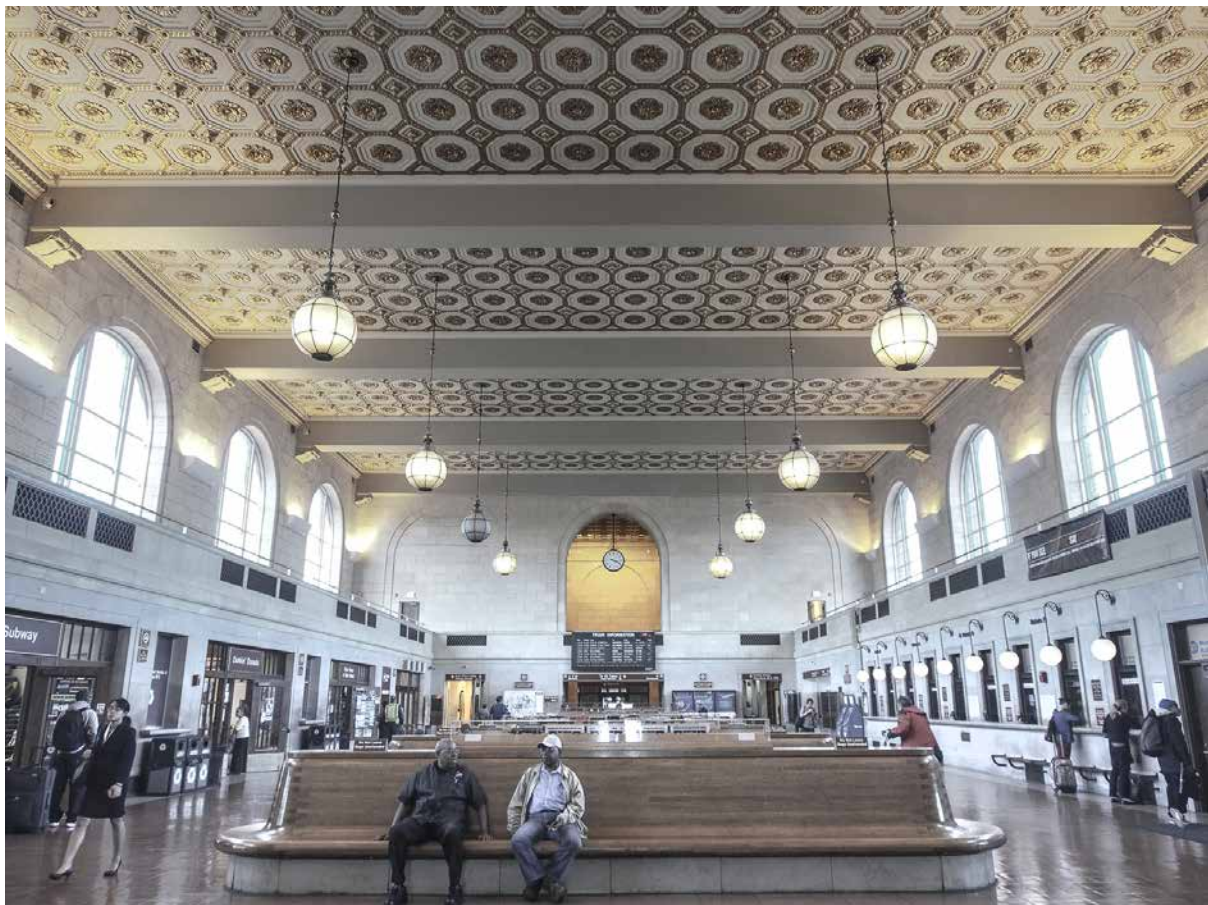


Title	Status	Available/ Programmed Funding (FY16-20)	Unfunded (FY16-20)	Submitted By
<b>40. New Haven Line Undergrade Bridge Replacement Program</b>		\$270M	\$0	Connecticut DOT

The New Haven Line includes over 100 fixed, undergrade bridges that carry trains over roads and waterways. The majority of these bridges are over a century old and many are in need of replacement. In the late 1990s, CTDOT launched a multi-year program to replace these aging spans. These bridge replacements require that tracks be taken out of service, which can impact schedules and create delays for riders. As a result, the program is advancing in phases and is expected to extend beyond 2020. In the FY16-20 Plan, CTDOT will continue to advance design and construction, including the replacement of three bridges in Greenwich and Stamford in the early years of the Plan.

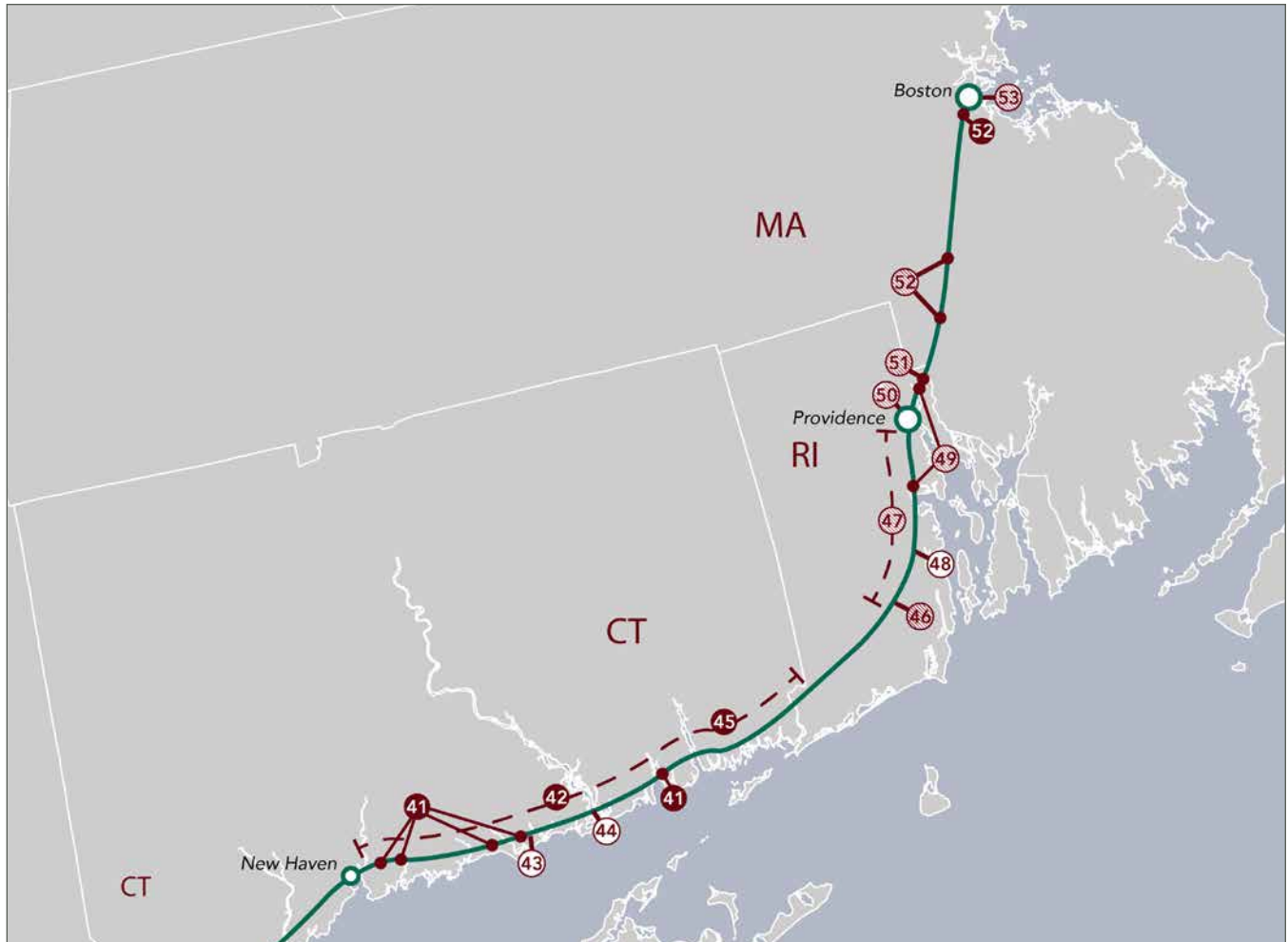


Union Station, New Haven, CT





# New Haven, CT to Boston, MA



- 41. Shore Line East Stations
- 42. Shore Line East Power Distribution Upgrade
- 43. Clinton Interlocking Improvements
- 44. Connecticut River Bridge Replacement
- 45. Shore Line East Catenary Upgrades
- 46. Kingston Area Track and Capacity Improvements
- 47. Rhode Island Third Track

- 48. Quonset Maintenance Layover Facility
- 49. RIDOT Station Improvements
- 50. Providence Station and Tunnel
- 51. MBTA Layover Facilities
- 52. MBTA Station Improvements
- 53. Boston South Station Improvements

## Overview

This segment of the NEC from New Haven, CT to Boston, MA is approximately 158 miles. Amtrak owns the 120 miles of this segment in Connecticut and Rhode Island, and Massachusetts owns the northernmost 38 miles within its borders. Amtrak controls train operations and maintains infrastructure over all 158 miles. Shore Line East and the Massachusetts Bay Transportation Authority (MBTA) operate commuter service on the line for 86,700 daily passengers, along with freight service operated by CSX and Providence & Worcester.

In the late 1990s, the federal government supported a major program to electrify and modernize the territory to support the introduction of the Acela service. In recent years, Rhode Island DOT has expanded commuter rail service to new stations. In 2013, Amtrak completed the replacement of the Niantic River Bridge, funded in part by ARRA.

Despite recent investment, the segment still relies on several aging assets that cause reliability problems. The Connecticut River Bridge still stands at over 100 years old and needs to be replaced. The segment also includes chokepoints in Connecticut, Rhode Island, and Massachusetts that preclude service expansion to meet even short-term growth needs. The most significant chokepoint is at Boston South Station, which services over 320 daily trains and is currently operating at-capacity during rush hour and has limited space for storing and servicing trains.

The FY16-20 Plan includes funded investments in new station capacity in Connecticut, Rhode Island, and Massachusetts and investments in new track and electrical infrastructure to increase capacity. The Plan proposes additional funding for the Boston South Station Expansion Project and investments at Providence Station, to build upon existing federal grants. The Plan also proposes investments to support the continued development of new track and station capacity to ease existing bottlenecks and support service expansion, develop additional layover facilities for storing trains, and the replacement of the Connecticut River Bridge to advance state-of-good-repair.

Boston South Station, Massachusetts



# Basic Infrastructure

For the FY16-20 Plan, Amtrak has identified approximately \$277M over five years in feasible basic infrastructure investments in the territory between New Haven, CT and Boston, MA. Planned basic infrastructure investments include key maintenance and replacement programs to keep infrastructure installed with federal funding in the 1990s in a state-of-good-repair.


Amtrak plans to repair several interlockings between New Haven and Boston during FY16-20. These interlockings are due for normal circuitry and relay technology upgrades. Other basic infrastructure programs for this region include repairs at undergrade bridges and culverts, maintaining circuit breakers and sectionalizing switches, and a sustained program of track infrastructure upgrades. The track program includes turnout renewal, curve patch replacement, and undercutting.



# Mandated Projects

For the FY16-20 Plan, Amtrak and its state partners aim to further improve safety on the line, while advancing compliance with federal regulatory requirements. Amtrak plans to enhance and expand the existing Positive Train Control system between New Haven and Boston. Additional investments include right-of-way fencing and environmental projects.

## Major Backlog and Service Preservation & Improvement Projects

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By
<b>41. Shore Line East Stations</b>		\$13M	\$0	Connecticut DOT

When Shore Line East service was launched in the 1990s, most stations featured a single low-level platform along the eastbound track. As a result, westbound trains have been required to switch tracks to service these stations, which consumes capacity and creates conflicts with other trains. Over the past decade, CTDOT has embarked on a series of investments to expand and improve stations, constructing two high-level platforms, improved waiting areas, and expanded parking. In recent years, the state has completed investments at multiple stations. In FY16-20, the state will perform work at Clinton, Madison, and New Haven State Street, resulting in two high-level platforms at all SLE stations, which will reduce delays and expand capacity for future service. In addition, the state will expand parking at Guilford and study the feasibility of constructing a new station in Niantic, CT.



<b>42. Shore Line East Power Distribution Upgrade</b>		\$10M	\$0	Connecticut DOT
---	---	-------	-----	-----------------

CTDOT currently operates diesel-powered trains on Shore Line East. In the future, the state plans to operate faster and more efficient electric-powered trains, similar to the equipment operated on the New Haven Line. While Amtrak runs electric trains in this territory, the electrical system is not currently adequate to also support SLE trains. For this project, CTDOT will increase the capacity of the power distribution system between New Haven and New London, CT to support the future use of electric equipment and to facilitate future service expansion for both Amtrak and Shore Line East.



<b>43. Clinton Interlocking</b>		\$0	\$10M	Connecticut DOT, Amtrak
---------------------------------	---	-----	-------	-------------------------

CTDOT plans to construct a new interlocking near Clinton that will increase the flexibility of Shore Line East operations. The new interlocking will enable trains to flexibly serve the existing and future platforms at Clinton and Madison stations and make greater use of the Clinton siding, a short stretch of third track along the south side of the NEC. By enabling SLE trains to use all platforms and tracks in the area, the interlocking will enable Amtrak and SLE to expand services while reducing train conflicts and their resulting delays.

**Funding Needs.** An investment of \$10M over the five-year period would allow Connecticut to design and initiate construction of the interlocking within FY16-20.

Connecticut DOT, Amtrak

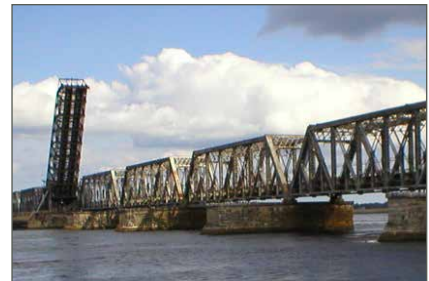


<b>44. Connecticut River Bridge Replacement</b>		\$0	\$661M	Amtrak
---	---	-----	--------	--------





Completed in 1907, the Connecticut River Bridge joins Old Saybrook with Old Lyme, CT and carries both Amtrak and Shore Line East commuter trains. Many key elements of the bridge have reached the end of their design life and require extensive maintenance to remain in operable condition. Amtrak plans to replace the Connecticut River Bridge to improve reliability and reduce travel time along this segment.













**Funding Needs.** With \$661M of additional funding in FY16-20, Amtrak could complete the design and preliminary engineering and begin initial construction of the proposed Connecticut River Bridge replacement.







Amtrak





Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>45. Shore Line East Catenary Upgrades</b>  As noted above, CTDOT plans to switch Shore Line East from diesel-powered trains to electric-powered equipment. To enable this transition, CTDOT is installing electric catenary along key stretches of track in Old Saybrook, Guilford, and New London, which will enable Shore Line East to operate electric trains without disrupting Amtrak operations in these areas. Construction is expected to be complete in the FY16-20 timeframe, enabling a transition to electric equipment and supporting future service expansion.	\$	\$15M	\$0	Connecticut DOT, Amtrak	
<b>46. Kingston Station Capacity Expansion</b>  Amtrak is managing the design and construction of the Kingston Capacity Expansion project to build a high-speed passing siding and high-level platforms at Kingston Station. The project also includes the construction of a new interlocking (Liberty) west of Kingston. In FY16-20, Amtrak and Rhode Island plan to complete the environmental analysis, prepare the final design, and construct an additional 1.5 miles of an electrified third track on a heavily used portion of the NEC. The project will improve ADA access at the station, increase capacity, and reduce travel time.  <b>Funding Needs.</b> If \$17M of additional funding were available from other sources, Rhode Island and Amtrak could proceed to complete the project.	⌘	\$12M	\$17M	Rhode Island DOT, Amtrak	
<b>47. Rhode Island Third Track</b>  Portions of the NEC main line between Providence and Kingston, RI are only two tracks, which restricts capacity and limits available time slots for commuter service from the southern portion of the State. Rhode Island will evaluate and identify issues with the addition of a third track along one of the few tangent track territories that will allow high-speed rail overtakes and provide for a future commuter service to Kingston which is currently only served by Amtrak. In FY16-20, RI will undertake planning, environmental analysis, design and construction of capacity improvements from Providence to Kingston.  <b>Funding Needs.</b> With \$90M in additional funding, Rhode Island could begin construction of the proposed third track.	⌘	\$1.5M	\$90M	Rhode Island DOT	
<b>48. Quonset Maintenance Layover Facility</b>  The development of a new maintenance and layover facility at Quonset, RI would provide much-needed capacity for MBTA's equipment maintenance operation or other passenger rail operators in the Northeast. This facility would also supplement the existing facility in Pawtucket, RI with additional maintenance and storage capacity.  <b>Funding Needs.</b> With \$17M in additional funding during FY16-20, Rhode Island DOT could advance design and construction of the Quonset Layover Facility.	\$	\$0	\$17M	Rhode Island DOT	

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>49a. RIDOT Stations: Pawtucket/Central Falls Station</b>		\$0.5M	\$44.5M	Rhode Island DOT	
<p>Rhode Island has proposed developing a new in-fill commuter station at Pawtucket/Central Falls, RI, along the MBTA Providence Line. This new station offers the potential to provide new communities with access to commuter rail service. In FY16-20, Rhode Island will complete the preliminary engineering and environmental analysis of the new station project.</p> <p><b>Funding Needs:</b> With \$44.5M in additional funding, Rhode Island could complete construction of the new station within the five-year time frame.</p>					
					
<b>49b. RIDOT Stations: Warwick / T.F. Green Airport</b>		\$0	\$40M	Rhode Island DOT	
<p>The Warwick/T.F. Green Airport rail station opened in 2011. In Phase 1 of the project, Rhode Island DOT constructed a station house and a single high-level platform to support the introduction of MBTA commuter rail services to the Airport and to new communities south of Providence. For Phase 2, Rhode Island DOT has proposed expanding the station with additional track and platform capacity to enable additional train service, including Amtrak service at the station. There is currently no funding available for this project in FY16-20.</p> <p><b>Funding Needs.</b> With additional funding of \$40M in FY16-20, Rhode Island could complete the design and construction of Phase 2 improvements at Warwick/T.F. Green Airport station.</p>					
					
<b>50. Providence Station and Tunnel</b>		\$9.75M	\$22M	Rhode Island DOT	
<p>The present-day Providence Station opened in 1986 when the NEC was re-routed and depressed through Downtown Providence with a tunnel at the foot of the State House. Since that time there has been considerable development around the station and ridership demands placed on the station have exceeded the original planning. Therefore both interior and exterior improvements are being contemplated and developed, including pedestrian access enhancements and an adjacent intermodal transit hub.</p> <p><b>Funding Needs.</b> With an additional \$22M in available funding, Rhode Island could complete the final design and construction of the tunnel and station improvements.</p>					
					
<b>51. MBTA Layover Facilities: Pawtucket Layover Facility</b>		\$2.8M	\$18M	Rhode Island DOT	
<p>Rhode Island DOT is funding MBTA-led improvements to the existing Pawtucket Layover Facility, where the MBTA stores and services some commuter rail trains for the Providence/Stoughton Line. Through these enhancements, the MBTA will be able to perform fueling and some light equipment maintenance in Pawtucket, relieving pressure on other MBTA facilities. Phase 1 of the layover improvements was completed in 2013 and included a 700 ft. inspection pit under track 4. In FY16-20, Rhode Island DOT and MBTA will complete phase 2 of this project, which includes the construction of fueling and sanding facilities. \$2.84M in funding is available for this work from RIDOT.</p> <p><b>Funding Needs.</b> Phase 3, the construction of an open-air building over equipment inspection pit completed in Phase 1 could be completed with \$18M in additional funds.</p>					
					

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>52a. MBTA Station Improvements: South Attleboro</b>		\$0	\$8M	Massachusetts DOT	
<p>Currently emergency repairs are underway at the South Attleboro Station pedestrian bridge which carries passengers from the South Attleboro Commuter Rail station parking lot to the inbound platform over Railroad Avenue and the Northeast Corridor. A Consultant study is proposed for subsequent station improvements such as rehabilitation of stairways, pedestrian walkways, establishment of new bus stop for RIPTA, accessible parking improvements, pedestrian crossings, and mini-high platforms.</p> <p><b>Funding Needs.</b> With \$8M in additional funding during FY16-20, MassDOT could implement construction of the accessibility improvements at South Attleboro.</p>					
<b>52b. MBTA Station Improvements: Mansfield Station</b>		\$2M	\$8M	Massachusetts DOT	
<p>Mansfield Station is a heavily-used station on the commuter rail and it is not fully accessible at present. The scope of project includes pedestrian ramps and stairways to make platforms accessible for both the inbound and outbound passengers as well as replacing the existing mini-high platforms which are in poor condition with compliant mini-high platforms. Several other accessibility improvements are planned for Mansfield Station, such as repaving both platforms, new tactile strips along both platforms, new lighting, guard rails, bollards, signage, curb cuts and improvements in parking lots for better accessibility.</p> <p><b>Funding Needs.</b> With \$8M in additional funding during FY16-20, MassDOT could implement construction of the accessibility improvements at Mansfield.</p>					
<b>52c. MBTA Station Improvements: Ruggles Street Station</b>		\$30M	\$0	Massachusetts DOT	
<p>The Ruggles, MA station currently has one platform, accessible to tracks 1 and 3, which limits the number of MBTA trains that can service the station. Massachusetts plans to construct a new platform in FY16-20 would serve track 2, enabling all inbound and outbound MBTA trains to serve the station. These station improvements will increase system capacity for rail operations along this segment of the NEC. In 2014, Massachusetts was awarded \$20M in TIGER grant funding to complete the platform construction and make other accessibility improvements to the station.</p>					
<b>53. Boston South Station Expansion Project</b>		\$32.5M	TBD	Massachusetts DOT	
<p>Boston South Station is the busiest station in the MBTA commuter rail system and Amtrak's third-busiest station on the NEC. The terminal is currently operating at capacity, both in terms of train movements and passengers, creating a significant bottleneck and a major obstacle to service expansion. Massachusetts DOT is currently advancing the Boston South Station Expansion Project to identify a vision for future growth at the station. In FY16-20, Massachusetts DOT is using state funding and a previous HSIPR grant to complete preliminary engineering and environmental analysis.</p> <p><b>Funding Needs.</b> Although planning for the Boston South Station Expansion Project is fully funded, the project implementation cost and start date for construction are yet to be determined.</p>					



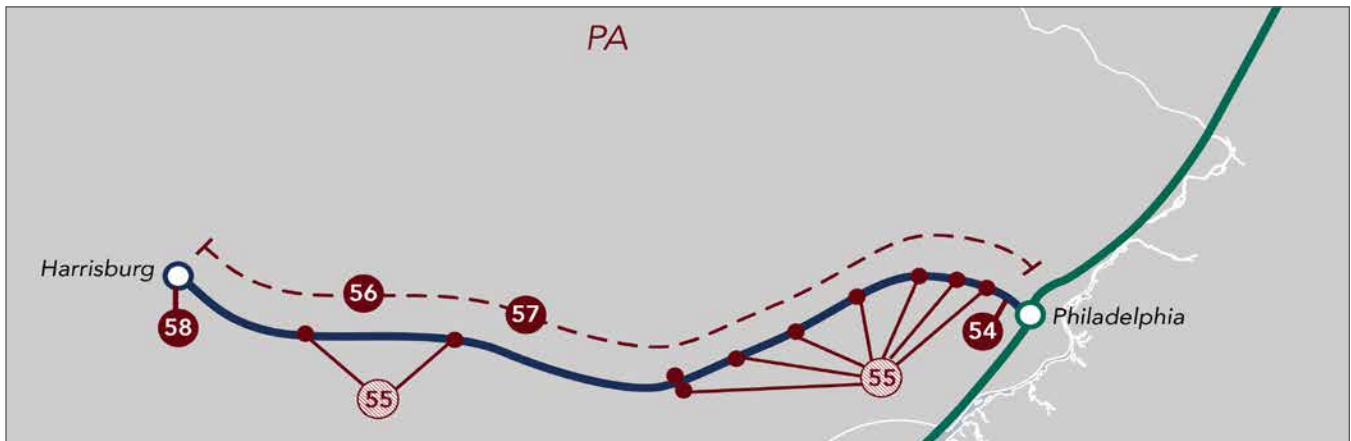


Providence Station, RI





## Harrisburg Line: Philadelphia, PA to Harrisburg, PA



54. SEPTA Cynwyd Line Signal Improvement and Paoli/Thorndale Line Connection  
55. Harrisburg Line Station Improvements  
56. Harrisburg Line Interlocking Improvements

57. Auto-Block Signaling / Central Control  
58. State Interlocking

### Overview

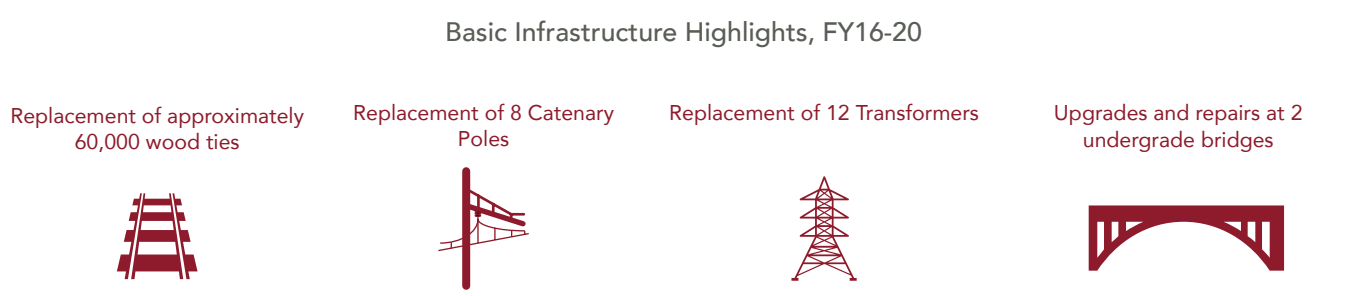
Amtrak owns and operates the infrastructure on the 104-mile Harrisburg Line between Philadelphia, PA and Harrisburg, PA. The Harrisburg Line is served by SEPTA Regional Rail from Philadelphia to Thorndale, PA, and Amtrak's Keystone and Pennsylvanian services. Approximately 23,000 SEPTA and Amtrak riders use the Harrisburg Line each day.

In 2006, Amtrak and the Commonwealth of Pennsylvania completed major investments, funded in part by Federal dollars, to upgrade the tracks, signals, and electrical system, which enabled Amtrak to reduce travel time between Harrisburg and Philadelphia by 30 minutes. Despite these improvements, additional investments are needed to bring the Harrisburg Line to a state of good repair and to support future service goals for both SEPTA and Amtrak.

The FY16-20 Plan identifies investments to upgrade existing stations and modernize aging infrastructure systems. In FY16-20, fully funded investments include a series of major station investments that will ensure ADA compliance and greatly improve the passenger experience along the Harrisburg Line. With additional funding in FY16-20, SEPTA, Pennsylvania DOT, and Amtrak could complete a series of track and interlocking investments that would reduce travel time on the Harrisburg Line and support more efficient and expanded rail service. In addition, stakeholders could complete the modernization of the signal system and continue to advance station investments.

# Basic Infrastructure

For the FY16-20 Plan, Amtrak and its state partners have identified approximately \$24M over five years in feasible basic infrastructure investments on the Harrisburg Line. These investments will fund key maintenance and repair programs and will address the state-of-good-repair backlog for basic infrastructure assets.



# Mandated Projects

For the FY16-20 Plan, Amtrak and its state partners aim to further improve safety on the line, while advancing compliance with Federal regulatory requirements. Amtrak plans to enhance and expand the existing Positive Train Control system on the Harrisburg Line. Upgrades at several stations will achieve ADA compliance.

## Service Preservation & Improvement Projects

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By
-------	--------	-----------------------------	------------------------------------	--------------

### 54. SEPTA Cynwyd Line Signal Improvement and Paoli/Thorndale Line Connection



\$11M

\$0

SEPTA

This project will provide a new access route from the Harrisburg Line to the Cynwyd Line. It includes installing new catenary structures, overhead catenary, power-operated switches and signals, new track, and repairs to existing undergrade bridges. The new access route to the Cynwyd Line will be via the Harrisburg Line's No. 4 track. Construction is already underway for the Cynwyd Access project and will be finished during the FY16-20 period.



### 55a. Harrisburg Line Station Improvements



\$177M

\$0

Pennsylvania DOT, SEPTA, Amtrak

The Commonwealth of Pennsylvania, in partnership with SEPTA and Amtrak, has embarked on an investment program that will eventually modernize virtually all of the Amtrak stations along the Harrisburg Line, including shared Amtrak-SEPTA stations. For FY16-20, Pennsylvania DOT and SEPTA will complete construction on high-level platforms at Villanova and Exton rail stations. In addition, SEPTA will lead construction of high-level platforms and other improvements at Ardmore, and initiate improvements at Paoli Station. Pennsylvania DOT and Amtrak will complete the replacement of three stations at Middletown, Mount Joy, and Coatesville, all with new, high-level platforms and improved passenger facilities.



### 55b. Harrisburg Line Station Improvements: Downingtown



\$18M

\$22M







Pennsylvania DOT



Pennsylvania DOT has identified potential investments for the shared SEPTA-Amtrak station at Downingtown. Proposed work includes construction of a new station building, pedestrian tunnels and walkways, and a parking deck to improve the passenger experience and achieve ADA compliance.

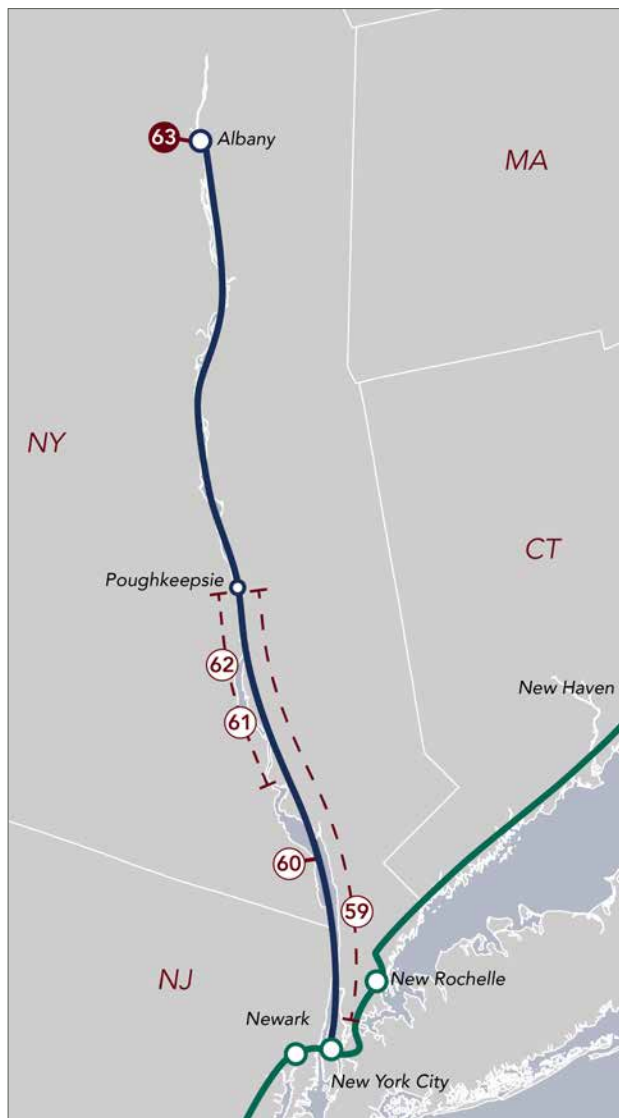
**Funding Needs.** If additional funding of \$22M were available in FY16-20, Pennsylvania DOT and Amtrak could complete preliminary engineering, final design and advance construction of the proposed station investments at Downingtown.



Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>56. Harrisburg Line Interlockings</b>		\$3.5M	\$281M	Pennsylvania DOT, Amtrak	
<p>Pennsylvania DOT proposes to fully replace multiple interlockings on the Harrisburg Line, to advance state-of-good-repair and to support more efficient and expanded service for both SEPTA and Amtrak. In FY16-20, Pennsylvania DOT is performing preliminary work on the following interlockings: Bailey, Potts, Paoli, Wynnefield, Villa, Nova, Valley, and Stiles. In FY16-20, Pennsylvania DOT will complete preliminary engineering and environmental analysis, funded by an HSIPR grant, for the replacement of interlockings.</p> <p><b>Funding Needs.</b> With \$8M in additional funding, Pennsylvania could complete the preliminary engineering and full design of the interlockings. With \$273M in additional funding, Pennsylvania could advance construction of the interlockings.</p>					
<b>57. Auto-Block Signaling / Central Control</b>		\$0.75M	TBD	Pennsylvania DOT	
<p>Pennsylvania has partnered with Amtrak to upgrade the signals along the Harrisburg Line. Currently the Harrisburg Line is not integrated into the centralized computer system in Philadelphia, but controlled at local towers with orders relayed by phone from CETC. Amtrak's goal is to integrate the Harrisburg Line into CETC's computer control system and eliminate the local tower operations. In FY16-20, Pennsylvania and Amtrak will complete preliminary engineering and environmental analysis for the signals upgrades to the Keystone Corridor.</p> <p><b>Funding Needs.</b> Design of the auto-block signaling and central control project is complete, but the additional funding needs for preliminary engineering, environmental analysis and construction is still to be determined.</p>					
<b>58. State Interlocking</b>		\$24M	\$0	Pennsylvania DOT	
<p>State Interlocking is located at Harrisburg, PA, and is a chokepoint along the Harrisburg Line. Old interlocking components require trains to slow down significantly to change tracks, increasing overall travel time. In 2011, the state of Pennsylvania received a \$40 million ARRA grant to rebuild State Interlocking with more modern components. The project will improve train movements along the Harrisburg Line and permit higher speeds to reduce travel time. Preliminary engineering and final engineering are complete. Construction is in progress and is anticipated to be completed in 2017.</p>					



## Albany Line: New York, NY to Albany, NY



### Overview

Along the 160-mile Albany Line, Amtrak owns the sections between New York Penn Station and Spuyten Duyvil (Bronx), Metro-North Railroad (MNR) owns the section between Spuyten Duyvil and Poughkeepsie, and, with funding support from New York State DOT, Amtrak leases the section between Poughkeepsie and Albany from CSX Transportation. Amtrak and MNR operate passenger rail service for almost 30,000 daily riders along the line, while CSX Transportation and CP operate freight service.

Despite high ridership, there are numerous chokepoints caused by obsolete or inadequate track and signals systems, which constrain capacity and speed. Track and station improvements are needed to alleviate current congestion, and yard facilities must be expanded to meet capacity needs.

New York State DOT received \$154 million in ARRA grant funding to complete infrastructure improvements on the Albany Line to improve reliability by addressing several key causes of delays. Some of these investments are wrapping up this year. The Plan identifies additional investments New York State DOT, Amtrak, and MTA could complete that would prepare the Albany Line for future growth.

59. Hudson Line Undergrade and Overhead Bridge Priority Repair and Normal Replacement  
60. Harmon Shop and Yard Upgrade  
61. Upper Hudson Line Station Improvements

62. Upper Hudson Line Signals Upgrades / Track Capacity Improvements  
63. Albany-Rensselaer Station Fourth Track

## Basic Infrastructure

For the FY16-20 Plan, Amtrak has identified approximately \$60M over five years in feasible basic infrastructure investments to perform maintenance and needed repairs on the portions of the Albany Line it oversees. These investments are required to maintain basic infrastructure assets in a state-of-good-repair.

MNR has proposed continued investment in maintenance and repair for the portions of the Albany Line it maintains as part of MTA's proposed Five-Year Capital Program. Constrained funding levels have not yet been finalized in an approved MTA Five-Year Capital Program. With sufficient funding, MNR would continue to advance key investments in basic infrastructure along the Albany Line, known also as the MNR Hudson Line. Available funding for basic infrastructure is inadequate to maintain this section of the railroad in a state-of-good-repair. Additional infrastructure needs on the Hudson Line have been identified in the MTA Twenty-Year Needs Assessment.

### Basic Infrastructure Highlights, FY16-20

Upgrades and repairs at 8 stations



Replacement of approximately 80,000 wood ties





Upgrades and repairs at 2 undergrade bridges



## Mandated Projects

For the FY16-20 Plan, Amtrak and its state partners aim to further improve safety on the line, while advancing compliance with federal regulatory requirements. Amtrak plans to install PTC on the territories between New York Penn Station and Spuyten Duyvil and Poughkeepsie and Albany. As part of the proposed MTA Five-Year Capital Program for 2015-2019, MNR proposes to complete installation of PTC on the Hudson Line between Spuyten Duyvil and Poughkeepsie.

## Service Preservation & Improvement Projects

Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>59. Hudson Line Undergrade and Overhead Bridge Priority Repair and Normal Replacement</b>		\$0	\$45.4M	Metro-North Railroad	

MNR has three undergrade bridges and 12 overhead bridges between Spuyten Duyvil and the Division Post at MP 75 that require replacement or priority repairs. Seven of the bridges requiring replacement are in the critical four-track section carrying Amtrak's Empire Service as well as MNR's electric suburban service. Additionally, several other bridges require rehab, superstructure replacement, and various priority repairs to maintain state-of-good-repair. The condition of these bridges are problematic and deteriorating, and may become perilous within the next five years if no repair or replacement actions are taken.

**Funding Needs.** With \$45.4M in funding, MNR could complete repair, component replacement, or complete replacement of the bridges identified above, initially starting with the bridges in the poorest condition. This will ensure continued safe operation of trains.



<b>60. Harmon Shop and Yard Upgrade</b>		\$0	\$463M	Metro-North Railroad	
---	---	-----	--------	----------------------	---

MNR plans to replace the Harmon Shop electric repair facility to complete a multi-year shop replacement program. This project consists of modernizing a hundred year-old shop and yard complex to support an expanded fleet of electric and diesel hauled rail cars.

**Funding Needs.** If additional funding of \$463M were available in FY16-20, MNR could complete preliminary engineering and initiate construction of the proposed electric repair facility.




<b>61. Upper Hudson Line Station Improvements</b>		\$0	\$11.5M	Metro-North Railroad	
---	---	-----	---------	----------------------	---

All upper Hudson Line rail stations require renewal, upgrades, and improvements. Major rehabilitation of station elements is needed at Garrison, Cold Spring, Beacon, New Hamburg, and Poughkeepsie. New side platforms need to be installed at Cortlandt and Beacon to provide adequate access/egress capacity during peak travel hours. At Poughkeepsie station, re-construction of mechanical, electrical, and structural elements is required. This work was fully designed in 2010-14.

**Funding Needs.** With \$65M in funding in 2020-2024, Metro-North could complete major rehabilitation of station components, renew the Poughkeepsie station building, and add the two required new commuter platforms. However, initial priority repair work must be completed during the next three years for \$11.5M.



Title	Status	Available Funding (FY16-20)	Additional Funding Needs (FY16-20)	Submitted By	
<b>62. Upper Hudson Line Signal Renewal and Track Capacity Improvements</b>		\$0	\$90M	Metro-North Railroad	

MNR has identified track segments along the upper Hudson Line between Croton-Harmon and Poughkeepsie that create chokepoints and limit train throughput. New designs for the signal system will provide improved track capacity through shorter signal blocks to provide operational flexibility which helps to improve service reliability. The project will include trunk copper cable replacement with fiber optic technology and other signal capacity improvements available with new designs based on best practices. This project includes conventional signaling only and does not include PTC overlay. The design was complete in 2010 and needs to be updated and refreshed prior to construction work.

**Funding Needs.** With \$90M of additional funding, MNR could refresh the design and complete the construction of a new signal system with improved capacity, new technologies, and new equipment along the upper Hudson Line during FY16-20, which will also improve service reliability and operational flexibility.



### 63. Albany-Rensselaer Station Fourth Track



\$50.5M \$0

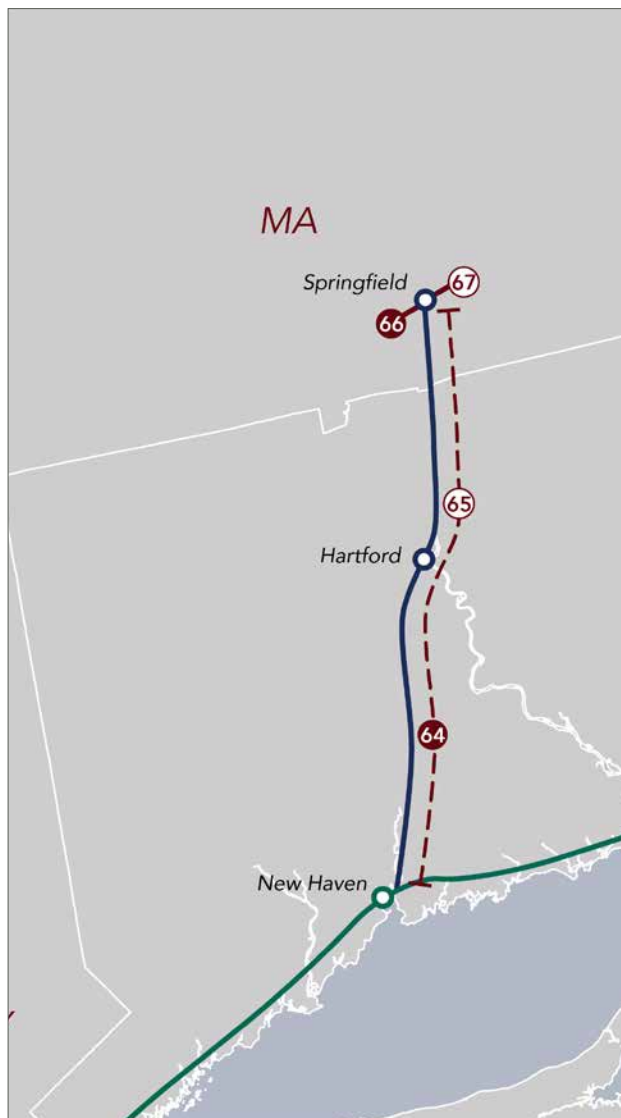
New York State DOT

The Albany-Rensselaer Station does not currently have a fourth track platform, which causes passengers to wait outside the station until a track is available. The signals are also outdated and inadequate for the number of trains using the station. New York State received ARRA grant funding to complete track, signal, and station upgrades at the Albany-Rensselaer Station to increase the overall operational efficiency and capacity of the station, and to improve the passenger experience. The project, included under New York's Empire Corridor Capacity Improvement Program, is scheduled to be completed in 2016.





## Springfield Line: New Haven, CT to Springfield, MA



### Overview

This 60-mile branch of the NEC to Springfield, MA is owned and operated by Amtrak and runs from New Haven, CT to Springfield, MA. Amtrak is currently the sole passenger rail operator on the line, while CSX Transportation, Connecticut Southern, and Pan Am Southern operate freight service.

With the assistance of ARRA and other federal programs, the state of Connecticut has embarked upon a complete overhaul of this segment called the New Haven-Hartford-Springfield (NHHS) Rail Program. Plans include the development of a new commuter rail service known as CT*rail* - Hartford Line. Construction is underway along many parts of the corridor to add additional track, replace or repair structures, eliminate at-grade crossings, and replace signaling systems in preparation for new service beginning in 2016. While some portions of the NHHS Rail Program are funded and nearing completion, additional investments identified for future phases are needed to fully support service goals.

- 64. New Haven-Hartford-Springfield Rail Project: Phases 1-3A
- 65. New Haven-Hartford-Springfield Rail Project: Phases 3B-5
- 66. Springfield Union Station Improvements
- 67. Springfield Maintenance and Storage Facility

## Basic Infrastructure

Like other parts of the NEC rail network, this line has suffered from decades of under-investment and many key systems are aging, unreliable, and in need of investment. Though the NHHS Rail Program is categorized as a service preservation and improvement project, as it will support a dramatic increase in service on the line, the Program will also result in the replacement and modernization of key basic infrastructure systems in the process.

The initial phases of the NHHS Rail Program (1-3A) include the installation of a new signaling and communication systems, substantial upgrades to bridges and tracks, replacement of existing grade crossings, and the modernization or replacement of existing rail stations.

Not all funding has been identified for the final phases of the NHHS Rail Program (3B-5). With additional funding, the Program would continue to make basic infrastructure investments that would support new and improved services between New Haven and Springfield.

### Basic Infrastructure Highlights, FY16-20

Construction of four new stations and improvements to existing stations



Installation of approximately 27 miles of new track



Installation of approximately 60 miles of Signal and Communications cable



Replacement or repair of 17 bridges and culverts



## Mandated Projects

Amtrak, CTDOT, and Massachusetts are committed to advancing safety in the NHHS Rail Program. The Program, though classified as a service preservation and improvement project, includes a major upgrade to the line's signaling system that will result in the full implementation of Positive Train Control.

## Service Preservation & Improvement Projects

Title	Status	Available/ Programmed Funding (FY16-20)	Unfunded (FY16-20)	Submitted By
-------	--------	---	-----------------------	--------------

### 64. New Haven-Hartford-Springfield Rail Program: Phases 1-3A



\$365M

TBD

Connecticut DOT, Amtrak

These phases of the NHHS Rail Program are currently underway to rebuild and upgrade infrastructure including the addition of a second track between New Haven and Hartford; overhaul of the signal and communications system; rehabilitation or replacement of many bridges and culverts; and improvements at Wallingford, Meriden, Berlin, and Hartford stations.



### 65. New Haven-Hartford-Springfield Rail Program: Phases 3B-5



\$0

\$250M

Connecticut DOT, Amtrak

The regional vision for this corridor includes the completion of double tracking to achieve 25 trains per day.



### 66. Springfield Union Station Improvements



\$4M

\$0

Massachusetts DOT

Massachusetts plans to begin work on a large-scale renovation and expansion of rail and bus facilities at Springfield Union Station. Of the larger \$78M project, approximately \$20M is rail related. Phase 1 work includes restoration of the station building, re-activation of tunnel connecting the terminal and rail platforms, vertical circulation from tunnel to station platforms, construction of parking garage, and construction of 24-bay bus terminal. The project is scheduled to be completed in 2016 and will increase capacity and improve the passenger experience at the Springfield rail station.



### 67. Springfield Maintenance and Storage Facility



\$0

\$20M

Massachusetts DOT

Massachusetts plans to construct a new maintenance and storage facility in Springfield, MA on site partially owned by Massachusetts DOT. The new facility will increase capacity and reliability for the Springfield line by allowing trains to be maintained at an additional site.

**Funding Needs.** If additional funding of \$18M were available in FY16-20, Massachusetts could complete the design of the new Springfield maintenance and storage facility.



Hartford Union Station, CT





## Credits

Unless otherwise noted, photos belong to the Northeast Corridor Commission or are courtesy of Amtrak, the Connecticut Department of Transportation, Metro-North Railroad, NJ TRANSIT, and Rhode Island DOT.

Page 38: “Metro-North Hudson Line Repairs” by Metropolitan Transportation Authority of the State of New York (flickr user MTAPhotos), 2012. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at <https://www.flickr.com/photos/mtaphotos/8145010891/>.

Page 43: “Union Station, Washington, DC” by Jeffrey Zeldman (flickr user zeldman), 2013. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by-nc-nd/2.0>. Photo available at <https://www.flickr.com/photos/zeldman/9466164718>.

Page 45: “Union Station” by Cliff (flickr user nostril-imago), 2008. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://www.flickr.com/photos/nostri-imago/3368063413>.

Page 45: “Overtake” by flickr user skabat169, 2015. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/rf9nCY>.

Page 46: “MP-36” by Ryan Stavelly (flickr user rstavelly), 2010. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://www.flickr.com/photos/rstavelly/4861248909>.

Page 46: “Two MARC trains at Odenton Station” by Ryan Stavelly (flickr user rstavelly), 2012. Used under a Creative Commons License Attribution-Share Alike 2.0 Generic: <http://creativecommons.org/licenses/by-sa/2.0/deed.en>. Photo available from: [http://commons.wikimedia.org/wiki/Category:Kawasaki\\_MARC\\_III\\_coaches#mediaviewer/File:Odenton\\_MARC\\_two\\_shot.jpg](http://commons.wikimedia.org/wiki/Category:Kawasaki_MARC_III_coaches#mediaviewer/File:Odenton_MARC_two_shot.jpg)

Page 47: “MARC Local” by Ryan Stavelly (flickr user rstavelly), 2010. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://www.flickr.com/photos/rstavelly/4861249241/in/photostream>.

Page 48: “SEPTA Silverliner V’s at Marcus Hook” by Jarret Stewart (flickr user m877), 2014. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://flic.kr/p/oDk1Sc>.

Page 53: “SEPTA Silverliner V’s Approach to Bridesburg” by Jarrett Stewart (flickr user m877), 2011. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://flic.kr/p/a52uqi>.

Page 54: “New Brunswick Station” by Adam Moss (flickr user road geek), 2014. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://www.flickr.com/photos/roadgeek/14421176690/in/photolist-dF1aGa->.

Page 54: “Elizabeth NJ Transit Station” by flickr user brownpau, 2013. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://flic.kr/p/fHfVoP>.

Page 55: “Coming down the Line” by flickr user frankieleon. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://flic.kr/p/q1SMxL>.

Page 55: “Track 3 – Location 4 – Newark Penn Station – New Jersey” by Jeff Turner (flickr user respres), 2015. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available from: <https://flic.kr/p/rnJxbt>.

Page 56: “NYC - James Farley Post Office - Future home of Moynihan Station” by Wally Gobetz (flickr user wallyg), 2008. Used under a Creative Commons License Attribution-NonCommercial-NoDerivs 2.0 Generic: <https://creativecommons.org/licenses/by-nc-nd/2.0>. Photo available at: <https://flic.kr/p/4tivLR>.

Page 57: “Southern Part of Sunnyside Yard Looking East from Queens Boulevard Overpass” by Jim Henderson, 2008. Public Domain. Photo available at: [http://en.wikipedia.org/wiki/Sunnyside\\_Yard#mediaviewer/File:Sunnyside\\_Yard\\_East\\_jeh.JPG](http://en.wikipedia.org/wiki/Sunnyside_Yard#mediaviewer/File:Sunnyside_Yard_East_jeh.JPG).

Page 57: “Hell Gate Bridge” by Dave Frieder, 2008. Used under a Creative Commons License Attribution 3.0 Unported: <http://creativecommons.org/licenses/by/3.0/deed.en>. Photo available at: [http://commons.wikimedia.org/wiki/File:Hell\\_Gate\\_Bridge\\_by\\_Dave\\_Frieder.jpg](http://commons.wikimedia.org/wiki/File:Hell_Gate_Bridge_by_Dave_Frieder.jpg).

Page 59: “Metro North (New Haven Line) train approaches Bridgeport, CT station eastbound. Dec. 2012” by flickr user rik-shaw, 2012. Used under a Creative Commons License Attribution-NonCommercial-NoDerivs 2.0 Generic: <https://creativecommons.org/licenses/by-nc-nd/2.0>. Photo available at: <https://flic.kr/p/pbvjJk>.

Page 63: “New Haven – Union Station” by Sharat Ganapati (flickr user frozenchipmunk), 2013. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/hCBT9A>.

Page 67: “Clinton Station” by Adam Moss (flickr user roadgeek), 2013. Used under a Creative Commons License Attribution-NonCommercial-NoDerivs 2.0 Generic: <https://creativecommons.org/licenses/by-nc-nd/2.0>. Photo available at: <https://www.flickr.com/photos/roadgeek/10936741546/>.

Page 68: “Metro-North Catenary Damage” by Metropolitan Transportation Authority of the State of New York (flickr user MTAPhotos), 2014. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/nCkL4a>.

Page 70: “Inbound train at South Attleboro” by Pi.1415926535, 2013. Used under a Creative Commons License Attribution-Share Alike 3.0 Unported: <http://creativecommons.org/licenses/by-sa/3.0/deed.en>. Photo available at: [http://commons.wikimedia.org/wiki/File%3AInbound\\_train\\_at\\_South\\_Attleboro.JPG](http://commons.wikimedia.org/wiki/File%3AInbound_train_at_South_Attleboro.JPG).

Page 70: “Two MBTA trains near Mansfield, MA, December 2014” by Pi.1415926535. Used under a Creative Commons License Attribution 3.0 Unported: <http://creativecommons.org/licenses/by/3.0/deed.en>. Photo available at: [http://commons.wikimedia.org/wiki/File%3ATwo\\_MBTA\\_trains\\_near\\_Mansfield%2C\\_MA%2C\\_December\\_2014.JPG](http://commons.wikimedia.org/wiki/File%3ATwo_MBTA_trains_near_Mansfield%2C_MA%2C_December_2014.JPG).

Page 70: “\_JY\_1139\_Crop” by Derek Yu (flickr user signalpad), 2008. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/4CUPmm>.

Page 71: “Providence Station” by Matt Cloutier (flickr user mcloutier89), 2014. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://www.flickr.com/photos/124766284@N06/15491708238>.

Page 74: “Single Car Silverliner V on the Cynwyd Line” by Jarrett Stewart (flickr user m877), 2012. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://www.flickr.com/photos/m877/7224492766>.

Page 74: “Mount Joy Station” by Adam Moss (flickr user roadgeek), 2013. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/eNrWsG>.

Page 74: “Downingtown Station” by Adam Moss (flickr user roadgeek), 2013. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/dNxsZC>.

Page 75: “P1040080” by flickr user skabat169. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/8r3TMU>.

Page 78: “IMG\_6755” by Kurt Raschke (flickr user kurtraschke), 2008. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/5tnQ22>.

Page 82: “Amtrak Regional Shuttle in Hartford, CT” by Adam E. Moreira, 2005. Used under a Creative Commons License Attribution-Share Alike 3.0 Unported: <http://creativecommons.org/licenses/by-sa/3.0/deed.en>. Photo available at: <http://commons.wikimedia.org/wiki/File:AmtrakRegionalSpringfieldShuttleatHartford.jpg>.

Page 82: “Springfield Union Station” by Deval Patrick (flickr user massgovernor). Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://www.flickr.com/photos/massgovernor/8249957599/in/photolist-duYEuU-dz2bSi-duYCXG-dz2cp2-dz2bYg-dz7Fq9-dz7EPU-dz2crg-a3daed-iBTaBU>.

Page 82: “AMTRAK, Springfield/MA, Nov 28, 2011” by flickr user kuknauf, 2011. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://flic.kr/p/pnpyVW>.

Page 83: “Romanesque Hartford Union Station” by flickr user erussell1984, 2015. Used under a Creative Commons License Attribution-Non-Commercial-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by/2.0>. Photo available at: <https://www.flickr.com/photos/erussell1984/163462121848>.

Page 87: “A crazy mess of holiday travelers” by Connie Ma (flickr user ironypoisoning), 2012. Used under a Creative Commons License Attribution-ShareAlike 2.0 Generic: <https://creativecommons.org/licenses/by-sa/2.0/>. Photo available at <https://www.flickr.com/photos/ironypoisoning/8359404631/>.

NJ TRANSIT Concourse, Penn Station, NY







Front Cover: Wilmington, DE Station  
Back Cover: Tie replacement on the Northeast Corridor

[www.nec-commission.com](http://www.nec-commission.com)