

Investing in the Northeast Corridor Advancing the American Economy

February 2016





The United States Congress established the Northeast Corridor 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 Northeast Corridor (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 commuter rail operators in the Region.



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Executive Summary

This report illustrates how current and potential future levels of investment in the Northeast Corridor (NEC) could shape the economy of the Northeast region and the nation. It is not a cost-benefit analysis or a full economic impact study. Its purpose is to provide an economic context for deliberations regarding a vision for the NEC through the NEC FUTURE planning process under the leadership of the Federal Railroad Administration (FRA).¹

Economic Engine for the Region and Nation

The NEC region is home to nearly one-fifth of the U.S. population and, with \$3 trillion in annual economic output, the fifth largest economy in the world. Nearly a quarter of the country's top universities, a fifth of Fortune 500 company headquarters, and many top hospitals are located in this region which consists of just 2 percent of the nation's land area.

Economic activity depends on the efficient movement of people, goods, and ideas. Rail service along the NEC plays an essential role in this most densely populated part of the country, relieving congestion from the highway and aviation networks and unlocking access for families to higher-paying jobs and more affordable housing markets.

Over \$20 billion is needed² – on top of typical annual investments of between \$400 and \$500 million – to restore existing NEC infrastructure to a state of good repair, sustain existing service levels, and thereby protect current economic productivity. Levels of investment would have to exceed those figures in the coming decades to allow the economy of the Northeast and the country to advance alongside global peers.

Protect the Economy

As rail infrastructure along the NEC ages, the system is becoming more vulnerable to service disruptions. A previous study by the Commission found that a theoretical loss of all service along the NEC for just one day would cost the economy \$100 million.³ The present study finds that the cost of actual delays – measured in lost time and productivity – combined with the extra time users build into their schedules “just in case,” totals nearly \$500 million every year. That figure will grow in the coming years if historic levels of capital investment persist.

However, historic low levels of capital investment have even graver consequences. Aging infrastructure on the verge of failure has the potential to suspend or severely reduce rail service. Hundreds of thousands of workers depend on these rail services to access jobs in core markets, communities with affordable housing options, or both. If infrastructure is not restored to a state of good repair, the link between workers and jobs could be disrupted, increasing household costs in the short term and impeding regional business growth in the longer term.

A complete loss of NEC service could cost the economy \$100 million per day

Service disruptions already cost the economy \$500 million per year

Advance the Economy

Higher than historic levels of capital investment in the NEC – such as in the build alternatives under consideration in the NEC FUTURE process – could drive economic expansion and support U.S. global competitiveness. Additional capacity, improved travel time, and new origin-destination pairs could increase the attractiveness of already-strong U.S. markets, fuel the development of centers of innovation, and grow mid-sized cities throughout the region. Global competitors are benefiting from investments that take advantage of these principles and plan to invest many billions more. Relative to gross domestic product (GDP), countries like China, Switzerland, India, Spain, and Russia spend three to 15 times the amount the U.S. does on rail infrastructure.

Economic impacts related to transportation system use are easiest to forecast. NEC FUTURE estimates that once completed, the build alternatives would provide approximately \$4 billion in transportation-related benefits for users of the rail system. In addition to these direct user benefits, NEC FUTURE forecasts approximately \$500 million in potential non-rail user benefits, including increased safety and reduced emissions.

The Commission's previous study focused on the benefits for users of the highway and aviation systems – such as reduced congestion, emissions, operating and fuel costs, and traffic accidents – of investments to increase NEC capacity to keep pace with travel demand growth. That study forecast approximately \$8 billion in annual potential benefits.

Investments in the NEC to keep pace with travel demand growth could benefit the economy \$8 billion per year by 2040 in transportation-related cost savings alone; economic development benefits could be even greater

The potential benefits of investment related to increased global competitiveness and stronger connections between markets are difficult to quantify and thus are explored qualitatively in this report.

Bolstering markets that already lead the economy – the major job centers in New York, Washington, Boston, and Philadelphia – is crucial. Particularly in New York, investment in transportation capacity may be required to ensure the viability of projected job growth.

The potential for more transformative economic gain may lie in mid-sized cities such as Baltimore, Hartford, Newark, New Haven, Providence, and Wilmington. Their economies, with anchors such as research universities and corporate headquarters, stand to benefit from more reliable and frequent service, providing faster access to the financial and human capital resources of major hubs. Investment could attract more residents and employers to these communities where lower costs of living would be paired with high-quality rail connections to the larger markets. Such investment in infrastructure would support recent economic and demographic trends and align with local economic development plans already in place.



Downtown Boston and the Charles River

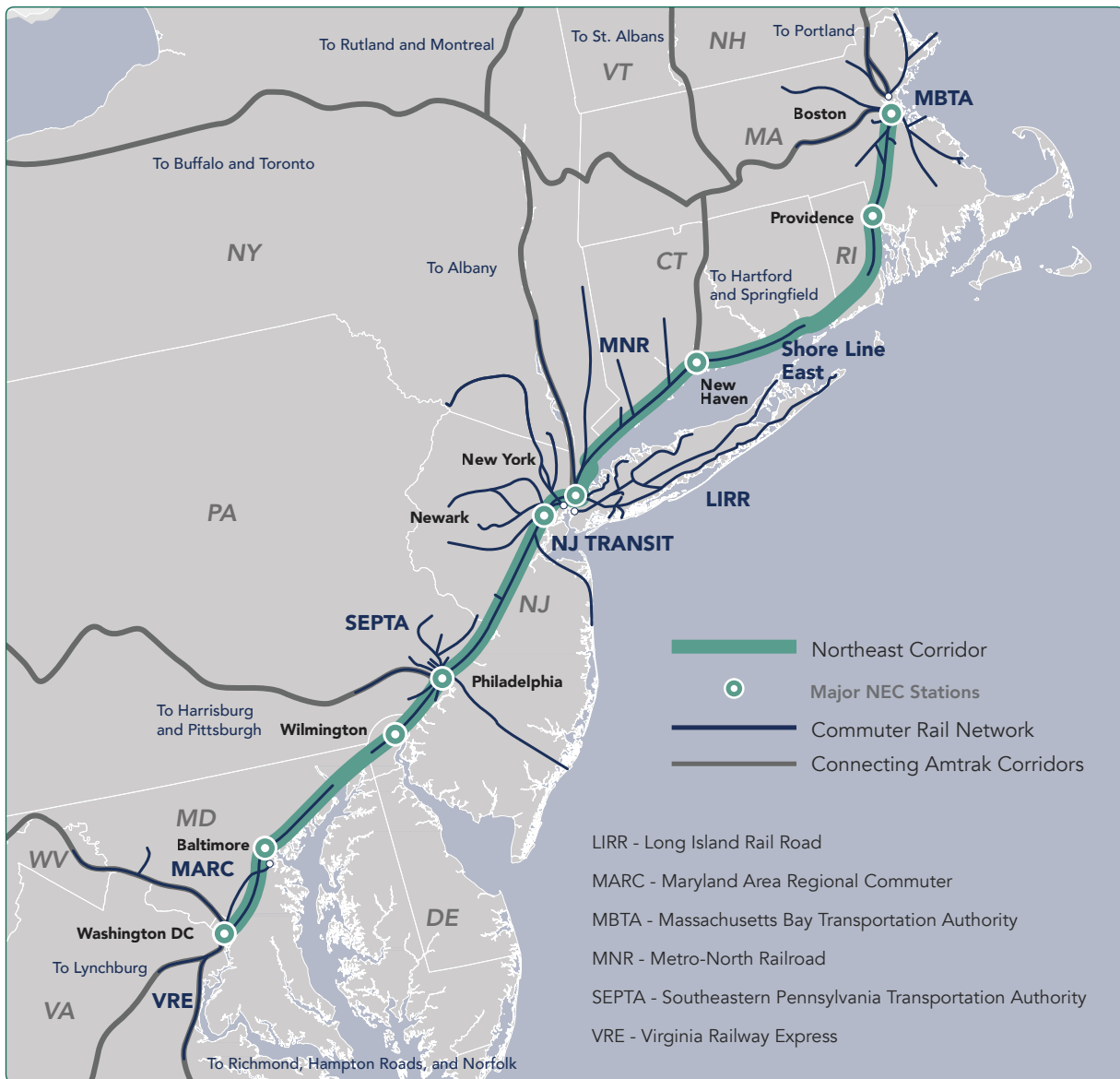
Introduction

Higher than Historic Funding Required to Protect and Advance the Economy

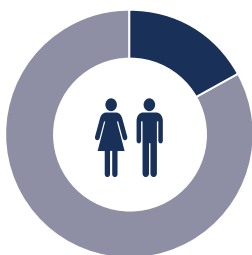
This report illustrates two ways in which higher than historic levels of capital investment in the Northeast Corridor (NEC) could impact the economy. The first increment of additional capital investment would be required to *protect* current economic productivity by sustaining existing service levels. A second increment of additional capital investment could *advance* the national economy in line with global competitors by improving access to markets.

This report builds on prior work of the Commission to outline the NEC's capital needs and critical economic role. This report is not a cost-benefit analysis nor an exhaustive economic impact study. Rather, the purpose of this report is to lay out how current and potential future levels of investment in the NEC could define the economic potential of the region and the nation. This work is intended to provide context for investment decisions framed by the NEC FUTURE planning process led by the Federal Railroad Administration (FRA).⁴ This report does not evaluate the specific investment scenarios under consideration but seeks to articulate how different levels of investment relative to recent history would impact the economy. It should be noted that the “No Action Alternative” outlined in the NEC FUTURE Draft Environmental Impact Statement (EIS) itself assumes increased investment — i.e., higher than historic levels of investment are required just to maintain current operating conditions.

Northeast Corridor Rail Network



U.S. Population



Home to 17% of the U.S. Population

Source: U.S. Census Bureau, 2010

U.S. GDP



Producing 20% of U.S. GDP

Source: Bureau of Economic Analysis, 2010

U.S. Land Area



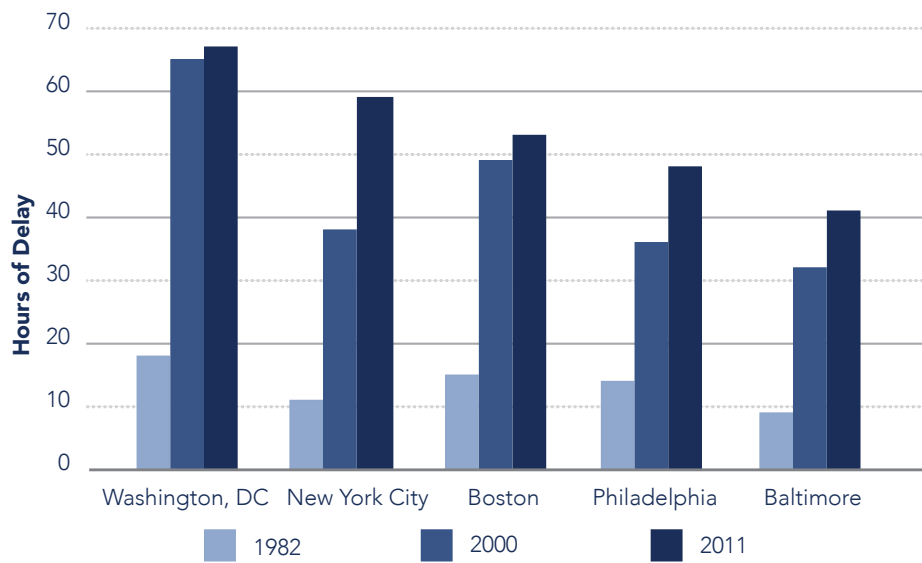
On just 2% of U.S. Land Area

Source: U.S. Geological Survey



Traffic Attempting to Enter New York City

Annual Hours of Delay Per Auto Commuter: Select Metropolitan Areas, 1982-2011



Source: Texas Transportation Institute, 2012 Urban Mobility Report



487 Million

miles are traveled each day by drivers in the NEC region



>\$1,000

cost per year for drivers due to congestion

High-Density Region with Diverse Transportation System and Unique Needs

The NEC region has a greater need for diverse transportation options than the country as a whole with 17 percent of the U.S. population on just two percent of the U.S. land area.⁵ With 170 of the nation's 328 worst highway bottlenecks, rail offers millions of annual travelers a safe and reliable escape from traffic. For over a century, rail has helped shape the economy where today seven million jobs (one third of all jobs in the region) are within five miles of a rail station.⁶

Rail options for daily commuting expand both the range and quality of jobs to which workers have access, and allow companies to find and attract the right workers for their needs. Of the 1.2 million commuter rail trips per day in the region, 710,000 use a portion of the NEC. For business travel between cities in the Northeast, rail provides an important alternative to congested highways and airports. Intercity rail services on the NEC carry more travelers within the region than all airlines combined.

Rail also supports the movement of goods throughout the country, with the NEC transporting 14 million car-miles of freight each year and linking seaports with manufacturers to export goods.⁷ In particular, the NEC provides a critical connection between Midwestern manufacturing plants and global markets via the Ports of Baltimore and Wilmington.

Investment Needed to Maintain and Advance Vital Economic Role

Over \$20 billion is needed – on top of typical annual investments of between \$400 and \$500 million – to restore existing NEC infrastructure to a state-of-good-repair, sustain existing service levels, and thereby protect current economic productivity. Additional investment could advance the economy of the Northeast alongside its global peers. As the workforce shifts toward preferences for communities with more diversity in people, activities, and transportation choices, access to rail and other transit is increasingly important as regions compete for skilled workers and the businesses that chase them. Investments in higher frequency service, reduced travel times, and new travel patterns could unlock additional growth in the already powerhouse markets of New York, Boston, Philadelphia, and Washington, DC. Such investments could have an especially significant impact on business growth in mid-size cities like Baltimore, Wilmington, Newark, New Haven, Hartford, and Providence by integrating their economies with the larger hubs of activity.

Executive Summary / Chapter One Notes and Citations

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Amtrak Trains Navigating Winter Conditions

Protect the Economy

Inadequate Investment Threatens the Vitality of the Region's Economy

Merely continuing historic levels of capital investment would not only fail to address key chokepoints on the NEC, but would put existing service levels at risk. Daily commuters depend most heavily on today's NEC. One of rail's greatest advantages is superior travel time reliability compared to congested, accident-prone roadways where automobile commuters lose more than \$32 billion annually in the Northeast due to delays.⁸ Yet, the failure to invest in a state of good repair or expand NEC infrastructure to keep pace with growing ridership already costs the economy nearly \$500 million annually in lost productivity due to train delays. That number could rise with more frequent service outages and delays without higher than historic levels of investment. That figure also does not account for a broader range of impacts related to economic competitiveness that are not easily quantified.

As the region's population grows, more workers will be commuting to jobs each day, placing a strain on the entire transportation system. For rail systems that have experienced years of under-investment and service interruptions, additional demand with no infrastructure expansion could add to delays and reduce reliability across the rail, highway, and aviation networks. At certain capacity chokepoints, the continuation of insufficient levels of capital investment could actually result in reductions in available train service. Higher levels of investment are required to protect the economy from lost productivity due to service delays, service disruptions, and insufficient capacity relative to forecasts of job and population growth in key markets.

Over 750,000 Daily Trips Depend on Fast, Reliable Service on the NEC

The great majority of the approximately 750,000 daily rail trips taken on the NEC are by commuters on the eight regional rail operations to access jobs in the four major economic centers in the region – Boston, New York, Philadelphia, and Washington. Commuter railroads link these higher-paying job centers with more affordable housing markets, as highlighted in Regional Spotlights on pages 7 and 12.

While accounting for fewer trips, intercity rail travel also plays an integral role in supporting the economy of the Northeast by carrying more travelers within the region than all airlines combined. The majority of trips taken on Amtrak’s Acela and Northeast Regional trains are for business purposes, taking advantage of the NEC’s convenient connections between the metropolitan economies of the Northeast.

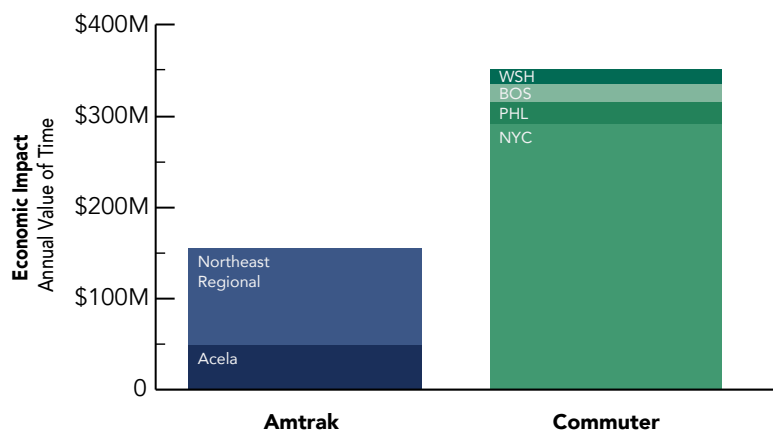
Costs of Delay are Substantial and Growing

For this study, train performance data from Amtrak and NEC commuter rail operators were reviewed and analyzed. Simply adding up the delays experienced by all passengers that currently ride on the system and placing a value on that lost time — lost time at work, missed meetings, but also lost time with family, social events, and the aggravation and stress that results from unpredictable service — comes to a \$120 million annual price tag.

This understates the true cost of delays, however. About 30 percent of all delay costs on the NEC occurs in the morning peak period when people are using the railroad to get to work. Travelers build in additional buffer time in making trip plans as a hedge against significant unexpected delays.⁹ On a system that operates on-time most days, passengers will build in little to no buffer and choose a train that gets them to their destination “just in time.” On a system like the NEC, where delays are more frequent and unpredictable, travelers do not have that luxury. By applying a buffer time to estimate the additional economic “penalties” imposed on rail users from current patterns of trip time variability, the cost of the current delays on the NEC increases four-fold — to nearly \$500 million annually.¹⁰

The costs presented here attempt to place a value on the day-to-day inconvenience to passengers that result from the unreliability of current service on the NEC. They do not capture the more infrequent major delays that result from an acute failure in infrastructure (e.g., bridge outage), which are discussed on page 11. They also do not account for the service constraints imposed from existing capacity limitations and the potential benefits to the broader transportation system if these constraints were relieved.

Annual Cost of Lost Time Due to Service Delay, including Planning Buffer



Data Source: NEC Commission analysis of NEC train performance data, 2015

Spotlight: Trans-Hudson Rail Access

The New York metropolitan area is the clearest case where continued historic levels of investment would fail to protect our economy. The New York metropolitan area is the largest economy in the U.S., and the Manhattan core provides the regional economy with more than 2.1 million jobs, many of them in high-paying, high-growth knowledge sectors fields. These jobs are filled by workers from throughout the region, resulting in more than 1.6 million people commuting into Manhattan each day.¹¹ With employment exceeding pre-recession levels, average wages higher than anywhere in the nation, and greater economic diversification, Manhattan is a powerhouse employment destination for the entire metropolitan area and Northeast region.

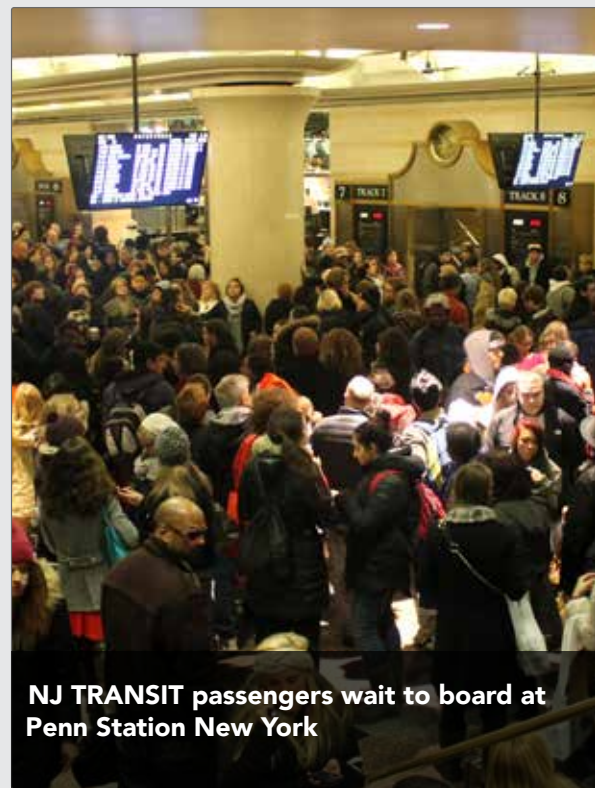
Without higher capacity and more reliable rail service to the New York core from areas west of the Hudson, Manhattan may be unable to realize current projected growth. At the same time, those local economies west-of-Hudson that currently benefit enormously from the capacity and accessibility to New York provided by trans-Hudson rail services stand to lose in the wake of impaired rail service.

If recent trends are an indication, Manhattan's revived importance as a job generator, and the west-of-Hudson's role as labor provider, will continue and grow. Since 2004, there has been a remarkable reversal in the economic fortunes of New York City and its Manhattan core versus the rest of the region. While other parts of the region held steady or lost jobs over the last ten years, New York City has gained 550,000 jobs. That is more than six times the number of new jobs New York City gained in the previous five decades combined.¹²

The existing trans-Hudson train tunnel, completed in 1910, was already in need of investment when it suffered flooding and significant damage during Hurricane Sandy in 2012. The tunnel now faces closure for crucial repairs within the next 20 years. Without new infrastructure, rail service will be significantly reduced from current levels, pushing tens of thousands of commuters off rail and onto other parts of the already congested transportation network.



Midtown Manhattan



NJ TRANSIT passengers wait to board at Penn Station New York

Median Housing Prices



Source: U.S. Census Bureau, 2009-2013 American Community Survey

The share of Manhattan workers commuting from areas west of the Hudson is increasing, while the outer boroughs of New York City, Long Island, Connecticut, and suburban New York counties have stable or slightly declining shares of the total workforce. New Jersey, the largest portion of the west-of-Hudson area, supplied 13.6 percent of Manhattan workers in 2013, a figure up from 11.6 percent a decade earlier. The total number of Pennsylvania workers making the journey to Manhattan more than doubled over that period, from fewer than 9,000 in 2002 to 18,000 in 2013.¹³

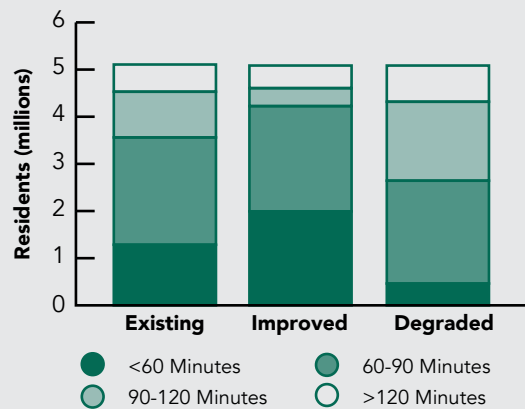
Key factors contributing to these dynamics are Manhattan's generous supply of jobs and compensation rates 75 to 100 percent greater than adjacent communities,¹⁴ paired with its extremely high cost of living. West-of-Hudson communities in New Jersey, New York, and Pennsylvania boast median housing prices less than half of Manhattan's.

Benefits for Manhattan Businesses and Existing and Future Commuters

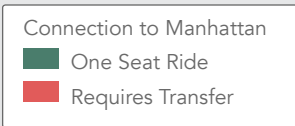
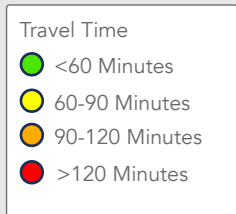
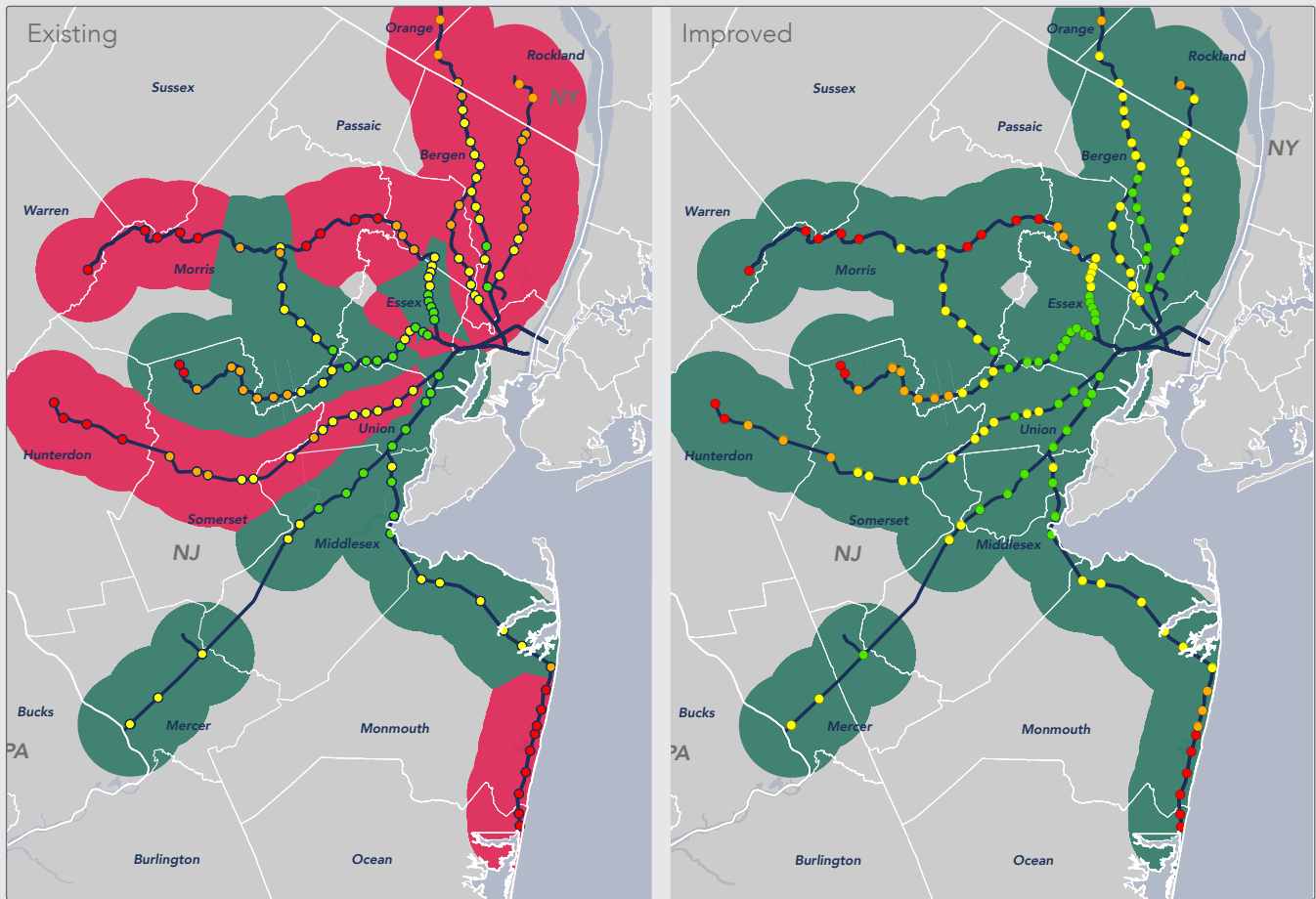
Investment in a package of rail capacity improvements between Newark, New Jersey and Penn Station New York, including a new trans-Hudson tunnel, expansion of train and passenger handling capacity in or near Penn Station, and replacement of bridges, would prevent the disruption of rail service and improve access to the Manhattan labor market. Not only would this package of investments allow for higher frequency of service for existing riders, it would reduce travel time and introduce one-seat commute access via rail to Manhattan for millions of additional west-of-Hudson residents.



Travel Time to Manhattan



West-of-Hudson to Manhattan Rail Connection



If additional rail investments are realized, including a new rail tunnel and Secaucus Loop, the number of people with access to one-seat, direct rail service to Manhattan could more than double from 2.4 million to all 5.1 million residents living near NJ TRANSIT stations.

Forecasts of strong growth in Manhattan’s economy could mean 195,000 to 420,000 new jobs by 2030. Recent commuting trends indicate that 31,000 to 72,000 additional workers could be looking to cross the Hudson every rush hour to fill these positions, a 10-20 percent increase from current levels.¹⁵ Given the relative saturation of capacity by car, bus, and PATH, commuter rail services offer a compelling opportunity to accommodate growth in west-of-Hudson commuting and enable Manhattan firms to efficiently meet future labor needs.



Today, more than 300,000 commuters cross the Hudson River each day. By 2030, recent trends indicate that number could increase by up to 72,000 new commuters.

Benefits for West-of-Hudson Communities

Manhattan would not be the only economy to benefit from improved access to workers. There are several key ways that communities west-of-Hudson would benefit economically:

- Real estate value.** When the Access to the Region’s Core (ARC) project was under review, the Regional Plan Association (RPA) analyzed the impact on housing values of direct-to-Manhattan service along the Morris and Essex Lines afforded by the Midtown Direct, Montclair Connection, and Secaucus Transfer improvements.¹⁶ Using a large statistical sample, RPA researchers found that it raised the average home sale value by two to seven percent, depending on distance from the station. Assuming consistency with the RPA findings, enabling one-seat-ride service from Glen Rock, New Jersey, for instance, could raise the median home price (about \$630,000 presently) by about \$40,000 for homes within one mile of the Glen Rock station.
- Personal income.** Access to Manhattan jobs results in significant wealth brought back to commuters’ home communities. With an estimated 300,000 workers from the west-of-Hudson region holding jobs in Manhattan,¹⁷ and with Manhattan’s average salary 75-100 percent greater than average salaries in home areas,¹⁸ trans-Hudson commuting supports approximately \$35 billion in annual wealth brought back to New Jersey, Pennsylvania, and suburban New York counties. Approximately \$5.5 billion of that total is attributable to the 50,000 trans-Hudson NEC commuters today.¹⁹
- Reverse commuting and revitalization of west-of-Hudson urban centers.** Trans-Hudson commuting has a strong impact on the labor force of the communities outside of Manhattan as well. Statewide, “reverse” commuting from New York City to New Jersey has risen by 12 percent between 2002 and 2013, even amid flat job growth overall in the State. In city centers like Newark and New Brunswick, where a nationwide trend of companies relocating to transit-friendly locations can be seen, commuting from New York City has increased by more than 11 and 42 percent, respectively.²⁰

In Newark, this trend is exemplified by Panasonic. Before the company moved its North American headquarters from a sprawling suburban campus to Newark’s center in 2013, transit commuting accounted for four percent of employees. Since moving to a new building just one block from Newark Penn Station, the share of employees using transit has skyrocketed to 57 percent, with the company shooting for an eventual goal of 75 percent.²¹

Reverse Commuting Trends

	NJ Statewide	Newark, NJ	New Brunswick, NJ
Percent of Workers Commuting from New York City, 2013	3.2%	4.8%	2.0%
Percent Growth 2002-2013	12.1%	11.4%	42.4%

Source: U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics.



Spotlight: Economic Revitalization of Baltimore

Higher than historic levels of investment in the Northeast Corridor could protect and support the ongoing redevelopment as well as future growth of the City of Baltimore and surrounding communities. Located 38 miles from each other, the Baltimore and Washington metropolitan areas share residents, jobs, and cultural destinations, making the two cities economically interdependent. Washington is decidedly the stronger of the two economies, but investments in the NEC offer benefits to both regions.

There are 2.7 million jobs located in the Washington, D.C. metropolitan area, 7.4 percent of which are filled by residents of the Baltimore metropolitan area.²² Washington, D.C. jobs offers a higher average salary than in the City of Baltimore, \$85,877 versus \$59,944 in 2014.²³ The average salary of a MARC commuter is \$100,373, which reflects a long-standing national trend of long commuting distances correlated with higher income jobs.²⁴ The District also offers a larger overall job market, with 783,500 jobs, compared with 323,148 in the City of Baltimore.

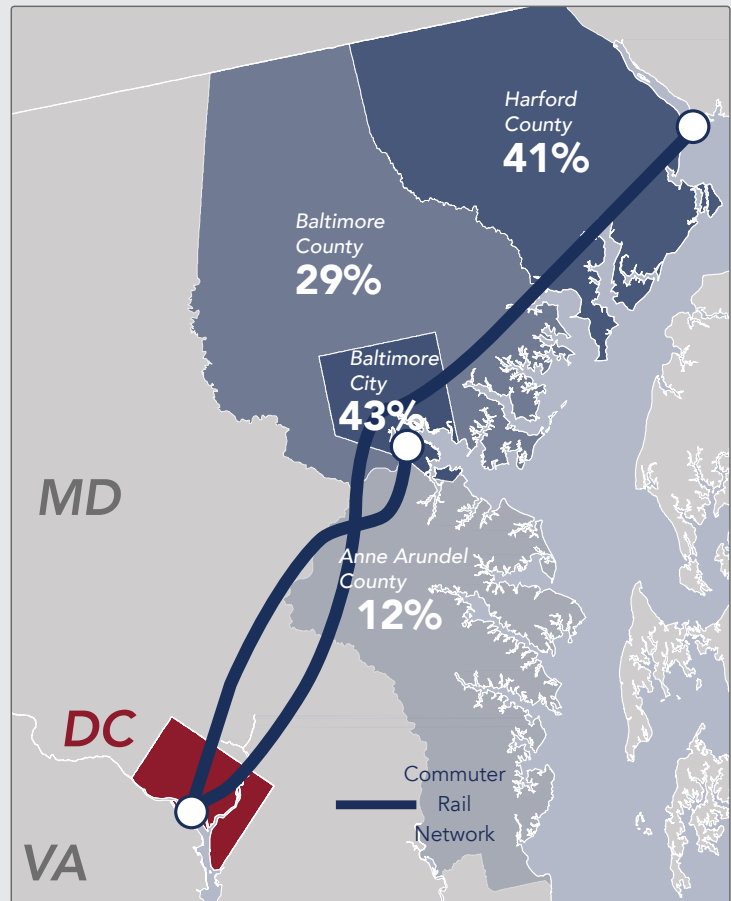
The NEC increases labor access to the job market in Washington while also providing opportunities for employees working in D.C. to reside in the lower cost Baltimore-area housing market. The median home sale in the District in 2015 was \$520,500, whereas the median home sale in the City of Baltimore is only \$110,000.²⁵ The housing market in the D.C. metro area outpaces the Baltimore metro area as well. The rental market in Washington is similarly difficult to afford, with approximately 36 percent of renters paying more than \$1,500 per month and 18 percent paying \$2,000 or more per month.²⁶ In comparison, 12 percent of renters in the City of Baltimore pay \$1,500 or more per month and only 3 percent pay \$2,000 or more per month.



Source: U.S. Census Bureau, 2009-2013 American Community Survey

A Core Service for Baltimore and Maryland

Just over 43 percent of residents of the City of Baltimore that work in the Washington, D.C. metro area travel via the NEC.²⁷ At just under an hour, the trip is approximately as long as driving but with vastly superior reliability. These residents benefit the Baltimore economy by increasing income spent in the City, stimulating residential development, increasing residential property values, and raising local tax revenue. Without access to jobs in Washington, D.C. via an efficient rail commute, many of these residents might choose to leave the City of Baltimore or to settle for lower-paying jobs closer to home.



A Critical Connection at Risk and Benefits of Investment

The Baltimore and Potomac (B&P) Tunnel opened in 1873 and is in dire need of replacement. While safely in operation today, the tunnel undergoes frequent inspections and could be called out of service at any time. If the tunnel is deemed unsafe to continue operation, all train service between Baltimore Penn Station and West Baltimore would be suspended, affecting the busiest portions of the MARC Penn Line as well as Amtrak service north out of Washington.

The 19,250 passengers who commute daily via MARC into Washington, D.C. on the Penn Line would be most immediately affected. Approximately 20 percent of current Penn Line riders might be able to switch to the Camden Line before it also reaches capacity. The net increase in travel time, however, would be 22 minutes per person, which is a 34 percent increase in travel time.²⁸ Assuming the remaining displaced passengers shift to driving alone, commuter buses or telework, the net increase in travel time would be approximately 9,000 hours lost per day, or more than \$110 million per year lost when monetized by the average salary of a MARC commuter. This ignores many other costs such as increased automobile congestion and additional costs imposed on the aviation network as Amtrak passengers are diverted to air travel.

Investment in a replacement tunnel offers the opportunity to accommodate the 48,000 daily passengers between Baltimore and Washington projected for 2040,²⁹ more than double the current ridership. With an average annual income of \$100,373, the additional capacity could bring \$2.9 billion in employee wages into the Baltimore region, and an estimated \$650 million in wages to the City of Baltimore itself.³⁰

Costs Imposed on Rail Operators

Beyond the costs incurred from extra passenger travel time, rail operators also must pay for the additional operation time beyond scheduled hours. This includes labor costs for crew, standby equipment, and other operational strategies. Considering the additional crew costs alone, average delays for Amtrak and commuter trains are estimated to cost an extra \$24 million annually in operating expenses.

Costs Imposed by Extreme Events

In addition to the systemic delays on the Corridor discussed on page 6, extreme events can result in more acute costs to rail passengers and the transportation system. A previous study by the NEC Commission found that a single day without rail service could cost the economy up to \$100 million in impacts to transportation system users, to the environment, and through lost productivity. Though this value is useful to conceptualize the integral role the NEC plays in the economy of the Northeast and the economic loss the region would suffer without it, an NEC-wide loss of rail service is unlikely.

More frequent are events that cause extreme disruptions at specific locations and are beyond the buffer time for which passengers plan. These events might be caused by weather, power supply failures, or aging movable bridges stuck in the “open” position, effectively severing rail service on the NEC for an extended period. The fragility and vulnerability of NEC infrastructure was made clear during Superstorm Sandy in 2012. Another example, in the fall of 2013, Connecticut’s New Haven Line suffered a nearly two-week-long power outage limiting service for over 60,000 riders a day with an estimated economic impact of over \$60 million.³¹ Such periodic economic productivity losses from extreme events must be added on top of the average impacts estimated at nearly \$500 million annually.



Tie Replacement on the Northeast Corridor



Baltimore and Potomac (B&P) Tunnel

Sum of Costs is Greater than its Parts

While the combination of costs described in this chapter are significant, they do not tell the complete story. If average delays increase and very long delays become more common and more extreme, the long-term risks to the regional economy would increase as well. Costs would cut into household income and the productivity of firms, eroding wealth in the region. Moreover, these costs might ultimately cause some households and businesses to rethink their decisions to locate in the Northeast or the U.S.

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Downtown Newark, New Jersey

Advance the Economy

Higher Levels of Investment Offer Opportunities for Growth

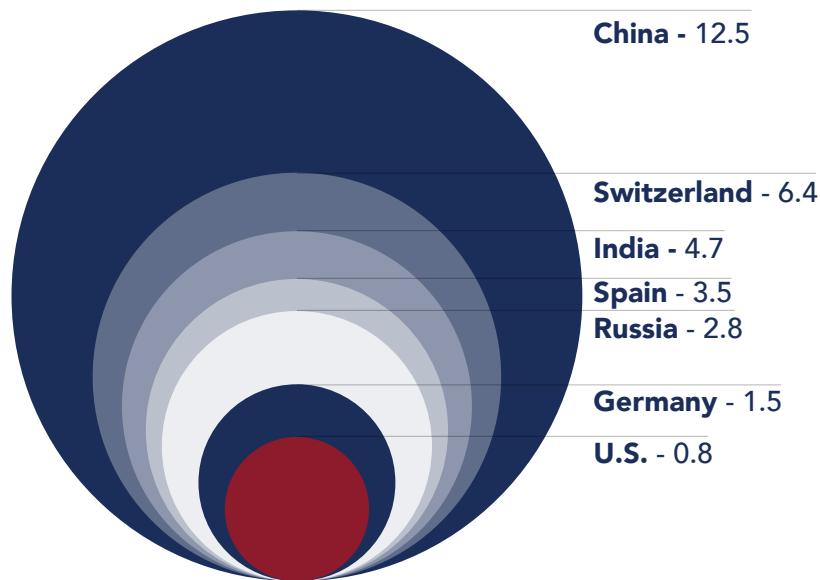
Higher than historic levels of capital investment in the Northeast Corridor would offer an opportunity to drive economic expansion and support U.S. economic competitiveness into the future. At the very least, higher levels of investment in additional rail capacity could limit future strain on the broader transportation system and reduce overall transportation-related economic costs. Improved travel time and new origin-destination pairs could solidify the attractiveness of existing strong markets on a global scale, fuel the development of centers of innovation, and grow mid-sized cities throughout the region. Such investments in infrastructure would align with recent trends and local economic development plans already in place. Additionally, investments that benefit freight rail could shape the competitiveness of East Coast ports and manufacturers across a broad swath of the country.

For decades, peer economies abroad have been investing in railroad infrastructure as a means of shaping and sparking economic growth. As detailed in the previous chapter, thriving job markets benefit from railroad investments through dependable access to labor. High-performing railroads serve another important function by spreading the economic success of one core market to others across a wider geography. Global competitors have benefited from investments that take advantage of this principle and are planning to invest many billions more.

Investments to Reduce Transportation-Related Costs

The economic impacts of higher levels of NEC investment related to transportation system use are easiest to forecast and quantify. NEC FUTURE estimates the capacity provided and ridership generated by the build alternatives would result in approximately \$4 billion in annual transportation-related benefits for users of the rail system, once built. In addition to these direct user benefits, NEC FUTURE forecasts approximately \$500 million in potential non-rail user benefits, including increased safety and reduced emissions.

National Investment in Rail Infrastructure, 2008
Dollars per \$1,000 of GDP



Source: SCI Verkehr - Worldwide Railway Funding and Investment Budgets 2009

A previous study by the NEC Commission³² focused on the potential benefits for users of the highway and aviation systems of increasing NEC capacity to keep pace with travel demand growth. Such benefits included reduced congestion, emissions, operating and fuel costs, and traffic accidents. That study forecasted approximately \$8 billion in annual potential benefits.

These figures do not capture the full economic impact, but they demonstrate the potential for return on investment. Forecasts of economic benefits related to increased global competitiveness and stronger connections between markets are more difficult to quantify. Examples of these benefits, including evidence from abroad, are explored in the subsequent sections.

Investments to Improve Commuter Service

The benefits of higher investment levels to improve commuter rail service go far beyond reduced highway congestion and transportation-related costs. Governments around the world have invested in large-scale rail projects to connect workers to jobs in major metropolitan areas, especially in regions with multiple activity centers and employment nodes such as those in the Northeast.

From 1970-2000, France undertook a concerted effort to improve and expand the existing regional rail network in Paris, known as the Regional Express Rail (RER). During this period, the Paris metropolitan region grew both in terms of population and geographic spread. Investments in the RER improved existing service and increased access to jobs centers in new areas of the region, facilitating enhanced regional economic growth. The number of jobs in outlying cities with station access grew by 12.8 percent over what would have occurred without the RER.³³

Spotlight: Centers of Innovation

The knowledge sector that drives much growth for the U.S. in the modern global economy may rely on intellectual capabilities over physical inputs. However, the activity underpinning today's economy remains highly dependent on physical location, proximity, and accessibility. That is why economic growth is increasingly taking place in what many are calling "innovation districts." Transit, including commuter rail, is a key asset to these emerging clusters. Rather than the auto-centric suburban developments of previous decades, today's creative, scientific, and technology workers favor denser, more walkable environments accessible via transit.

High-performing transit, though important, is not by itself enough to create an innovation district. Fortunately, the Northeast possesses many other assets, including research institutions, an educated and skilled workforce, and established firms in innovation industries, that contribute to a successful innovation district. Furthermore, local governments, industry groups, and anchor institutions in the Northeast are already enjoying success attracting businesses and workers and are planning their futures around this model.

Innovation District, Boston

The City of Boston's Innovation District, an initiative to revitalize 1,000 acres of land on the South Boston waterfront, is located near Boston's South Station. The Boston Innovation District launched in 2010 to create a new community that attracts and supports innovative and entrepreneurial companies, building off of access to the myriad university and institutional partners such as Harvard University, the Massachusetts Institute of Technology, and others, located in Boston and nearby Cambridge.

Since that time, the area has added more than 5,000 new jobs in over 200 companies. The companies locating in the Innovation District are diverse: technology firms provide 30 percent of new jobs; firms in creative industries (e.g., design, advertising) provide 21 percent of new jobs; while life science and green technology firms provide 16 percent. Firms locating in the Innovation District also vary by size, with a quarter of firms having fewer than 10 employees and 40 percent of firms sharing space with others in co-working spaces or incubators. Companies that have announced moves to the Innovation District will bring another 4,000 jobs to the area.³⁴

Drexel University Innovation Neighborhood, Philadelphia

Drexel University is developing a 12-acre Innovation Neighborhood that can accommodate 6.4 million square feet of development directly adjacent to Philadelphia's 30th Street Station.³⁵ The Innovation Neighborhood will feature space for Drexel University's teaching and research activities, private firms that collaborate with Drexel to bring research to market, and public space designed to foster interaction and serve as a gateway to University City from 30th Street Station. Located in proximity to the Innovation Neighborhood are Drexel's ExCITe Center incubator space and the University City Science Center research park (two existing examples of university/industry synergy), as well as the Cira Centre office tower, which has a direct connection to 30th Street Station. Drexel University estimates that 9,500 new jobs directly related to the Innovation Neighborhood will be generated by the development.³⁶



Renderings of Drexel's Innovation Neighborhood



20 percent

of U.S. patents since 2000 were granted in the NEC Region, more than Silicon Valley



6 of the 10

top-ranked U.S. universities are located along the NEC



10 of the 28

top U.S. adult and children's hospitals are located along the NEC

Taking advantage of the accessibility provided by Amtrak and SEPTA Regional Rail at 30th Street Station is at the center of Drexel's vision for the Innovation Neighborhood. In an Op-Ed in the Philadelphia Inquirer, "Philadelphia's 30th Street Can Be More Than a Train Station," Drexel's President John A. Fry wrote that the Northeast Corridor service provided by Amtrak "can produce considerable returns with reasonable investments" and that its "potential extends well beyond expanded transportation infrastructure. It can significantly affect long-term economic growth through commercial, residential, and retail development." He went on to say that "we are witnessing a revival of transportation-oriented development to meet new demand. In this new era, urban rail stations can once again be centerpieces not only of travel, but also of commerce and learning."³⁷

In the time since the Innovation District concept was announced, Drexel has seen the concept repeatedly validated by market interest. In November 2015 the university announced the opening of a new medical device accelerator in the Innovation Neighborhood, PHL Next Stage Medical, which will provide a shared, supportive work environment for early stage and established medical device manufactures, as well as life sciences talent and capital firm Militia Hill Ventures. The PHL Next Stage Medical accelerator, the first announced resident of the Innovation Neighborhood, will occupy approximately 20,000 square feet in a building directly adjacent to 30th Street Station. Access to 30th Street Station was a key factor in the location of PHL Next Stage Medical in Innovation Neighborhood.

The Innovation Neighborhood lies within Philadelphia's greater University City neighborhood, which encompasses Drexel University and the University of Pennsylvania, that is the center of the city's 'Meds and Eds' economy. University City, driven by the synergy of university and hospital research and commercial partners, has grown significantly within the past decade, recently reaching a milestone of 75,000 jobs. Middle to high-wage positions grew by 79 percent between 2008 and 2013, at a time when the rest of Philadelphia experienced much slower job growth. Today, University City has a 97 percent office occupancy rate, 79,000 square feet of retail space under development, and 1,420 recently completed or under construction residential units.³⁸

University of Delaware STAR Campus, Newark, DE

The NEC is facilitating the creation of innovation districts not only in major metropolitan centers but also in smaller mid-sized cities throughout the corridor. The University of Delaware, for instance, is seeking to capitalize on its proximity to the NEC to catalyze regional economic development through partnerships between Delaware's flagship university and the private sector. Its new Science Technology and Advanced Research (STAR) Campus is being built on a 272-acre site directly adjacent to the Newark, Delaware Amtrak and SEPTA regional rail station. The master plan for the campus includes a new transit center that will enhance access between the station, the STAR campus, and the existing campus, located one mile away. Committed STAR campus partners include Thomas Jefferson University Hospital, near the NEC in Philadelphia, and the U.S. Army's Aberdeen Proving Ground in Maryland. The University considers rail service a critical part of its strategy to attract corporate partners based in Baltimore, Philadelphia, and elsewhere.³⁹



In London, a new regional rail connector, Crossrail, is currently under construction to link the city center with suburban job and activity centers. At £14.8 billion (approximately \$21.9 billion based on current exchange rates), it is one of the largest investments in transportation infrastructure in the world today. In addition to improving the region's gridlocked traffic, the project is expected to have a significant positive impact on London's regional economy by connecting, for the first time, all of the region's main employment centers. Crossrail is projected to add 181,000 jobs to the regional economy, while increasing commercial and residential property values in central London by 10 percent and 25 percent, respectively.⁴⁰

In Toronto, transportation officials are reevaluating the role of their regional rail network in fostering economic growth in the greater metropolitan area. Rather than focus on peak-period only service, Toronto has taken steps to increase off-peak service, leading to a 30 percent increase in ridership.⁴¹ The City plans to expand bi-directional all-day service to the burgeoning technology and start-up corridor between the cities of Toronto and Waterloo. They estimate that the enhanced service will generate 40,000 jobs and \$567 million in annual personal income tax revenues.⁴² By expanding all-day commuter rail service, Toronto recognizes that contemporary metropolitan economies are regional in nature and have multiple economic nodes, including those outside the urban core.

Investments to Improve Intercity Service

Higher investment levels to improve intercity service offer benefits that include solidifying the attractiveness of existing strong markets on a global scale as well as expanding the reach of those strong markets to support the economies of smaller cities in the Northeast. Examples from abroad provide some key insights on the potential economic impact of intercity rail improvements on regional economies.

Across Japan, the country's high-speed rail network, known as the Shinkansen, has had a broad impact on the regional and local economies where stations have been located. These areas have achieved higher population and employment growth rates relative to other parts of the country.⁴³

One city that capitalized on the introduction of Shinkansen service is Saku City. Sakudaira Station, located just outside the City's downtown and 100 miles from Tokyo, opened in 1997. The City actively sought to facilitate development of the station area by developing an integrated land use plan. Saku City sponsored development of the station building, and rezoned the land near the station for retail, commercial, and residential uses. The opening of Sakudaira Station has been credited with increasing the City's population by eight percent in the 15 years following the station's opening. Tax revenue generated in the station area rose from ¥4.35M in 1996, the year before opening, to ¥535.59M in 2012, a 123-fold increase.⁴⁴ Between 1987 and 2001, across Nagano Prefecture, population growth in cities with Shinkansen access was six percent, versus just two percent for cities lacking a Shinkansen station.⁴⁵

In Germany, the Neubaustrecke Köln-Rhein high-speed rail line opened in 2002, connecting the major metropolitan regions of Cologne and Frankfurt. Two small towns, Montabaur and Limburg, with populations of 12,500 and 34,000, respectively, have stations on this line. Following the opening, the economic output of these two towns grew by 2.7 percent more than the surrounding area, as residents gained access to jobs in both Cologne and Frankfurt, and conversely, firms gained access to inexpensive real estate in both Montabaur and Limburg.⁴⁶ Researchers determined that every one percent increase in market access (as defined by GDP weighted by travel time) resulted in 0.3 percent GDP growth.

In both cases, successful local economic development efforts had at their foundation significant rail infrastructure investment on behalf of regional and national governments. These investments either reduced the travel time between cities or created new connections between cities where they did not previously exist. Such efforts can unlock growth, especially in smaller markets, where both potential residents and employers can take advantage of lower real estate costs.

Sakudaira Station.
Saku City, Japan.



Spotlight: Mid-Sized Markets

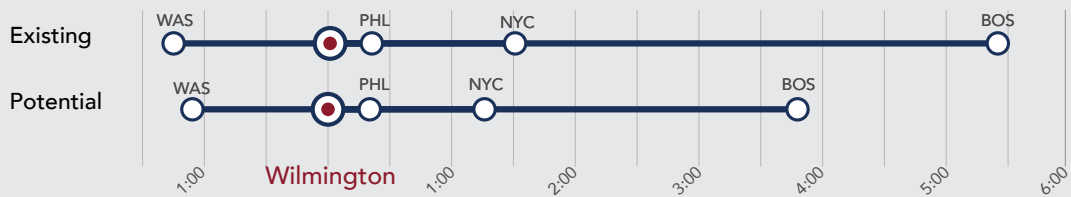
Rail service is a vital link for mid-sized cities throughout the Northeast – connecting them with the capital, talent, and business opportunities in larger metropolitan centers. Mid-sized cities also provide less expensive locations for business operations of major firms. Cities such as Wilmington, New Haven, and Providence have benefited from their mainline location through connections to the major metropolitan economies and cities throughout the corridor. Other cities, such as Hartford, not on the NEC mainline, have the potential to benefit with higher levels of investment.

Today, infrequent service and lengthy travel times place limits on the potential growth mid-size cities might realize in terms population and jobs. With higher levels of investment in improved service, such cities would be able to better retain and attract workers commuting to nearby major metropolitan areas and firms that depend on periodic access to them. Service improvements in consideration through the NEC FUTURE process would dramatically decrease the travel time from mid-sized cities such as Wilmington, Providence, and Hartford to the larger strong markets in New York, Boston, and Washington.

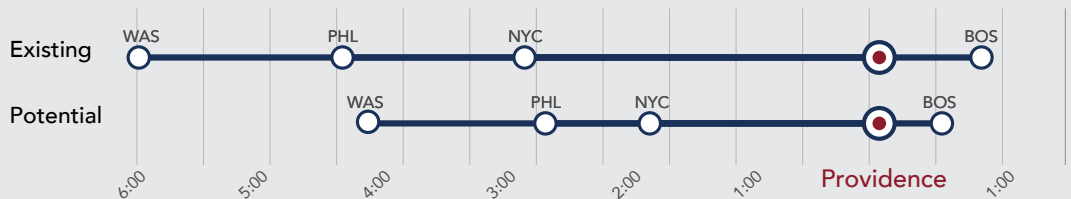
For business travel, service improvements translate into direct economic gains. U.S. Travel Association research has found that 42 percent of business travelers believe that without face-to-face meetings they would lose customers, and that potential customers are nearly twice as likely to become customers following a face-to-face meeting. For every dollar spent on business travel, U.S. firms generate \$9.50 in additional revenue.⁴⁷ Using today's intercity fares as a conservative baseline along with projected ridership increases and travel-time improvements shown below, a total of \$1.4 billion in additional revenue would be generated by business travel to and from Wilmington, Hartford, and Providence alone.

Travel Times to Major Cities Along the NEC

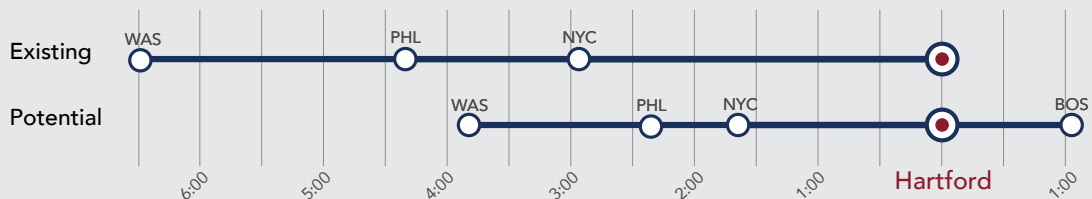
Wilmington



Providence



Hartford

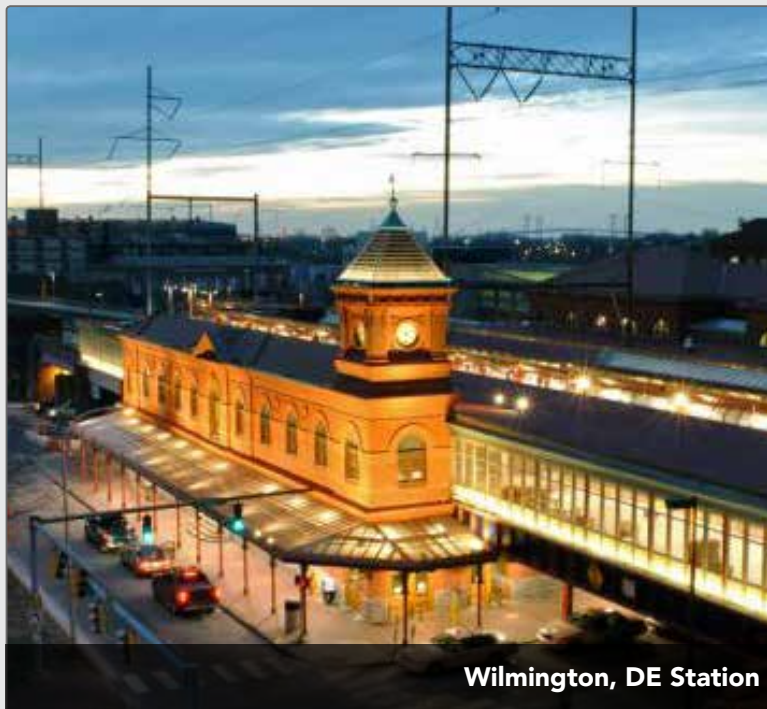


Wilmington, Delaware

Wilmington, Delaware has capitalized on its easy access to the nation's financial center in New York City and its regulatory center in Washington, D.C. to build a robust financial services center. Supported by the Financial Center Development Act in 1981, the State of Delaware is now home to 2,000 financial services firms employing more than 36,600 people. Companies with significant operations in the State include Barclays, Capital One, Deutsche Bank, Wells Fargo, BNY Mellon, Bank of America and JPMorgan Chase.⁴⁸ Many of these firms are located within walking distance of Wilmington's Amtrak Station and rely on convenient access to firm headquarters and offices in New York City.

Providence, Rhode Island

Providence, Rhode Island, historically a manufacturing-based economy, is today transitioning to an economy based on innovation, tourism, and creative industries. The Providence metropolitan area experienced a sharp decline in employment following the recession that began in 2008, falling from 584,000 employed in the region in December 2004 to a low of 537,200 in December 2009, and recovering to 570,200 by December 2014. The types of jobs that have grown in the region post-recession have been primarily in the professional and business services and tourism sectors.⁴⁹ The NEC is providing Providence firms and workers with access to the highly-educated greater Boston area workforce and partners, customers, and capital in Boston and New York.





Cargo Being Loaded at the Port of Baltimore

Spotlight: Port of Baltimore and the Nation's Economy

The Port of Baltimore, ninth in the nation among all ports by the value of cargo processed and thirteenth by cargo weight, is a crucial economic asset. The nation's top seaport for handling "roll on/roll off" cargo, automobiles, light trucks, construction equipment, and farm equipment in 2014, the Port of Baltimore handled nearly 29.5 million tons of international cargo worth nearly \$53 billion, setting a record for the Port.⁵⁰ The Port of Baltimore has transitioned over the past decade from predominately importing foreign cargo (just 21 percent of cargo by weight in 2003 were exports) to one that is a major exporter of American-made goods and commodities, with 53 percent of all cargo by weight being exports in 2013.⁵¹

The manufacturers of cargo exported from the Port of Baltimore are located across the Midwest in places such as Detroit, Michigan (Ford Motor Company and GM), Waterloo, Iowa (John Deere) and Hesston, Kansas (Agco).⁵² The economic viability of

Midwest Communities and Firms that Depend on NEC Access to the Port of Baltimore



these manufacturing plants is directly influenced by access to the Port of Baltimore. Additionally, the port itself is a major component of the Baltimore regional economy, providing 33,920 jobs in the state of Maryland and \$2.9 billion in personal income. An additional 93,700 jobs in Maryland are directly related to activities at the Port, such as manufacturers, distributors, and automobile dealers.⁵³

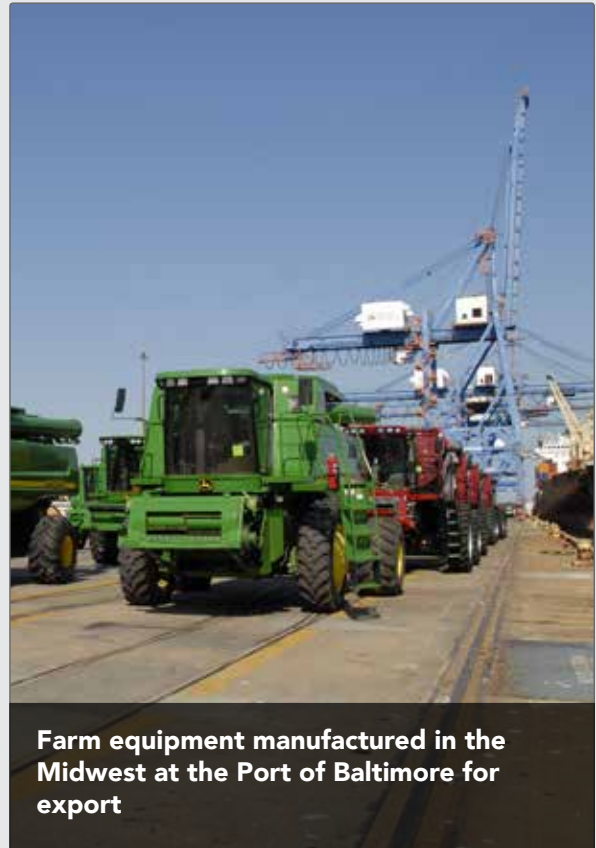
Demand for freight rail access to the Port via the NEC exceeds capacity, with the maximum number of trains on the schedule currently. Any delay or issue related to the NEC, such as the need for maintenance, causes expensive delays for shippers.⁵⁴ In the era of just-in-time manufacturing, the time to market for goods is intricately planned. Goods leave factories so that they will make vessel calls at the port with minimum time stored at the port; vessel calls are infrequent so if a shipment misses its vessel it may be waiting for weeks for the next vessel at a very high cost.

The Port handles cargo that is not easily transported via truck, such as construction and farm equipment. Rail is often the most practical and economical way to ship these goods for export to foreign markets. Though automobiles can be transported by truck, one automobile manufacturer estimated that if it were unable to use the NEC to access the Port, the result would be an additional \$150 to \$200 in per vehicle freight costs to ship vehicles via a car carrier.⁵⁵

Potential Future Conditions at the Port of Baltimore

Ensuring reliable access and capacity for freight rail to reach the Port is crucial. Investments to enhance freight rail access could play a key role in the Port's competitiveness as well as the competitiveness of firms that rely on it.

- **Time to Market.** Increasing the capacity of the NEC to carry freight traffic could decrease time to market. Even a day's reduction in travel time can make a big difference for a manufacturers' bottom line.⁵⁶
- **Improved Reliability.** Manufacturers calculate production in terms of units per day, including the time it takes to travel on rail to port, literally down to the minute. One manufacturer, Case New Holland (CNH), typically plans for their equipment to arrive one week in advance of their shipping date – creating a "hedge" or "buffer" to accommodate rail-related delays. Today, it takes 17 to 22 days to get CNH's product to the Port of Baltimore via rail. Investments that reduced the buffer time could be transformative – driving improved cash flow and the opportunity to reinvest in manufacturing plants. Today, CNH exports \$3 billion worth of farm equipment annually.⁵⁷
- **Greater Volumes.** With additional capacity on the NEC, shipping rates could fall, making it more attractive for firms to expand manufacturing plants in the United States rather than abroad.⁵⁸
- **New Types of Cargo.** Currently, the NEC cannot accommodate double-stacked container traffic. While the Port of Baltimore is prepared to handle the larger Post-Panama Canal expansion container vessels, infrastructure investments would be required on the NEC to move double-stack containers for shipment to and from the Midwest.



Farm equipment manufactured in the Midwest at the Port of Baltimore for export

Investments for Economic Growth

Over \$20 billion is needed – on top of typical annual investments of between \$400 and \$500 million – to restore existing NEC infrastructure to a state of good repair, sustain existing service levels, and thereby protect current economic productivity. Levels of investment would have to exceed those figures in the coming decades to allow the economy of the Northeast and the country to advance alongside global peers.

This report illustrates two ways in which higher than historic levels of capital investment in the NEC could impact the economy. The first increment of additional capital investment would be required to *protect* current economic productivity by sustaining existing service levels. A second increment of additional capital investment could *advance* the national economy in line with global competitors by improving access to markets.

This work is intended to provide context for investment decisions framed by the NEC FUTURE planning process led by FRA. The “No Action Alternative” outlined in the NEC FUTURE DEIS itself assumes increased investment — i.e., higher than historic levels of investment are required just to maintain current operating conditions. This alternative was developed because the National Environmental Policy Act (NEPA) requires a baseline against which to compare alternatives. But even the additional increment of capital investment required to achieve a baseline of maintaining current service is unlikely to reduce the nearly \$500 million per year this study estimates that NEC users suffer in lost productivity due to poor infrastructure condition, congestion, and other factors. The future impact on users of the highway and aviation networks is likely to be even greater. Failure of NEC service to keep pace with population and travel demand growth in the future could cost those travelers up to \$8 billion per year in congestion and other transportation-related costs.

Economic impacts related to transportation system use are relatively easy to forecast. But those figures only measure part of the potential economic benefit of infrastructure investment. Higher levels of capital investment in the NEC – such as in the build alternatives under consideration in the NEC FUTURE process – could drive economic expansion and support global competitiveness. Additional capacity, improved travel time, and new origin-destination pairs could ensure the viability of projected growth in major markets, spark growth in mid-sized markets, and put the U.S. on par with peer regions around the world when competing for economic growth.

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Back Cover: Early construction of the Hudson Yards development project over rail yards adjacent to Penn Station New York