Title
NEC FUTURE: An Approach to Integrating Transportation Planning and the National Environmental Policy Act

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Authors
Stephanie Camay
Parsons Brinckerhoff
One Penn Plaza
New York, NY 10119
(212) 465-5178
camays@pbworld.com

Rebecca Reyes-Alicea
U.S. Department of Transportation
Federal Railroad Administration
One Bowling Green
New York, NY 10004
(202) 281-0194
rebecca.reyesalicea@dot.gov

Ruby Siegel
AECOM
605 Third Avenue
New York, NY 10158
(973) 803-0591
ruby.siegel@aecom.com

Amishi Castelli, Ph.D.
U.S. Department of Transportation
Volpe National Transportation Systems Center
22 Broadway
Cambridge, MA 02142
(617) 494-2822
amishi.castelli@dot.gov
ABSTRACT
The 457-mile (735 km) Northeast Corridor (NEC) anchored by Boston’s South Station in the north, New York’s Pennsylvania Station in the center, and Washington, D.C.’s Union Station in the south, is one of the most heavily traveled rail corridors in the world. Shared by intercity, commuter, and freight operations, the NEC is an unmatched asset, moving more than 259 million passengers and 14 million car-miles of freight per year. The NEC faces serious challenges, with century-old infrastructure, outdated technology, and inadequate capacity to meet current or projected demand. With similar capacity issues on the region’s highways, and some of the most congested airports in the nation, the Northeast’s economic future is in jeopardy.

Responding to these pressing issues, the Federal Railroad Administration (FRA) initiated the NEC FUTURE program, a comprehensive planning effort to define, evaluate, and prioritize future transportation investments in the NEC. The planning effort includes the preparation of a Passenger Rail Corridor Investment Plan that comprises a Tier 1 Environmental Impact Statement and Service Development Plan. This paper outlines the FRA’s approach to integrate the alternatives development process and the evaluation of the environmental impacts of those alternatives. As the NEC FUTURE program continues, through 2016, this approach will create a framework for investment that balances the needs of various users of the corridor in a manner that ensures safe and efficient travel throughout the Northeast. The planning process and analytic tools used for NEC FUTURE can serve as best practices for other similar corridor studies.
INTRODUCTION

NEC FUTURE is a comprehensive planning effort to define, evaluate, and prioritize future investments in the Northeast Corridor (NEC). Launched by the Federal Railroad Administration (FRA) in February 2012, NEC FUTURE will create a framework for the future investments needed to improve passenger rail capacity and service through 2040, through an analysis of market conditions in the corridor, development of program alternatives, and an evaluation of the environmental impacts of those alternatives. The scope of NEC FUTURE has two major components:

- Service Development Plan (SDP) that articulates the overall scope and quantifies the specific benefits and costs for proposed intercity, commuter and freight rail alternatives
- Tier I Environmental Impact Statement (EIS) that addresses the broad environmental effects for the entire corridor along the route of the proposed service

Together, these form a Passenger Rail Corridor Investment Plan (PRCIP), in accordance with the guidelines established by the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) (1). The PRCIP will be a foundation for future project development including engineering design, Tier 2 environmental reviews, environmental permitting, and construction.

Planning for transportation improvements at an early stage is critical for agencies seeking to meet current and future demands for their transportation infrastructure (2). Moreover, the need to achieve a better integration of planning and project development provides the impetus for the use of tiered National Environmental Policy Act (NEPA) procedures (3). As such, the premise of NEC FUTURE is using a tiered approach to the integration of transportation planning and the NEPA process.

While the FRA has integrated planning and environmental analyses, as well as performed Tier 1 environmental reviews, for other rail corridors in the nation, NEC FUTURE is particularly unique, due to both the corridor extent and the inherent planning process. The 457 mile (735 km) NEC is multi-jurisdictional, crossing eight states and the District of Columbia, requiring a higher level of coordination. In addition, the alternatives development process is designed to consider a broad array of alternatives that address the program’s Purpose and Need. Some alternatives involve significant change in the ways passenger service is offered, while others result in fewer modifications to the existing system and focus, rather, on improving service efficiencies. Even the establishment of the No Action alternative is complex in the face of uncertain and inconsistent funding levels.

In order to integrate the NEPA and alternatives development processes, FRA needed to define an approach with built-in flexibility – to inform early alternatives development, allow NEPA and alternatives development to converge, maintain consistency throughout the NEPA analyses, and limit the necessary re-work of alternatives that is often required with concurrent processes. This paper describes FRA’s approach to launch NEPA and alternatives development simultaneously and the lessons learned during this process. As the NEC FUTURE program continues throughout 2016, this approach will create a framework for future investment in the Northeast Corridor. Moreover, the planning process and analytic tools used for NEC FUTURE can serve as best practices for other similar corridor studies.

NORTHEAST CORRIDOR

The NEC is one of the most heavily traveled rail corridors in the world – an unmatched asset that connects the major metropolitan areas of the Northeast region (4). Figure 1 shows a map of the NEC, indicating the existing passenger rail network that comprises the existing NEC, connecting intercity corridors, and commuter rail corridor connections. Anchored by Boston’s South Station in the north, New York’s Pennsylvania Station in the center, and Washington, D.C.’s Union Station in the south, and shared by intercity (Amtrak), eight commuter rail operators, and four freight railroads, the NEC accommodates more than 259 million annual passengers (5) and approximately 370,000 tons of freight per year (6).
From a ridership perspective, the importance of the NEC continues to grow. Annual ridership on Amtrak’s intercity NEC services has increased by over 30 percent, from 8.6 million in 2000 to 11.4 million passengers in 2012 (4). Commuter trips have similarly increased. Since 2003, commuter rail ridership in the Northeast has risen by 33 million trips, to 348 million annual trips in 2011 (7). More than half of these trips (62% of commuter rail riders and 53% of commuter trains) travel on the NEC for at least a portion of their trip. In addition, between 2000 and 2011, Amtrak’s share of the air/rail travel market increased from 37 to 75 percent for trips between New York City and Washington, D.C., and from 20 to 54 percent for trips between New York City and Boston (4).

From an economic perspective, the NEC supports the Northeast economy by delivering workers to jobs, businesses to clients, goods to market, and people to leisure activities. Daily NEC users contribute more than $50 billion annually to the national economy. An unexpected loss of the NEC for one day could cost the nation nearly $100 million in transportation-related impacts and productivity losses (8).

In order to meet these growing demands, the NEC faces serious challenges. The NEC rail network dates back to the mid-1800s, with portions built as early as the 1830s (9). Since that time, new markets and travel patterns have emerged. Over the last 100 years, investment has been made to maintain...
and improve that rail network to contemporary railroad operations. However, despite these improvements, century-old infrastructure, outdated technology, and inadequate capacity are unable to meet current or projected travel demand. With similar capacity issues on the region’s highways, and some of the most congested airports in the nation, the Northeast’s economic future is in jeopardy.

Historically, investment in the NEC has occurred through a partnership between federal and state government and the operating railroads. The federal government supported the development of the NEC in the 1970s with the Northeast Corridor Infrastructure Program (NECIP) and the electrification of the railroad from New Haven to Boston as part of the Northeast Railroad Improvement Program (NERIP). In addition, joint agreements among the rail operators and owners have facilitated continuing improvements to support growth, particularly commuter rail, along the NEC. These investments have supported the maintenance, and in some cases expansion, of the existing NEC for passenger and freight operations, including both intercity and regional or commuter services.

In 2008, in conjunction with PRIIA, the Northeast Corridor Infrastructure and Operations Advisory Commission (NEC Commission) was established to more formally coordinate planning for and investment in the NEC. Two recent federal programs, PRIIA and the American Recovery and Reinvestment Act of 2009 (ARRA), provided the FRA with significant new authority to plan and fund passenger rail improvements across the nation, including the NEC. Those changes led to development of the NEC FUTURE program, which was initially funded under the High Speed Intercity Passenger Rail (HSIPR) program.

NEC FUTURE

NEC FUTURE is comprehensive planning effort to develop an integrated passenger rail transportation solution for the Northeast, which will define, evaluate, and prioritize future investment alternatives for the NEC through 2040. Through the NEC FUTURE program, the FRA will determine a long-term vision and investment program for the NEC. This planning effort includes the preparation of a Passenger Rail Corridor Investment Plan (PRCIP) that comprises two key components in support of the vision. They include a service development plan that is focused on passenger rail service planning and alternatives analysis and an environmental analysis of those alternatives conducted under the National Environmental Policy Act and related laws and regulations. The outcome of the PRCIP is a preferred alternative that best and most reasonably addresses the underlying transportation challenge.

The Tier 1 EIS will assess the broad corridor-wide impacts of proposed improvements. The environmental review process is designed to evaluate alternatives and compare their impacts and benefits based on measurable criteria. The Tier 1 EIS will consider a variety of potential environmental effects that the proposed action may have on the natural and built environment, in accordance with NEPA and the Federal Railroad Administration’s Environmental Procedures (10). The SDP is a detailed plan for proposed rail service. It will provide a platform to improve existing rail service (for example, through faster or more frequent service) and develop new service to meet the growing travel needs of the public. The SDP defines these improvements and evaluates the operational, network, and financial impacts of the proposed changes, with the goal of weighing the benefits and costs of the proposed investment.

The NEC FUTURE program is being developed in close coordination with the NEC Commission. The NEC Commission members include representatives from Amtrak, the U.S. Department of Transportation, the states along the NEC and District of Columbia, and non-voting representatives of the freight railroads who operate over the NEC. Connecting states and commuter operators on the NEC have also been invited as non-voting representatives. The FRA also regularly coordinates with federal, state, and regional agencies.

ADVANCING NEPA CONCURRENT WITH ALTERNATIVES DEVELOPMENT

FRA initiated the NEPA process concurrent with its development of alternatives. During NEPA scoping, a range of NEC improvement options, based on previous efforts undertaken by various stakeholders, were presented to the public as a range of possible alternatives. It was made clear that the development, screening and evaluation of the alternatives to be analyzed in the Tier 1 EIS had not begun and would be
informed by stakeholder and public comments received during scoping and subsequent agency and public engagement. Generally, even when considering a programmatic or corridor-wide set of investments, the sponsoring agency has some pre-scoping analysis which helps to set limits or define the range of alternatives to be considered within the NEPA analysis. This is critical to guiding the level of detail for analysis (especially for a Tier 1 EIS) and the physical geography or study area to be considered.

In the case of NEC FUTURE, where NEPA and alternatives development were launched simultaneously, FRA needed to define an approach with built-in flexibility – to inform early alternatives development, allow NEPA and alternatives development to converge at some future point, and maintain consistency throughout the NEPA analyses, and limit the necessary re-work of alternatives that is often required with concurrent processes.

**Tier 1 Rationale**

The concept of tiering first appeared in the White House Council on Environmental Quality (CEQ) regulations in 1978. These regulations define tiering as “the coverage of general matters in broader environmental impact statements…with subsequent narrower statements or environmental analyses…incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared” (40 C.F.R. § 1508.28)(11). CEQ addressed tiering again in guidance issued in 1983. In that guidance, CEQ reiterated its view that Tier 2 documents could avoid duplication of paperwork, by summarizing the issues raised in Tier 1 and incorporating by reference analyses already prepared in Tier 1 (12).

FRA, as the lead federal agency, determined that the appropriate NEPA class of action for NEC FUTURE is a Tier 1 EIS. This decision was based on the size and extent of the corridor, as well as the programmatic planning approach. The NEC FUTURE study area includes a broad geographic area, stretching from Washington, D.C., in the south, to Boston, Massachusetts, in the north, and covering over 50,000 square miles (129,500 km²). Areas outside of the study area, such as Virginia and New Hampshire, are also being considered in the analysis of markets and services connecting to the NEC. Moreover, conceptual planning and design is being conducted at a level of detail needed to support programmatic decisions. While NEC FUTURE will identify a preferred investment program composed of a number of rail passenger service improvement projects for the corridor, more detailed design and environmental analysis will be conducted in the future at the project level through a Tier 2 compliance process that will inform the project-level decisions to be made.

The Tier 1 EIS will document existing conditions in the NEC FUTURE study area, and environmental consequences of a No Action and a range of Action Alternatives (collectively referred to as Tier 1 EIS Alternatives) for the proposed action. The proposed action in the NEC FUTURE Tier 1 EIS is the selection by FRA of a preferred investment program to improve rail passenger service for the NEC. The Tier 1 EIS will describe environmental consequences at a programmatic level consistent with the level of detail and broad geographic extent of the Tier 1 EIS Alternatives. The Federal Transit Administration (FTA) is a cooperating agency in the NEPA process, as FTA provides special expertise related to their responsibility for funding projects for the Northeast region’s commuter railroads and transit agencies. In this partnering role, FRA and FTA will work together to identify opportunities in the Tier 1 process to create efficiencies applicable during the subsequent project-level development and environmental review processes.

**Stakeholder Coordination**

Public involvement and agency coordination are particularly important in a tiered NEPA process, because of the unusually large scope of the process and because the process is unfamiliar to the public and many agencies (3). As such, stakeholder coordination has been critical to the NEC FUTURE planning process. NEC FUTURE is not only a technical process. Equally important is the opportunity for a broad public dialogue to establish a future vision for the corridor. By bringing together numerous stakeholders from the corridor’s eight states and the District of Columbia, the planning process is structured to help foster a broad agreement on future directions for corridor investment.
The FRA is committed to an open and transparent public and stakeholder involvement process. Two rounds of regional dialogues and workshops helped to engage participants in the relatively abstract choices involved in the program, such as market and service options for the NEC, levels of investment, and evaluation criteria. Scoping meetings in all nine jurisdictions provided both corridor-wide and local input for the initial program alternatives. To reach NEC riders, who range from daily commuters on regional systems to intercity Amtrak passengers, the FRA also held a “pop-up” tour of 16 rail stations in the spring of 2012. Other tools include a comprehensive website, e-mail alerts, e-newsletters, webinars, and numerous meetings, and briefings with stakeholders and interest groups.

This approach of incorporating traditional tools with technology, such as holding webinars or webcasts along with each round of public and agency meetings and providing ‘virtual meeting’ materials on the website with opportunities for questions and comments allows for better public engagement. The train station pop-up tour took the approach of directly targeting and conversing with riders traveling along the NEC. The FRA set up a portable information booth at stations along the northeast corridor using traditional print media, along with technology. iPads were used to display program information and record riders’ comments and concerns and bookmarks with the URL and QR code were distributed so riders unable to stop and talk could visit the NEC FUTURE website and submit comments at their convenience. FRA’s social media accounts were regularly updated throughout the tour. This initiative reached over 12,000 riders.

In light of the program’s scale, FRA’s emphasis has been on finding the best ways to communicate the broad planning concepts considered for NEC FUTURE. For example, unlike typical transportation studies, NEC FUTURE considers connections between city pairs rather than site specific station locations. Focus on this level of detail has also been important to managing expectations about the on-going technical analyses. Feedback from stakeholders and the public has also helped FRA to more clearly articulate the importance of addressing immediate needs within the context of a long-term vision for the NEC. These challenges are on-going, and remain a priority for the FRA as the NEC FUTURE program advances.

**Council on Environmental Quality Pilot**

As part of the planning process for NEC FUTURE, a unique partnership was established with the CEQ. On January 13, 2012, CEQ and FRA announced the selection of the NEPA pilot project for the Tier 1 EIS associated with the NEC FUTURE program (13). The FRA proposed an approach based on early engagement with federal resource and regulatory agencies. CEQ and FRA committed to engaging environmental resource and regulatory agencies and the public in the environmental review process early to set benchmarks that maintain rigorous environmental protections and save time and costs by avoiding conflicts and delays often found in complex multi-state transportation projects.

The CEQ and FRA pilot project for NEC FUTURE (CEQ Pilot) concluded in February 2013, but the commitment to early engagement remains a cornerstone for the overall NEC FUTURE approach to coordinating with federal and state resource and regulatory agencies. Particularly in light of the fact that federal and state resource and regulatory agencies do not often get involved at the Tier 1 level of analysis, this early engagement will prove invaluable to building broad understanding of the concepts, level of details, goals and objectives for the overall NEC FUTURE program. Furthermore, early resource agency participation, well before statutory or other regulatory decisions are necessary, has allowed FRA to take advantage of the technical and geographic-specific expertise of a broad spectrum of resource agencies to help inform the thoughtful development of resource-specific methodologies.

**Alternatives Development**

There are many possible futures for the NEC. Some could involve significant change in the ways passenger service is offered, while others can improve the NEC but keep the level of service much as it is today. Some options concentrate all improvements on the existing NEC from Washington, D.C., to Boston, while others branch out to serve new locations. The NEC FUTURE alternatives development process is designed to consider a broad array of alternatives that address the program’s Purpose and Need.
and determine a roadmap for establishing future service. These alternatives, which are being developed and screened in a multi-step process, have emerged through analysis of data on travel markets, as well as comments received during the scoping process that took place from June through October 2012, as well as ongoing stakeholder coordination. Information from previous studies and proposals was also utilized to form the alternatives.

**Purpose and Need**

The need for the NEC FUTURE program has been refined from the initial Scoping statement provided at NEPA initiation. While the needs themselves have remained consistent since Scoping – to address the aging infrastructure and capacity constraints of the existing NEC – the refinements reflect feedback FRA has received from stakeholder railroads, participating states, and resource and regulatory agencies. In large part, stakeholder concerns with the scale of the program have helped the FRA to clarify the critical needs that NEC FUTURE strives to address; additionally, guidance from resource and regulatory agencies have similarly encouraged a definition of need that clearly relates to the screening of alternatives.

The purpose of the NEC FUTURE investment program is to upgrade aging infrastructure and to improve the reliability, capacity, connectivity, performance, and resiliency of passenger rail service on the NEC for both intercity and regional trips, while promoting environmental sustainability and economic growth. Overall needs addressed by the NEC FUTURE program include the following:

- **State of Good Repair:** Service quality currently falls short, due to the aging and obsolete infrastructure that has resulted from insufficient investment in maintaining a state of good repair on the existing NEC Spine. Achieving and maintaining a state of good repair is needed to improve service quality.
- **Connectivity:** There is a need to improve the reach and effectiveness of the passenger rail network currently limited by gaps in connectivity among transportation modes and between different rail services.
- **Capacity:** In order to accommodate both existing riders and future growth in ridership, improvements at critical infrastructure chokepoints are needed to fix severe capacity constraints that limit service expansion and enhancements.
- **Performance:** In many markets, the trip times on passenger rail within the study area are not competitive with travel by air or highway. Improvements in travel times, frequency, or hours of service are needed to make passenger rail competitive with other modes.
- **System Wide Resiliency:** The NEC is vulnerable to the effects of disrupting events such as severe storms. A more resilient and redundant passenger rail network is needed to enhance safety, security, and the reliability of the region’s transportation system.
- **Environmental Sustainability:** Throughout the study area, energy use and emissions associated with transportation affect the built and natural environment. Passenger rail can help meet the region’s mobility needs with fewer environmental impacts.
- **Economic Growth:** A transportation system that provides options for reliable, efficient, and cost effective movement of passengers and goods is needed for continued economic growth in the Northeast region.

**Initial Alternatives**

Approximately 100 Initial Alternatives were identified covering the spectrum of opportunities to upgrade and expand the NEC, serve existing and new markets, provide better connectivity to other markets, and develop new high-speed rail service. Developing these alternatives began with analysis of Northeast travel demand and growth data to understand where people are traveling to, where growth in population and employment will occur, and whether travel patterns are likely to change in the coming decades. More specifically, existing regional and state travel demand and population growth data, ridership projections made by Amtrak and the commuter authorities, data /discussions with states and planning organizations,
and public and agency comments made during Scoping were used to identify current travel patterns and potential new rail markets.

The data underscore the dominance of the four primary markets on the existing NEC—Washington, D.C., Philadelphia, Boston, and particularly, New York. The data also show that there are other strong Northeast travel markets, both on and off the existing NEC. Those on the NEC, such as Baltimore, Wilmington, Newark, Stamford, and New Haven, already receive significant intercity and commuter/regional rail service. Those off the existing NEC hold potential as future important rail markets, either via connecting rail service to the NEC, or as markets along new alignments. These include Annapolis, Long Island, Hartford, Springfield, and Worcester. The data also support the importance of markets located on connecting rail corridors, including Richmond, Harrisburg, Lancaster, and Albany. Many of these off-corridor markets are under-served by passenger rail. Regional population and employment growth projections through 2040 support the continued attractiveness and expansion of these primarily urban markets, which will increase demand for both commuter rail and intercity rail services.

After determining the strongest Northeast travel markets, the many route and service options identified through data collection and scoping were organized by developing combinations of options for serving those markets. These options include how trains will access the markets (route/rail network), how much service to provide to each market (level of service and investment), and the type of service to be provided (service environment). Mixing and matching these options provides the basis for testing and comparing multiple market, investment, and service proposals.

During development of initial alternatives, the significant data collection effort required to support the NEPA environmental review was initiated. In order to retain flexibility to consider a still uncertain set of alternatives that could extend throughout the Study Area, the FRA decided to compile data regarding existing environmental and transportation resources for the entire Study Area, rather than limiting the data collection to certain corridors or routes. In this way, the data collection and management could advance before alternatives to be evaluated were known. While this did require collection of more data than were ultimately needed, it would allow FRA to later consider the range of possibly impacted resources early in the alternatives development process.

**Program Level** NEC FUTURE applied four incremental investment levels to broadly test investment options in the NEC over the next 30 years. This results in a range of visions for the NEC—from continuation of today’s rail operations at the low end to the opportunity to provide significantly different types of service to existing and new markets at the high end. As the investment level increases, the additional capacity enables carriers to consider a broad assortment of new services and targeted expansion of the rail line to new markets. The nature and extent of these new services and markets will be dynamic as the market for passenger rail on the NEC responds and grows.

**Network** Accessing the Northeast markets by rail requires use of existing or new rail alignments and service options, and continued access to the connecting rail corridors. On the basis of these data and input generated through scoping, the following route segments and combinations will support passenger rail service to a broad spectrum of Northeast markets, and provide continued access to connecting rail corridors. Accordingly, these were used to define the market networks for the Initial Alternatives:

- NEC mainline
- Wilmington-Annapolis-Washington
- New Haven-Long Island-New York
- Hartford-Danbury-New York
- Boston-Providence-Hartford-New Haven
- Boston-Springfield-New Haven

**Service** For the Initial Alternatives, service definition was described in three general categories: today’s mix of intercity and commuter rail service; and two types of enhanced service: simplified service mix,
which provides more frequent service to most markets (including via transfer between trains); and
expanded one-seat ride service to more markets. These categories encompass a broad range of potential
service options for the study area.

Preliminary Alternatives
The Initial Alternatives comprise the spectrum of feasible options for enhancing service on the NEC.
Defining a smaller set of Preliminary Alternatives involved consolidating and reorganizing the Initial
Alternatives to facilitate future isolation and testing of incremental service levels and route options.
Fifteen Preliminary Alternatives were developed through the combination of different service, capacity,
and network options under each of the four Program Levels. These alternatives continue to capture the
broad array of options for growing the NEC to accommodate projected 2040 demand and to support the
region’s transportation needs.

As with the Initial Alternatives, the Preliminary Alternatives were grouped within the four
Program Levels that present different visions for the NEC. Within each level, capacity is added that
permits the testing of a variety of service types and objectives, including minimizing travel time,
increasing the density of service, and adding one-seat ride options. In this manner, the operational and
ridership impacts of these incremental changes and different service can be isolated, tested, and
compared. Each Program Level includes three to four alternatives that test these variables.

The early collection of environmental data also allowed FRA to incorporate consideration of
potential environmental consequences in the evaluation of preliminary alternatives.

Program Level The Program Levels provide a broad range of investment opportunities to test various
route and service alternatives. As Program Levels increase from A to D, additional capacity is required to
support the desired level of service and ability to serve new markets. Capacity increment levels, ranging
from a low of 1 (initial and most pressing capital improvement projects) to a high of 5 (second NEC),
were developed to provide a platform for matching capacity with desired levels and types of service. This
allows better definition of the specific capacity improvements required to achieve the service objectives
of each alternative can be better defined, during the technical analysis of the alternatives.

Network Route segments from the Initial Alternatives were combined to create three network
alternatives south of New York and four network alternatives north of New York. These network
alternatives preserve the ability to add future connecting corridor service to various proposed markets
such as Cape Cod, MA, Scranton, PA, and Ocean City, MD. Most alternatives remain primarily on the
existing NEC. Alternatives that involve a second NEC are limited to Program Level D. These network
alternatives are representative only, as specific alignments and station locations along new right-of-way
will not be developed until commencement of Tier 2, project-specific environmental processes. The rail
networks are as follows:

- Existing NEC via Baltimore Penn and Philadelphia 30th Street Stations
- Existing NEC via downtown Baltimore and Center City Philadelphia
- Delmarva Route via Annapolis and Center City Philadelphia
- Existing NEC New Haven Line – Shore Line
- New York-Nassau-Suffolk via Hartford and Worcester
- Central Connecticut via Providence
- New York-Nassau-Stamford via Danbury and Springfield

The performance and impacts of operations over each of these networks and
submarkets/segments within each network will be evaluated in the next phase of the alternatives
development process to determine the best combinations of routes north and south of New York.

Service Once the Initial Alternatives were identified, further effort was directed to developing various
types of service that can be run on the corridor, from today’s conventional service to enhanced service
A number of alternate service types were defined and are being developed and tested with both simplified and one-seat-ride strategies to measure their effectiveness at filling market gaps left underserved or un-served by today’s conventional mix of services.

In addition, a number of independent elements are also being considered as they may impact some or all of the alternatives. These include terminal and intermediate station solutions, airport access solutions, and rail freight solutions. As the analytic tools and data become available for evaluation and screening of alternatives, these elements will be analyzed as overlays on the alternatives. This might include, for example, an overlay analysis with respect to the potential options for making rail connections to and between airports, and for configuring the stations, yards, and railroad alignments within the major terminal areas.

**Tier 1 EIS Alternatives**

As the next step of the alternatives development process, the Preliminary Alternatives were evaluated to identify a smaller set of alternatives for detailed analysis in the Tier 1 EIS. This evaluation considered the ability of the Preliminary Alternatives to expand capacity, accommodate growth, rebuild aging infrastructure, improve service effectiveness and performance, and increase connectivity. Based on these findings, public input, and extensive consultation with stakeholders, three Tier 1 EIS Action Alternatives have been developed that combine the most promising elements of the 15 Preliminary Alternatives. Each Tier 1 EIS Alternative includes different assumptions about the services to be offered, the geographic markets to be served, and the type and general location of the infrastructure needed to support those services. Moreover, each alternative reflects a distinct vision for the NEC and the role it will play in the region’s future transportation system. Stakeholder coordination was critical to the development of these three unique solutions, particularly in response to the importance of presenting a range of alternatives in the NEPA process.

While the Tier 1 EIS Alternatives will provide varied levels of passenger service and reach different markets, ranging from modest upgrades of the existing NEC to significant expansion of the rail network, all Tier 1 EIS Alternatives will be responsive to the overall needs to be addressed by the NEC FUTURE program, and thus, some features will be common to all of them. For example, each alternative will be designed to:

- Achieve a state of good repair, including an initial set of projects to meet the most immediate needs of the NEC
- Maintain and improve service on the existing NEC
- Expand the range of service offerings to fill gaps in connectivity that existing in the current service
- Increase capacity and improve service by addressing choke points that constrain operations
- Incorporate ways to optimize rail operational efficiency, based on recognized best practices, in order to improve overall rail performance
- Protect freight access and future expansion of service

The Tier 1 EIS Alternatives will be evaluated against criteria that encompass the following important factors:

- Ridership (growth and capacity)
- Costs (capital, operations and maintenance)
- Performance (service effectiveness)
- Environmental consequences
- Economic development
- System connectivity and accessibility
- Flexibility, redundancy, resiliency
- Interoperability
To inform consideration of the environmental factors, the Tier 1 EIS will include information on the degree to which the alternatives support:

- Environmental stewardship and sustainability (the avoidance and/or minimization of adverse environmental effects on water and ecological resources and land use conversions, and the alternatives contributions to air quality and greenhouse gas emissions)
- Socioeconomic benefits, include potential benefits to and avoidance of disproportionate impact to environmental justice populations
- Flexibility, redundancy, and resiliency (the ability of alternatives to adapt to and provide options to respond to factors that disrupt service, such as those associated with climate change and rising sea levels)

**Level of Detail**

The size of the study area presents special challenges in deciding how to document existing conditions and assess environmental consequences in a way that is meaningful to the reader and to the decisions to be made. For example, existing conditions would typically be described for an entire study area. The geographic coverage of the NEC FUTURE study area, however, requires an approach that defines existing conditions sufficient to assess environmental consequences without creating a voluminous encyclopedia of data. For these reasons, existing conditions and environmental consequences are described for specific geographic areas within the study area. The relationship between these concepts, which will guide the Tier 1 EIS analyses, is shown in Figure 2.

**FIGURE 2. Relationship of Representative Route, Affected Environment and Context Area**

A representative route is the potential rail alignment associated with a Tier 1 EIS Alternative. While the Tier 1 EIS is not expected to result in the selection of a site-specific alignment, the representative route provides a sound basis for programmatic evaluation of the environmental effects of each Alternative. The representative route includes the physical footprint of the improvements associated with the Tier 1 EIS.
Alternatives. The horizontal and vertical dimensions of the footprint of the representative route are based on prototypical cross-sections identifying construction type applied to topography or land use type, stations and supporting facilities, and right-of-way requirements. The footprints associated with the representative routes range in width from 150 to 300 feet (46-91 meters), and vertical dimensions have yet to be determined. Improvements associated with stations and supporting facilities (tracks, platforms, parking) could flare out beyond these dimensions.

**Affected Environment**

The affected environment is a geographic area for which existing conditions and environmental consequences will be identified. The width of the affected environment will vary based on the resource being considered; it will be at least 2,000 feet wide, centered on the representative route. In some cases where appropriate to accurately characterize the resource, the affected environment will encompass the entire Study Area.

For each of the resources considered, the affected environment was defined to be sufficiently wide to:

- Encompass and account for the improvements associated with a Tier 1 EIS Alternative, including infrastructure improvements (such as embankments, aerial structures, track improvements), ancillary facilities (such as stations, yards, and parking structures), or service changes
- Account for any contiguous resource features that extend beyond the representative route

Resource-specific considerations, beyond those described above, used to establish the width of the affected environment swaths are summarized as appropriate, and explained further in resource effects assessment methodology reports that will be incorporated into the EIS. For some resources, environmental assessments consider an area not as easily tied to a physical footprint. For example, air quality is evaluated for air-sheds defined by metropolitan planning organizations. Similarly, transportation is considered from a network perspective since it provides connections beyond the area surrounding a footprint. These affected environment definitions may be revised as planning for the program progresses and input is received from stakeholders and/or resource and regulatory agencies.

**Context Area**

Resources within a broader context area will be identified with the intent of allowing for qualitative evaluation of potential shifts in representative routes. The context area, which extends beyond the affected environment and will be standardized for all resources, is five miles wide, centered on the representative route. For those resources for which the affected environment encompasses the entire study area, there will be no context area analysis.

**GIS Database**

A geographic information system (GIS) database has been created for the NEC FUTURE program to compile, store, and analyze data to be used in the documentation of existing conditions and assessment of environmental consequences. No field work or subsurface testing will be conducted for the Tier 1 EIS. Instead, analyses are based on readily available secondary-source data (e.g. GIS-based, published reports, technical analyses).

As the data were collected from a variety of sources, it was reviewed carefully to ensure a uniform level of detail. Future year projections and calculations relative to population and employment, travel demand and related topics developed for the NEC FUTURE program will be incorporated into the GIS data base for use in resource-specific analyses. This GIS database also includes information developed to define the characteristics of each Tier 1 EIS Alternative, such as routes, stations, service types and frequency. Together, resource-specific data (e.g. land cover, demographics, and ecological resources) and information about the Tier 1 EIS Alternatives will be layers in the GIS data base. The interaction of these layers provides the basis for defining the affected environment and assessing environmental consequences.
SUMMARY
This paper describes the FRA’s approach to integrate transportation planning and the NEPA process for the NEC FUTURE, a comprehensive planning effort to define, evaluate, and prioritize future transportation investments in the Northeast Corridor. As the NEC FUTURE program continues throughout 2016, this approach will create a framework for future investment leading to the Northeast Corridor of tomorrow. The planning process and analytic tools used for NEC FUTURE can serve as best practices for other similar corridor studies.
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REFERENCES


