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SAFETY AND SECURITY:

Progress Made Implementing Positive Train Control, but
Significant Challenges Remain

Audit Report OIG-A-2015-013 | June 19, 2015




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Memorandum

To: DJ Stadtler, Jr.
Executive Vice President, Chief Operations Officer

From: David R. Warren 
Assistant Inspector General, Audits

Date: June 19, 2015

Subject: *Safety and Security: Progress Made Implementing Positive Train Control, but Significant Challenges Remain* (Audit Report OIG-A-2015-013)

The Rail Safety Improvement Act of 2008¹ requires Amtrak (the company) and each railroad hosting intercity or commuter rail passenger service to install and operate an approved Positive Train Control (PTC) safety system by December 31, 2015. The Federal Railroad Administration (FRA) has issued performance-based safety standards and requirements for developing and implementing PTC systems, including a process for obtaining regulatory approval of the system.² In response to FRA requirements, the company developed a PTC implementation plan that detailed how it would meet the federal requirements. In 2010, FRA approved the company's plan.

The company has an ongoing program to implement its FRA-approved plan (the plan) by installing new equipment on its property and locomotives. In December 2012, we reported on the progress made and the significant challenges the company faced in implementing its FRA-approved plan.³ In October 2014, we started a follow-up review of our 2012 report.

¹ Public Law 110-432, Division A.

² 49 CFR 236 Subpart I was issued in 2010.

³ *Railroad Safety: Amtrak Has Made Progress in Implementing Positive Train Control, but Significant Challenges Remain* (Report No. OIG-E-2013-003).

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The tragic derailment of Amtrak Train 188 in Philadelphia on May 12, 2015, continues to raise many questions, ranging from causation to safety systems that could have mitigated the excessive speed.⁴ In view of the current interest in the company's progress implementing PTC, we are issuing this interim report on the results of our work to date. Our reporting objective is to provide a point in time assessment of the company's progress implementing its FRA-approved plan, with a specific emphasis on the Northeast Corridor (NEC).⁵ We also generally discuss implementation progress on routes off the NEC and overall program management issues. We are continuing our work and plan to issue a final report at a later date.

For a detailed discussion of our scope and methodology, see Appendix A. For a list of our prior recommendations, see Appendix B.

RESULTS IN BRIEF

Since we last reported on the plan for implementing PTC in December 2012, the company has made progress implementing the plan and addressing the challenges we identified at that time. Nonetheless, the company faces significant challenges in fully implementing its FRA-approved plan on the NEC by the deadline.

The company plans to have the major components of its PTC system—an upgraded Advanced Civil Speed Enforcement System (ACSES)—installed on its property and locomotives on the NEC by the December 2015 deadline. However, the company's installation and testing schedule allows for little or no delays. For example, new radios are being installed in its locomotives, and the installation schedule calls for this to be completed in December 2015, the deadline date. The company faces other challenges to fully implementing the plan on the NEC, including testing the radio frequency spectrum that it acquired for the south end of the corridor and mitigating any interference identified. The company is also working with its state partners to implement ACSES on two feeder routes on the NEC. These projects are currently estimated to take two to three years beyond the deadline to complete.

⁴ Hearings were conducted by the U.S. House of Representatives, Committee on Transportation and Infrastructure on June 2, 2015, and the U.S. Senate, Committee on Commerce, Science, and Transportation on June 10, 2015.

⁵ In this report, we collectively refer to the company's routes in the northeast United States as the NEC, which includes about 400 miles of track between Washington and Boston.

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Interoperability with freight and commuter railroads remains a key challenge. For example, the company does not have a firm plan for deploying an alternative PTC system on the southern end of the NEC for one freight and one commuter railroad that run on that section of track but do not plan to use ACSES. On the northern end of the NEC, recent testing identified that there is a material chance that the radios that the company plans to use will generate interference that will cause the company's and the freight railroad's systems to not operate because they will use the same radio frequency spectrum.

It is also important to note that the company's plan only includes installing ACSES on the company's NEC property. This does not include the heavily travelled 56 miles of track owned by Metro-North Railroad in New York, most of which is between New York City and New Haven, Connecticut. In April 2014, Metro-North Railroad informed FRA that PTC implementation was unlikely to be completed by the deadline. Moreover, ACSES will not be installed on some company property. This includes areas where multiple railroads cross the company's property or where the track structure is complex, including areas around or in stations in Washington D.C., Philadelphia, New York, and Boston's South Station. The company plans to achieve safe operations by continuing to restrict train speeds moving through these areas using traditional signal systems and dispatching orders.

The company is continuing its efforts to ensure PTC interoperability on its trains that operate on freight railroad tracks throughout the rest of the country. Although the company plans to install PTC components on its locomotives, PTC will not be in place for the majority of these routes by the December 31, 2015 deadline because the freight railroads that own these tracks will not have completed installing PTC equipment on their properties.

For the company-owned track outside the NEC, the company is taking steps to ensure PTC interoperability. However, PTC systems will not be fully installed on their Michigan routes or in their Chicago and New Orleans stations by the December 2015 deadline.

We also identified several opportunities to improve program management processes and practices and recommended that actions are taken in the following areas:

- clarifying decision-making authority for completing tasks
- enhancing program management plans

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- assessing staff capabilities and capacities
- developing comprehensive program cost estimates

Addressing these areas will help ensure that the company can fully implement its plan for PTC.

The company provided oral comments on a draft of this report and stated that it generally agreed with our recommendations. The actions they cited meet the intent of our recommendations.

COMPANY'S PTC IMPLEMENTATION PLAN

The company's FRA-approved plan calls for a safety signal and train control system that can automatically reduce excessive train speeds that could cause collisions and derailments, can alert engineers to a misaligned track switch, and can protect roadway workers by slowing or stopping trains from entering work zones.

To meet FRA's requirements for PTC, the company is working to expand the capabilities of the safety signal and train control system. The company's plan to expand these capabilities sets forth the train routes where it will install new equipment and the types of new equipment that will be installed.

The PTC capabilities the company will be responsible for adding to its current safety systems vary depending on whether the company or another railroad owns or leases the property where the train routes are located. The company is principally responsible for train routes in the NEC, and other railroads are principally responsible for routes throughout the rest of the country.

Since we last reported on the company's plan in December 2012, the company has made progress advancing the plan, addressing the challenges identified at that time, and implementing actions we recommended. For example, the company has taken the following actions:

- Acquired the radio frequency spectrum needed to implement its plan between Washington D.C. and New York City. The company is working to complete installation of PTC equipment that uses this spectrum and have it tested and approved.

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- Obtained timely regulatory approval of upgrades to the company's existing signals and train control system needed to implement the plan. Further regulatory approvals will be needed as additional equipment upgrades are finished and the complete system becomes ready for testing.
- Established a test-bed and conducted initial testing of the freight railroads' PTC system to mitigate the potential effect of delays in the development of this system. Implementing this system on the NEC for some freight and commuter railroads' use continues to be challenging.
- Improved its process for developing costs estimates, but has not fully budgeted all costs associated with implementation of the plan.

PROGRESS HAS BEEN MADE, BUT FULLY IMPLEMENTING THE FRA-APPROVED PLAN ON THE NEC BY THE DEADLINE FACES SIGNIFICANT CHALLENGES

The company plans to have the major component of its PTC system, an upgraded ACSES, installed on its property and locomotives on the NEC. It also plans to test all equipment. Test results will be reviewed by FRA. Because some of the ACSES equipment is not scheduled to be installed until just prior to the December 2015 deadline, there is little or no time for schedule delays. Also, the company has not started to install the Interoperable-Electronic Train Management System (I-ETMS), which the company is responsible for installing for interoperability with commuter and freight railroads on the southern end of the NEC. The program office has not established target dates for installing and testing I-ETMS. Consequently, FRA's interoperability requirement will likely not be met by the deadline.

Plan for Installing PTC on the NEC

To implement its approved plan for PTC, the company is expanding the capabilities of its safety signal and train control systems on the property it owns or leases on the Northeast Corridor. For the NEC, the major effort in the company's FRA-approved plan is to install ACSES, which includes trackside and locomotive equipment and a communications network. ACSES will be installed on the company's mainline tracks from Washington D.C. to Boston. ACSES will also be installed on three feeder lines: from Philadelphia to Harrisburg in Pennsylvania; Springfield, Massachusetts to New Haven; and Poughkeepsie to Albany, New York. The company also plans to install

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I-ETMS on the NEC between Washington D.C. and New York City and in Pennsylvania between Harrisburg and Philadelphia.

Current signal and train control system. The company's current safety signal and train control systems generally include the following:

- The trackside signal system uses a colored light display to notify train engineers when and at what speed they are authorized to move the train. This system is installed across the NEC.
- The cab signal system gives engineers an advance display of what each signal will be showing. This system helps the engineer control speed and prepare for route changes. The system is installed on locomotives operating on the NEC.
- The Automatic Train Control system alerts the engineer to reduce train speeds to comply with track signals. The system is designed to prevent collisions by applying the train's brakes if an engineer fails to obey a signal. The system has been in use on the NEC since the 1950s and has been linked to the cab signal system since 1990, according to company officials. On May 21, 2015, FRA ordered the company to update its use of this system in the area where Train 188 derailed, identify each main track curve on the NEC requiring a speed reduction of 20 mph or more in the approach to those curves, and develop a plan to enforce speed limits at those curves.
- The Advanced Civil Speed Enforcement System is a transponder-based system that automatically reduces train speed to comply with restrictions and stop signals. The system determines a train's location by comparing the train's speed and braking distance and automatically applies the train's brakes if the train is exceeding the posted safe speed. Since 2000, the company has used a version of ACSES on the northern end of the NEC from New Haven to Boston and in parts of New Jersey, Delaware, and Maryland.

FRA-approved plan for PTC calls for adding equipment capabilities. The company plans to supplement its current safety signal and train control system with additional equipment capabilities to meet the federal PTC requirements. The new equipment capabilities are discussed below.

- The company is upgrading ACSES and expanding its use to other portions of the NEC. The upgraded system is the centerpiece of the company's plan for the NEC.

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The upgrades are designed to enhance ACSES capabilities by improving reliability, data capacity, and connectivity.

- The company also plans to install I-ETMS on portions of the NEC between Washington D.C. and New York City, and in Pennsylvania between Harrisburg and Philadelphia, for use by one commuter and one freight railroad that operate trains on company routes in those areas. (Most other U.S. railroads will use I-ETMS on their properties to help meet PTC requirements.)

Plan to have ACSES Installed on the NEC by the Deadline Faces Significant Challenges

Given that only six months remain to complete equipment installation, testing, and obtaining the required regulatory approvals, the company faces significant challenges in meeting the PTC implementation deadline. The PTC program office, which is part of the Engineering department, plans to complete installation of equipment on its mainline track and locomotives by the end of 2015. They are also planning that all necessary regulatory approvals will occur by the deadline. This timeframe allows for little or no schedule delays. Any adjustments in the installation schedule could delay testing, which could prevent the company from meeting regulatory requirements.

Trackside equipment is planned to be installed on mainline tracks, but not around five stations and not on two feeder routes by the deadline. The approved plan calls for the installation of upgraded ACSES trackside equipment on the NEC by December 2015. This includes ACSES components such as transponders, antennae, and other equipment. The components will provide information to the equipment onboard the locomotives and also will provide train location data to train dispatchers.

The company has achieved timely approval by FRA to use these new, technically advanced components to upgrade the capabilities of ACSES and meet PTC requirements. Program office officials told us the office has improved their management of the approval process since our last review. At this time, FRA has approved 5 of 6 ACSES upgrades. The documentation for the remaining upgrade has been submitted to FRA, and Engineering is working with FRA to ensure timely approval.

Company officials have stated that ACSES will be installed across the NEC by the end of December 2015 and that they are making every effort to meet this deadline. As equipment is installed and field-tested, the company plans to start incrementally using

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it. Program office officials and documents show that the company has completed, or is projected to complete, trackside installation of these components along about 400 miles of track between Washington D.C. and Boston, and about 104 miles of track in Pennsylvania from Harrisburg to Philadelphia by December 2015. For example, progress reports show that all radio antennae and towers have been installed in these areas. These reports also show that some fiber optic cable needed for ACSES's trackside communications has not been installed yet, but will be completed by December 2015. We will continue to review the installation schedule and progress.

However, the plan does not include installing ACSES in certain NEC terminal areas. Program officials said this decision was based on the technical complexities and high costs of installation in areas where multiple railroads cross the company's property or where the track structure is complex. Areas included are around or in Washington's Union Station, Philadelphia's 30th Street Station, New York's Penn Station, Springfield's Terminal, and Boston's South Station. In these areas, the company plans to achieve safe operations by continuing to restrict train speeds moving through these areas via its signal system and through dispatching orders. In addition, the company's plan does not include about 56 miles of track owned by Metro-North Railroad in New York, most of which is between New York City and New Haven. In April 2014, Metro-North Railroad informed FRA that it would likely not complete PTC implementation by the deadline.

Further, program officials have informed us that installation of ACSES on two lines that feed into the NEC is delayed, and the installation time frame estimates will exceed December 2015.

- Installation on the company's Springfield line—running about 60 miles from New Haven to Springfield—is delayed until December 2017. The delay is caused by major track and signal reconfigurations being performed by the company on behalf of the state of Connecticut. This work needs to be completed before ACSES can be installed.
- Installation on the company's East of Hudson line—running about 97 miles from Poughkeepsie to Albany—is delayed until December 2018. The delay is attributed to a lack of state funding, about \$29.4 million, to install ACSES and a delay in executing the lease on the property, according to a company official.

Company officials have been in discussion with state officials on these issues. Once installed, the equipment will be tested.

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Locomotive equipment planned to be installed by end of December 2015. The plan calls for upgraded ACSES equipment on company locomotives that operate on the NEC. This will include replacing radios on its Acela power cars, its P-32 Dual Mode electric/diesel locomotives, and some of the new ACS-64 electric locomotives that it has received. As additional ACS-64s are received, the company will have the new radios installed.

A procurement department official estimates that the company will have accepted about 60 new ACS-64 electric locomotives by the end of year. According to Mechanical department officials, this would ensure that enough locomotives would have upgraded ACSES components installed onboard to cover the company's needs for NEC service.⁶ As of June 10, 2015, the company has accepted 38 of these locomotives, and company officials plan to accept 3 locomotives each month for the rest of 2015. Because the company planned to retire its older AEM-7 and HHP-8 locomotives by the end of the year, it did not plan to install the upgraded versions of ACSES on these locomotives.

Nevertheless, Mechanical department officials informed us that installation of onboard equipment will be completed in December 2015. As with trackside equipment, any delay to the installation schedule could prevent the company from meeting regulatory requirements.

Challenges remain for achieving a fully operational communications network by the deadline. In 2013, the company obtained the 220 MHz radio frequency spectrum it needed to operate ACSES on the north end of the NEC from New Haven to Boston. But as we reported in 2012, the company did not have the 220 MHz spectrum required to operate ACSES from New York City south to Washington. Since then, the company acquired the spectrum (at a cost of about \$6.3 million), and the Federal Communications Commission (FCC) approved the transfer of the license from the vendor to the company in March 2015.

However, technical challenges remain:

- A potential radio interference issue exists between the company, freight, and commuter railroads on the NEC's north end. On May 29, 2015, the company and the freight railroads informed the FCC that interference was occurring between

⁶ According to Mechanical department officials, the company needs 43 locomotives a day to operate non-Acela service on the NEC.

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the company's ACSES radios and the freight railroads' I-ETMS radios during testing. According to FCC officials, because of the radio's current configuration, there is a material chance that this interference would cause one or more of the railroads' systems to not operate.⁷ According to an FCC official, FCC rules require licensees to work cooperatively to address interference issues. Program office officials identified two potential solutions to this issue: either obtain additional spectrum, or filter out potential interference. Senior company officials told us that the company is committed to developing a solution to this issue and is working with FCC. We will continue to review this issue.

- The company does not yet have permanent authority for using spectrum on the NEC's southern end. On May 29, 2015, FCC granted the company a six-month, temporary authority to test the ACSES communications network at full power. FCC officials stated that they plan to post a routine public notice in June asking for comments on whether the company's planned use of PTC on the southern end of the NEC will affect other broadcasting systems. Potentially affected parties, such as television stations along the NEC, can comment within 30 days.

According to FCC officials, if there are no significant comments, FCC could permanently approve using the radio frequency on the southern end by September 2015. However, any significant issues raised during the comment period could delay this testing and approval. According to FCC officials, depending on the nature of any public comments, the company may have to change PTC equipment locations. FCC officials also said the six-month temporary testing authority could be extended if needed. We will continue to review this issue.

Regulations require a final safety plan by the deadline. The FRA's regulation for PTC states that the company must submit a final safety plan that details how signal and train control systems meet PTC requirements. In January 2015, FRA notified the railroad industry of the procedures it needed to follow to ensure timely review and approval of the safety plan. Program officials stated that the safety plan is not required for ACSES because the company already received expedited FRA certification of ACSES as an existing PTC system. Nevertheless, the company has provided FRA a preliminary safety

⁷ FCC officials said the interference issue will not affect the NEC's southern end because of differences in the type of radio frequency spectrum owned by the company south of New York City.

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plan for an informal review. According to a program official, they will submit a final plan to FRA to address the potential need for a safety plan if this plan is required at a later date. We will continue to review this issue.

I-ETMS Will Not Be Installed on the NEC by Deadline

Most railroads that use the NEC plan to equip their locomotives with ACSES, but PTC interoperability with certain freight and commuter railroads on the southern portion of the NEC remains a significant challenge. The company will not have I-ETMS equipment installed and operational on the NEC by the deadline. The plan calls for using this system on the NEC so that one freight and one commuter railroad that did not want to use ACSES can be interoperable. In doing so, the program office decided to install I-ETMS as a second system to meet federal requirements for interoperability from Washington D.C. to New York and in Pennsylvania between Harrisburg and Philadelphia.

Program officials subsequently determined that installing an I-ETMS system on the southern end of the NEC was too costly. The company is in negotiations with a freight railroad to potentially install I-ETMS on the company's property at the freight railroad's expense. Program office officials do not have a timeline for installing this equipment, but they do not expect it to be done by the end of 2015. Program officials told us that if an agreement is not reached, they will require these railroads to use ACSES. According to an FRA document, this would require coordination with these other railroads, and the company would have to submit an amended PTC plan. Without a solution to this issue, the company cannot meet regulatory requirements by the deadline. We will continue to review this issue.

PROGRESS HAS BEEN MADE, BUT IMPLEMENTATION DEADLINE WILL NOT BE MET ON ROUTES OUTSIDE THE NEC

The program office has taken steps to ensure PTC interoperability on company-owned or leased property and routes outside the NEC. However, it will not have PTC systems installed and tested by the law's implementation deadline of December 31, 2015. The plan also calls for company trains operating on host railroads to have the required PTC equipment installed, but these railroads will not meet the December 2015 deadline for installing PTC on their tracks.

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On routes in Michigan. The company is responsible for installing PTC equipment on its routes between Porter, Indiana, and Dearborn, Michigan. The company owns portions of this track or maintains it on behalf of the Michigan Department of Transportation. The plan calls for installing trackside I-ETMS equipment and building a communications network.

In addition to I-ETMS, the plan also calls for the use of the Incremental Train Control System (ITCS) on these routes, which is a system designed to enhance safety at grade crossings. ITCS provides some of the same capability that Automatic Train Control provides on the NEC according to the company's Executive Vice President and Chief Operations Officer. Using technology such as the Global Positioning System, this system can pre-start warning equipment at highway crossings based on train speed and location. It can also slow the train to the posted speed if the crossing warning system does not activate in time. Since February 2012, the system has been in use on 97 miles of track in Michigan, enabling train speeds of up to 110 mph.

The company plans to use both I-ETMS and ITCS systems to meet PTC requirements in Michigan. Program officials estimate that both systems will be fully installed and tested by December 2016. We are continuing to review this issue.

At stations in Chicago and New Orleans. The company is responsible for installing PTC equipment at these stations because it owns or leases the track in these stations. The plan calls for installing trackside I-ETMS equipment and a communications network on portions of the track owned or leased by the company in Chicago and New Orleans. The program office did not plan to begin equipment installation at these terminal areas until early 2016. Program officials stated that the company is waiting for the freight railroads' final configuration of I-ETMS.

The decision to only partially install I-ETMS in these terminal areas was based on the technical complexity and associated costs of installing PTC in areas where multiple railroads move across company tracks, according to program office officials. The company's plan requested an exemption from fully installing PTC systems throughout these terminal areas. The exemption was based on existing speed restrictions, the safety train control system, and the frequency of rail traffic moving through these terminals. Given the limited rail traffic in New Orleans, program office officials told us in June 2015 that the company is going to change its plan and request a full exemption for this station. We are continuing to review this issue.

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On routes outside the NEC. The company also operates a number of trains on long-distance and state-supported routes over tracks owned by host railroads. In these operating situations, the company is responsible only for installing equipment in its locomotive cabs. The locomotive cab equipment will communicate with the host railroad's PTC equipment. The host railroads are responsible for installing trackside PTC equipment.

Mechanical department officials told us that the remaining installations of I-ETMS equipment on the company's diesel locomotives that operate on the company's long-distance and state-supported routes are on schedule for completion by the end of 2015.⁸ According to Mechanical department officials, completing the equipment installations on the company's 310 locomotives is a priority. However, rotating all the locomotives out of service to accomplish these installations becomes progressively more difficult over time since they are in service throughout the country. Therefore, the locomotives may not be readily available to perform the installation.

Mechanical department officials also told us that before this equipment can be used in revenue service, it must be tested and approved to ensure that it communicates effectively with other railroads' I-ETMS equipment. Officials from the Mechanical department said that they had begun testing I-ETMS equipment with two freight railroads, but acknowledge that testing needs to be completed with several others. Any delays in the installation and testing schedule, as with locomotives on the NEC, could prevent the company from meeting regulatory requirements.

Further, according to statements from FRA and the Association of American Railroads, the railroads that own the track over which the company's locomotives travel will not meet the December 2015 deadline for installing a PTC system. We will continue to review the installation and testing schedule related to implementing the plan for locomotives that operate off the NEC.

⁸ By installing these onboard systems, the company will meet its requirements for implementing PTC on routes outside the NEC.

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PROGRESS MADE, BUT IMPROVED PROGRAM MANAGEMENT CAN FACILITATE PTC IMPLEMENTATION

As discussed above, the program office has made progress in implementing the plan and at the same time has many tasks to complete. We identified several areas that offer the company opportunities to improve program management processes and practices, including:

- clarifying decision-making authority for completing tasks
- enhancing program management plans
- assessing staff capabilities and capacities
- developing comprehensive program cost estimates

Addressing these weaknesses will help the company to fully implement its approved plan for PTC.

Fragmented Authority and Staffing Gaps

In response to our 2012 recommendation, the company stated that PTC implementation was the responsibility of the Deputy Chief Engineer for Communications and Signals. They further stated that this official had the clear responsibility and authority to manage the integrated PTC program. However, the official told us that he does not have the authority to direct officials in the Mechanical and Transportation departments to complete program-related tasks. For example, he stated that he does not control Mechanical's budget or schedule for completing installation of equipment on the company's locomotives.

In June 2015, the company's Senior Vice President Operations and its Senior Vice President/Chief Engineer told us that they are in the process of hiring an overall PTC program manager who will have the authority to fully manage the program across departmental lines. The interviews for this position are ongoing according to the Chief Engineer. Additionally, according to the Senior Vice President Operations, the company established a working group of senior officials in early June to manage the program to address issues of immediate concern until the program manager is hired.

In addition, in our prior report we recommended that the program office develop a master project schedule that includes detailed tasks and dependencies for all departments involved and that this plan is periodically revised. Some progress has been

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made, but this recommendation has not been fully implemented. For example, the program office has developed a detailed plan for completing the key Engineering department tasks needed to complete PTC implementation. In early June 2015, the Mechanical department gave Engineering a high-level plan for installing PTC equipment in the company's locomotives, and Engineering incorporated this into an overall plan. However, the plan does not yet identify tasks associated with the critical path for completing the project.

Further, program officials raised issues about the program team's capacity and capabilities. The program office has 11 permanent employees and contractor support staff. Program officials told us they need another seven personnel to adequately staff the team—at an estimated cost of about \$700,000 per year. Their staffing proposal stated that additional resources were needed to help with general program management tasks and to address certain technical specialties, such as development of I-ETMS and communications issues. Staffing needs are under review, according to the Chief Engineer.

Cost Estimates are Incomplete

The program office reports spending about \$150.4 million on the PTC program through April 30, 2015. The company has funded these expenditures through its annual FRA capital grants, an American Recovery and Reinvestment Act of 2009 grant, and other FRA grants. However, additional substantial program costs are not disclosed in the company's financial plans.

Finance department officials told us that the \$18.1 million needed for the remainder of fiscal year (FY) 2015 is budgeted. They are in the process of developing the FY 2016 program budget. Finance department officials estimate PTC costs at about \$60.4 million for FY 2016 through FY 2019. The amounts that will be budgeted for each fiscal year have not yet been determined.

However, our work indicates that the company may need between \$91 and \$287 million more than currently estimated. If the company fails to obtain full funding from tenant railroads for installing I-ETMS on the NEC, those costs could increase even further. Most of these funds will be needed after FY 2015. The estimated costs for certain tasks are not included in the company's estimates, as discussed below:

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- The Transportation department estimates the cost for reimbursing host railroads for I-ETMS installation for the company's use ranges from \$83.4 to \$278.6 million. These costs are not included in the company's estimates or financial plans. The estimate is based on a low and high range of track miles on which host railroads will install I-ETMS for the company's use on routes outside the NEC. This is imprecise because host railroads are not required to share their estimates with the company, according to an official from the company's Host Railroad Partnerships office.⁹ A Transportation department official responsible for developing these costs told us that publicly disclosing these estimates could limit the company's ability to negotiate with other railroads. We understand this concern; however, not disclosing these potential liabilities in financial plans gives an inaccurate picture of the funding needs for future capital projects. These funds could be needed in FY 2015 and beyond.
- Additional funding to reduce interference with its ACSES communication system south of New York City is not included in the estimate. In March 2015, according to a program office official, the company received notification of a \$2.6 million grant from FRA to address this issue. The program office plans to negotiate with other railroads on this matter and obtain about \$7.4 million more to complete this work. The company will likely need this funding in FY 2015 and beyond.
- Additional funding for addressing staffing needs is not included in the estimates. The program office estimates that it needs an additional 7 staff at an estimated cost of \$700,000 per year. If staff are added in FY 2015, additional funding will be necessary this fiscal year and in the years beyond.

In addition, funding for I-ETMS installations on the NEC are not included in the company's estimates. As discussed above, the company is negotiating with a freight railroad to potentially provide I-ETMS on the NEC. This arrangement could include some cost to the company, but this will not be known until negotiations are completed. If the freight railroad does not pay for I-ETMS, the company's installation costs for I-ETMS on the NEC could be significant. If the company needs to install I-ETMS, it is likely to spend these funds in FY 2016 and beyond.

⁹ For example, the company estimated that it would have to pay a host railroad for up to 18 miles for \$2.2 million for installing I-ETMS for company use, according to a Transportation official. However, the host railroad notified the company that it may be installing I-ETMS on 700 miles for the company's use.

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CONCLUSION AND RECOMMENDATIONS

Since we last reported, the company has made progress implementing its FRA-approved PTC implementation plan. However, based on our work to date, all elements of the plan will not be implemented by December 2015. Regarding the highly travelled NEC, the company plans to have ACSES installed, tested, and approved by FRA for use by December 2015. Due to the significant challenges related to installing, testing, and obtaining regulatory approvals over the next six months, it remains to be seen whether the deadline can be met. However, the company will not have ACSES in operation on two feeder lines, and the required interoperability with commuter and freight railroads on the southern end of the NEC will not be achieved.

The company faces similar issues with installing I-ETMS equipment on its locomotives that operate on freight railroad tracks throughout the rest of the country. The company has stated that it will not meet the deadline for installing PTC on its property in Michigan and its stations in Chicago and New Orleans.

While we continue to perform our review, the company can take certain actions now to improve program management that would enhance PTC implementation. Therefore, we recommend that the Executive Vice President/Chief Operations Officer take the following actions:

- Place a high priority on hiring a PTC program manager and ensure that he or she has clear authority and accountability for managing all implementation tasks.
- Further refine the recently developed master program plan to include detailed tasks, milestones for completion, and periodic review of the plan to measure progress and mitigate schedule slippage.
- Reassess the program office's staffing needs to determine whether the current staffing capabilities and capacities are adequate to successfully implement the FRA-approved plan.
- Re-evaluate program costs and ensure costs are disclosed in the company's financial plans, including the costs of reimbursing host railroads.

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MANAGEMENT COMMENTS AND OIG ANALYSIS

On June 17, 2015, management provided official oral comments on a draft of this report. The Senior Vice President Operations stated that the company generally agrees with our recommendations. He noted that interviews are being held for the program manager position and once it is filled, specific actions to address our recommendations related to planning, staffing, and estimating program costs will be developed. The planned approach is consistent with the intent of our recommendations and we will review the company's actions as our work continues.

Senior officials from the Engineering and Mechanical departments also provided technical comments that are incorporated into this report as appropriate.

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APPENDIX A

Scope and Methodology

The scope of this interim report addresses the company's ongoing program to implement its FRA-approved plan for PTC by installing new equipment on its property and locomotives. Our reporting objective is to provide a point in time assessment of the company's progress implementing the FRA-approved plan, with a specific emphasis on the NEC. We also generally discuss implementation progress on routes off the NEC and overall program management issues. The principal departments in the company where we performed our work were Engineering, Mechanical, Transportation, and Finance. We conducted this audit work from October 2014 through June 2015 in Washington D.C. and Philadelphia.

Our methodology for assessing the company's progress in implementing its FRA-approved plan was to compare progress to date against the project schedule. To accomplish that work, we reviewed progress reports and financial data and interviewed cognizant officials. To do so, we reviewed documents from the program office, including the FRA-approved PTC implementation plan, internal monthly status reports, and annual reports to FRA. Further, we also reviewed documents from the Mechanical, Finance, and Transportation departments, as well as from FRA and FCC. In addition, we interviewed company officials responsible for implementing the plan from a number of departments, including Mechanical, Finance, and Transportation, and we interviewed regulatory officials from FRA and FCC that are responsible for approving the company's implementation of the plan.

Our methodology for assessing the adequacy of overall program management included reviewing decision-making authority for completing program tasks, obtained information on the adequacy of staff capability, reviewing program management plans, and reviewing program cost estimates.

We reviewed but did not assess the implementation plan schedules for installing and testing PTC systems. We present that information as it was provided to us by the program office. Reviewing that information will be a major focus as we complete our review.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the

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audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Internal Controls

We generally reviewed the management controls the program office has in place for implementing the FRA-approved plan. We focused on controls related to decision-making authority, program management plans, and cost estimates. We limited our conclusions and recommendations on controls to those areas. We did not review the company's or the program office's overall system of controls for program management.

Computer-Processed Data

We received computer processed data from the Finance department that included actual PTC expenditures for FY 2010 through April of FY 2015. We were provided expenditure data from the company's previous financial system from FY 2008 through FY 2009 and from Amtrak's Financial Information System for FY 2010 through FY 2015. We did not validate these numbers but relied on an unqualified opinion on the company's financial statements from its external auditors for FY 2008 through FY 2013. We did not validate the numbers for FY 2014 and FY 2015 because this information is not audited. However, we compared this financial data to program documents and found it to be sufficient for our purposes.

Prior Reports

In conducting our audit, we reviewed the following Amtrak OIG report:

- *RAILROAD SAFETY: Amtrak Has Made Progress in Implementing Positive Train Control, but Significant Challenges Remain*, (Evaluations Report OIG-E-2013-003, December 20, 2012)

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APPENDIX B

Prior Recommendations

In 2012, to address the challenges that the company faces in implementing PTC, we made these recommendations:

1. The Vice President, Operations, designate a senior executive to manage the overall program, or fully empower the Deputy Chief Engineer for Communications and Signals with clear responsibility and authority to manage the implementation of PTC as an integrated program; this would include the clear authority to address all of the challenges involved, regardless of the departments they pertain to, and the ability to make strategic and budgetary tradeoffs among the challenges.
2. The program manager designated by the Vice President, Operations, ensure that Amtrak
 - a. periodically reassesses the risks to PTC implementation and mitigates those risks, as necessary;
 - b. conducts a full analysis of the technical risks and costs associated with obtaining spectrum licenses in a piecemeal fashion, to determine the appropriate level of support needed, if any, from the federal government, to obtain spectrum in a technically adequate, cost-effective manner, or begin to develop a viable alternative if 220 MHz spectrum is unavailable;
 - c. updates and improves the reliability and accuracy of its cost estimates and includes the full amount of required funding in the 5-year financial plan and the annual legislative and grant funding request to complete implementation of PTC by the deadline;
 - d. develops a master project schedule that includes detailed tasks and dependencies and periodically revises it;
 - e. reconsiders the risks associated with the plan to award a fixed price contract to install I-ETMS;
 - f. remains engaged with FRA to increase the likelihood that the FRA review process stays on schedule; and
 - g. engages sufficiently at the appropriate level with host railroads and others in the industry to influence developments with I-ETMS that affect Amtrak.

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Appendix C

Abbreviations

ACSES	Advanced Civil Speed Enforcement System
FCC	Federal Communications Commission
FRA	Federal Railroad Administration
FY	fiscal year
I-ETMS	Interoperable-Electronic Train Management System
ITCS	Incremental Train Control System
NEC	Northeast Corridor
PTC	Positive Train Control
the company	Amtrak

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APPENDIX D

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OIG MISSION AND CONTACT INFORMATION

Mission

The Amtrak OIG's mission is to provide independent, objective oversight of Amtrak's programs and operations through audits and investigations focused on recommending improvements to Amtrak's economy, efficiency, and effectiveness; preventing and detecting fraud, waste, and abuse; and providing Congress, Amtrak management and Amtrak's Board of Directors with timely information about problems and deficiencies relating to Amtrak's programs and operations.

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