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Report to Congressional Requesters

September 2015

POSITIVE TRAIN CONTROL

Additional Oversight Needed As Most Railroads Do Not Expect to Meet 2015 Implementation Deadline

Accessible Version

GAO-15-739

GAO Highlights

Highlights of GAO-15-739, a report to Congressional Requesters

September 2015

POSITIVE TRAIN CONTROL

Additional Oversight Needed As Most Railroads Do Not Expect to Meet 2015 Implementation Deadline

Why GAO Did This Study

The Rail Safety Improvement Act of 2008 mandated certain railroads implement PTC by December 31, 2015. In prior work, GAO found that most railroads reported that they will miss this deadline due to numerous interrelated challenges caused by the breadth and complexity of PTC.

GAO was asked to review the progress of PTC implementation since GAO's last PTC report in 2013. The current report examines (1) progress railroads have made in implementation and in addressing challenges, and (2) how FRA has overseen implementation.

GAO reviewed relevant documentation, such as laws and regulations and PTC plans created by railroads. GAO used a structured interview guide to interview 29 railroads identified by FRA or others as implementing PTC— including the four largest freight railroads, 13 commuter railroads, and 12 smaller freight railroads—regarding their progress and challenges. GAO selected these railroads based on various factors, including size and geographic location and whether they are required to implement PTC. GAO also interviewed FRA officials and industry associations.

What GAO Recommends

GAO recommends that FRA develop a plan that outlines how the agency will hold railroads accountable for making continued progress toward the full implementation of PTC by, among other things, collecting any additional information needed to track progress of individual railroads. DOT agreed with the recommendation.

View GAO-15-739. For more information, contact Susan Fleming at (202) 512-2834 or flemings@gao.gov.

What GAO Found

Most railroads in GAO's review (20 of 29) estimate that they will implement positive train control (PTC)—a communications-based system designed to prevent certain types of train accidents—1 to 5 years after the statutory deadline of December 31, 2015 (3 did not have an estimated completion date). Of the remaining 6 railroads, one was excepted from installing PTC based on limited speeds on its track, and 4 commuter railroads and 1 small freight railroad estimate they will have PTC operational on their own tracks by the deadline. However, the ability of these 5 railroads to fully operate with PTC may be affected because other railroads that operate equipment on their tracks—known as tenants—or that own tracks that they operate on—known as hosts—may not be equipped with PTC. In addition, the ability of railroads to meet the deadline may be affected by the interoperability of their PTC system with those of other railroads and whether they can obtain final system approval from the Federal Railroad Administration (FRA). Railroads GAO interviewed said they continue to face implementation challenges. For example, these railroads told GAO:

- Development of a major component of the Interoperable Electronic Train Management System, being installed by the largest railroads, continues to be delayed. Smaller railroads have been challenged in obtaining PTC support and components due to the limited number of vendors.
- Some host railroads have many tenant railroads and the host railroad must work with tenants to determine if the tenants should equip with PTC. One large freight railroad said it must make this determination for 260 tenants. Railroads must ensure their systems are interoperable, a task that can be challenging when multiple railroads are involved.

FRA has overseen railroads' PTC implementation through a variety of methods, but these efforts were not sufficient to monitor and report on the progress of individual railroads. For example, while FRA reviewed railroads' annual reports, FRA officials said that the information in these reports was not sufficient to monitor progress and identify implementation challenges because the reports did not consistently include details such as the challenges railroads were encountering as they implemented PTC. Federal government standards for internal controls state that agencies should ensure adequate means to obtain information and communicate with stakeholders, and that the information should be relevant, reliable, and timely. In May 2015, FRA established an internal PTC task force that plans to collect new data on individual railroads' progress. However, the task force is newly formed, and FRA is still in the process of determining the strategies and plans it will use to oversee PTC implementation. GAO has previously reported on the benefits of developing comprehensive plans, including establishing deadlines for achieving objectives. As it is clear most railroads do not expect to meet the December 31, 2015, deadline, developing a plan for oversight that includes how FRA will monitor railroads' progress could help FRA ensure railroads comply with their implementation plans and help address uncertainties such as interoperability, regardless of whether the deadline is extended.

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Abbreviations

AAR	Association of American Railroads
ABS	Automatic Block Signaling
ACSES	Advanced Civil Speed Enforcement System
APTA	American Public Transportation Association
ASLRRA	American Short Line and Regional Railroad Association
DOT	Department of Transportation
E-ATC	Enhanced-Automatic Train Control
FCC	Federal Communications Commission
FRA	Federal Railroad Administration
I-ETMS	Interoperable Electronic Train Management System
I-ITCS	Interoperable–Incremental Train Control System
MBTA	Massachusetts Bay Transit Administration
Metra	North East Illinois Regional Commuter Rail
NTSB	National Transportation Safety Board
PTC	positive train control
RSIA	Rail Safety Improvement Act of 2008
SEPTA	Southeastern Pennsylvania Transportation Authority

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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September 4, 2015

Congressional Requesters

In September 2008, a commuter train collided with a freight train in the Chatsworth neighborhood of Los Angeles, California, resulting in 25 deaths and over 100 injuries. In the wake of this and other rail accidents, which was caused by the operator's missing a red signal, the Rail Safety Improvement Act of 2008 (RSIA) was enacted.[1] RSIA mandated the implementation of positive train control (PTC) systems by December 31, 2015, on "mainline" railroads used to transport inter-city rail passengers, commuter passengers, or any amount of poison-by-inhalation hazardous materials.[2] According to the Federal Railroad Administration (FRA), 40 railroads are required to implement PTC on over 68,000 miles of track nationwide. PTC is a communications-based system designed to prevent certain types of rail accidents caused by human factors, including train-to-train collisions, trains entering established work zones—which could cause roadway worker casualties or equipment damage—and derailments caused by exceeding safe speeds. For example, PTC can automatically slow or stop a train that is not being operated safely due to operator errors. More recently, in May 2015 an Amtrak train crashed in Philadelphia killing eight people on board. This crash occurred when the train traveled at too high a speed on a track not yet operational with PTC. According to the National Transportation Safety Board (NTSB), PTC would have prevented this accident. As of June 2015, this incident is under investigation by the NTSB, which has recommended the use of PTC since 1969. PTC remains on NTSB's most wanted list of transportation safety improvements.

We reported in 2013 that most of the railroads we included in our PTC review at that time indicated that they would likely miss the 2015 PTC implementation deadline due to numerous interrelated challenges caused

[1]Pub. L. No. 110-432, div. A, 122 Stat. 4848 (2008).

[2]RSIA defines main lines as those carrying 5 million or more gross tons of freight annually and authorizes the Federal Railroad Administration (FRA) to define the term "mainline" by regulation for passenger routes or segments over which limited or no freight railroad operations occur. Toxic materials are referred to as either toxic-by-inhalation or poison-by-inhalation materials.

by the breadth and complexity of implementing PTC.[3] Over the past 3 years, FRA has raised concerns that railroads will not meet the 2015 deadline. FRA's mission is to enable the safe, reliable, and efficient movement of people and goods. As PTC is a major safety improvement for the industry, FRA has a critical role to play in supporting and overseeing PTC implementation by railroads.

You asked us to examine progress in implementing PTC since we reported on this in August 2013 as well as how PTC is being overseen by FRA. This report discusses (1) progress freight and passenger railroads have made in implementing PTC and addressing challenges; and (2) how FRA has overseen the implementation of PTC.

In order to review progress freight and passenger railroads have made in implementing PTC and addressing challenges, we reviewed our prior reports on PTC, relevant documentation including RSIA and other relevant laws and regulations, and reports railroads filed with FRA regarding PTC implementation, including implementation plans and annual reports. We also used a structured interview guide to interview 29 railroads identified by FRA or others as implementing PTC. These included the 4 largest Class I freight railroads,[4] 13 commuter railroads,[5] and 12 smaller (Class II/III) freight railroads. We selected 7 of the commuter railroads as we included them in our 2013 PTC review and 6 to ensure diversity in ridership levels and geographic location. We selected 9 of the smaller freight railroads as they are smaller railroads identified by FRA as required by law to implement PTC because they host passenger

[3]GAO, *Positive Train Control: Additional Authorities Could Benefit Implementation,* GAO-13-720 (Washington, D.C.: Aug. 16, 2013).

[4]Freight railroads are classified by operating revenues. Class I: Railroad carriers having annual carrier operating revenues of $467 million or more. Class II: Railroad carriers having annual carrier operating revenues of less than $467 million but in excess of $37.4 million. Class III: Railroad carriers having annual carrier operating revenues of $37.4 million or less; after applying the railroad revenue deflator formula provided by the regulation. 49 C.F.R. § 1201.1-1. The 4 largest Class I railroads are BNSF Railway, CSX Corporation, Norfolk Southern, and Union Pacific.

[5]Capital Metro, Long Island Railroad, Massachusetts Bay Transit Administration (MBTA), Metro North, New Mexico Rail Runner Express, North East Illinois Commuter Rail (Metra), Peninsula Joint Powers (Caltrain), RTD Denver, Southeastern Pennsylvania Transportation Authority (SEPTA), Southern California Regional Rail Authority (Metrolink), Utah Transit Authority, Virginia Railway Express, and TriMet.

traffic[6] and 3 as they were recommended by an industry association as railroads not required by RSIA to implement PTC, but required to do so by larger Class I freight railroads whose track they operate on.[7] During these interviews, we asked railroads about their status in implementing PTC and challenges they are facing. We also interviewed officials with FRA, Amtrak, and the Federal Communications Commission (FCC) as well as representatives of industry associations. In addition, to review how FRA has overseen the implementation of PTC, we reviewed relevant documentation, as listed above, and interviewed FRA officials. We evaluated FRA's efforts in overseeing implementation of PTC against GAO's *Standards for Internal Control in the Federal Government*.[8]

We conducted this performance audit from April 2015 to September 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the 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.

Background

In the wake of the Chatsworth rail accident in September 2008 and other high-profile rail accidents, RSIA was enacted in October 2008. RSIA, among other things, required railroads (1) to install PTC—designed to prevent certain accidents caused by human factors, including train-to-train collisions and derailments caused by exceeding safe speeds—by December 31, 2015, on mainline track used to transport inter-city rail passengers, commuters, or any amount of poison-by-inhalation

[6]According to FRA, 10 smaller—or Class II/III—railroads are required by RSIA to implement PTC because they support passenger traffic. We did not interview one of them because it is jointly owned by two large freight railroads that we interviewed separately. The nine we interviewed were Alaska, Belt Railway of Chicago, Kansas City Terminal, Nashville and Eastern, New Orleans Public Belt, Pan Am Railways, Portland and Western, Saratoga and North Creek, Terminal Rail of Saint Louis.

[7]Indiana Railroad, Twin Cities and Western, and Watco. This issue is explained in more detail in our report.

[8]GAO, *Standards for Internal Control in the Federal Government,* GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999).

hazardous materials and (2) to equip locomotives that run on that track.[9] PTC must be designed to protect rail workers by preventing trains from entering work zones as well as to prevent the movement of trains through switches left in the wrong position on the track. In addition, RSIA requires railroads to ensure that their PTC systems are interoperable with trains from other railroads that might run on that track. Interoperability, as defined by RSIA, means systems must be able to communicate with one another so trains can seamlessly move across track owned by different railroads with potentially different PTC systems. Railroads often use one another's track. For example, railroads often operate their cars (as "tenants") on the track of another railroad, known as the "host." Interoperability is important given that according to FRA, there are 40 freight, intercity passenger, and commuter railroads that are required to implement PTC. FRA provides regulatory oversight of U.S. railroad safety and is responsible for overseeing PTC's implementation by railroads. If a railroad fails to meet the PTC implementation deadline, FRA has the authority to take enforcement actions, such as assessing civil penalties against a railroad.[10]

PTC is a communications-based system that links various components, namely locomotive computers, wayside units along the side of the track, and dispatch systems in centralized office locations.[11] In order to implement PTC, railroads must design, produce, and install more than 20 major components such as data radios for locomotive communication,

[9]In this report, we use the term locomotive generally; commuter railroads may have a variety of vehicles that must be equipped, such as cab cars and electric multiple unit trains.

[10]FRA's Acting Administrator stated in June 2015 testimony to Congress that FRA's enforcement policy under existing authorities is that (1) FRA can assess civil monetary penalties starting January 1, 2016; (2) penalties can vary based on the violation, such as $2,500 for a non-willful failure to keep records and $25,000 for willful failure to complete PTC implementation on a track segment; and (3) FRA reserves the right to use any and all enforcement tools, from civil penalties to emergency orders, to require railroads to make progress on PTC implementation to ensure public safety prior to January 1, 2016.

[11]In Europe, the European Rail Traffic Management System is a PTC-like project that has been under way for over a decade. However, this project differs in scope and objectives and serves a different rail network, making it difficult to compare it to implementation of PTC. For example, the primary goal of the European system is to make travel and trade more seamless, rather than to increase safety.

locomotive management computers, and back office servers.[12] Through these components, PTC uses radio frequency spectrum[13] to communicate a train's location, speed restrictions, and movements, and then potentially slows or stops a train that is not being operated safely. For example, a PTC system could have prevented the 2008 Chatsworth accident by first alerting the operator that the train was approaching a red signal and then stopping the train before passing the red signal. However, it should be noted that there are types of accidents, such as trespasser deaths—the leading cause of all rail-related deaths in America—and highway-railroad crossing accidents, that PTC technology is not designed to prevent.

Railroads are not required to implement the same PTC system; however, PTC systems must meet the system functionality requirements established by RSIA.[14] Regulations set forth PTC's core function requirements for system components such as wireless communications.[15] According to FRA's 2012 report to Congress, although some PTC

[12]More specifically, PTC systems are comprised of more than 20 components including the back office server; train management computer; interoperable electronic train management system software; authentication systems to verify users; track database of over 200 characteristics of track and trackside assets; interface and enhancements to the dispatch system; security application for message integrity; interoperable train control messaging system; radio for base station communication; data radio for locomotive communication and for switch and signal communication; communication switching network for interoperable back office communication; computer display units for onboard the locomotive; locomotive messaging system to route messages off the locomotive; GPS sensors onboard the locomotive; crash hardened memory module onboard the locomotive; onboard network devices for communications; switch position monitors; and integrated and stand-alone wayside interface units. The back office refers to the processes through which railroads collect information from PTC-enabled equipment, combine it with other data, such as Geographic Information System data on tracks, and tie into existing systems, such as crew, locomotive, and dispatch systems. The back office server, which is one component of the back office system, provides an interface to and from crew, locomotive, and dispatch systems, which are different at each railroad, and provides a centralized source of PTC-enabling information for the locomotive equipment and wayside units.

[13]Radio frequency spectrum is the medium for wireless communications and supports a vast array of commercial and governmental services. Commercial entities use radio frequency spectrum to provide a variety of wireless services, including mobile voice and data, paging, broadcast television and radio, and satellite services.

[14]Under RSIA, PTC must be designed to prevent train-to-train collisions, over-speed derailments, incursions into work zone limits, and the movement of a train through a switch left in the wrong position.

[15]49 C.F.R. § 236.1033.

components existed in some form prior to the mandate to implement PTC, none were designed or tested for PTC or to work in concert with so many other components. Furthermore, many of the components are first-generation technologies being conceived, designed, and developed for PTC. Suppliers have primarily undertaken the development of PTC components, but it is up to the railroads to integrate the components with the existing technology systems. Throughout the PTC implementation process, railroads are responsible for analyzing any integration issues with existing systems and mitigating any potential or actual defects or risks.

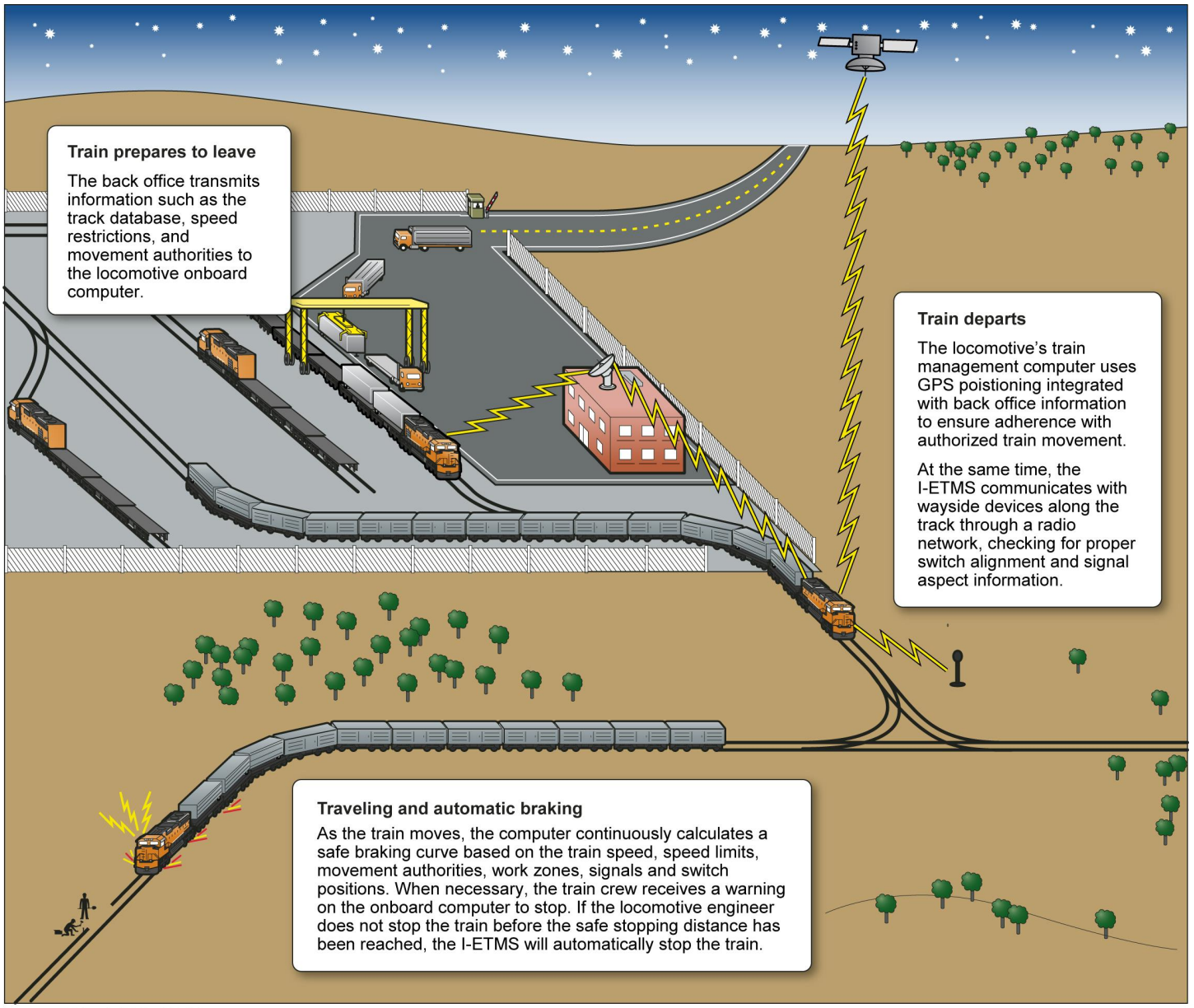
There are two primary PTC systems being implemented by railroads: Interoperable Electronic Train Management System (I-ETMS) and Advanced Civil Speed Enforcement System (ACSES). All Class I railroads in the United States plan to implement I-ETMS, which will account for most of the approximately 68,000 route miles that are required to be equipped with PTC. (See fig. 1).[16] Amtrak is implementing ACSES on the Northeast Corridor that runs between Boston and Washington, D.C.[17] Although ACSES and I-ETMS are functionally similar, the technologies they use differ. For example, to determine train location, ACSES relies on track-embedded transponders[18] while I-ETMS uses Global Positioning System information. Since most commuter and Class II/III railroads run over tracks owned by freight railroads or Amtrak, they are largely implementing the same systems developed by the freight railroads or Amtrak.

[16]Four railroads—BNSF Railway, CSX Corporation, Union Pacific, and Norfolk Southern—are together developing the standards for I-ETMS.

[17]Amtrak installed Incremental Train Control System (ITCS), another communication-based overlay PTC System, on its Michigan line.

[18]A transponder is a device for receiving a radio signal and automatically transmitting a different signal.

Figure 1: Basic Operation of the Interoperable Electronic Train Management System (I-ETMS)



Source: GAO. | GAO-15-739

Implementing regulations provide exceptions for railroads from installing PTC on certain segments of track or locomotives.[19] Mainline track exceptions include a passenger terminal exception and a limited operations exception. A limited operations exception may apply, for example, where passenger service is operated on a segment of track on a freight railroad that is not a Class I railroad on which less than 15-million gross tons of freight traffic is transported annually if the segment is signaled and if no more than 12 passenger trains operate during a calendar day. A limited operations exception may also apply on a Class I segment of a track that is unsignaled on which less than 15-million gross tons of freight traffic is transported annually if no more than 4 regularly scheduled passenger trains operate per day.[20] Exception requests have to meet certain requirements; for example, for a passenger terminal exception, there should be limited speed operations of less than 20 miles per hour—which is enforced by any available on-board PTC equipment, interlocking rules in effect prohibiting reverse movements other than on signal indications without dispatcher permission, and no freight operations are permitted or limited freight operations as long as no passengers are on board passenger trains within defined limits.[21] Railroads, if they also meet the other criteria, could also apply to have mainline segments of track excepted from PTC requirements if they no longer carry poison-by-inhalation hazardous material. Multiple railroads have applied for this exception. In addition, FRA provided Class II/III railroads operating in certain conditions with the ability to obtain a short-line exception, which would allow them to delay equipping their locomotives with PTC until December 31, 2020.[22]

As part of overseeing railroads' progress with PTC implementation, FRA is also responsible for reviewing and approving railroads' PTC-related plans. Railroads must submit and FRA must review and approve three plans: a PTC development plan, a PTC implementation plan, and a PTC safety plan:

[19]49 C.F.R. § 236.1019,

[20]See 49 C.F.R § 236.1019(c).

[21]See 49 C.F.R § 236.1019(b).

[22] See 49 C.F.R § 236.1006.

- The PTC development plan[23] describes, among other things, the PTC system a railroad intends to implement to satisfy the PTC regulatory requirements. According to an FRA August 2012 report to Congress, FRA's approval of the development plans took nearly 18 months to complete.

- The PTC implementation plan[24] describes a railroad's plan for installation of its planned PTC system. RSIA required railroads to submit these plans within 18 months (by April 16, 2010), and FRA to review and approve or disapprove them within 90 days.

- The PTC safety plan[25] provides railroad-specific information demonstrating that the PTC system, as implemented by the railroad, meets the required safety performance objectives, as well as information about a railroad's plans for testing the system and safety hazards and risks the system will address, among other things. By approving a safety plan, FRA certifies a railroad's PTC system, a precondition for operating the PTC system in revenue service—meaning the system would support trains in operation and transporting freight or passengers. Certification of a railroad's PTC system is FRA's formal recognition that the PTC system, as described and implemented, meets the statutory requirements and the provisions of PTC implementation as outlined in RSIA. Although FRA set no specific deadline for railroads to submit the safety plans, according to FRA, FRA requested that railroads submit their safety plans with sufficient time to allow up to 6 months for approval before the December 31, 2015, PTC implementation deadline. PTC regulations require FRA to review and decide or reject individual safety plans within 180 days of receiving them.[26]

[23]49 C.F.R. §§ 236.1009, 236.1013.

[24]49 C.F.R. §§ 236.1009, 236.1011.

[25]49 C.F.R. §§ 236.1009, 236.1015.

[26]49 C.F.R. § 236.1009

Most Railroads Do Not Expect to Meet the 2015 PTC Deadline and Continue to Face Challenges Implementing PTC

Most of the Selected Railroads Estimate Full Implementation within 1 to 5 Years after the Deadline and Continue to Face Challenges

In 2013, we found that most railroads did not anticipate meeting the 2015 deadline, and we identified challenges that were delaying railroads' PTC implementation. Based on our interviews with 29 selected railroads for this report, 20 estimated they would have PTC fully operational in revenue service on all required track (based on the current requirements regarding what track must have PTC installed) within 1 to 5 years after the 2015 deadline, and 3 stated that they did not have an estimated completion date.[27] Among the 23 railroads are three Class II/III railroads that are not required by statute to implement PTC on their track, but are equipping locomotives with PTC because they will run on PTC-equipped track.[28]

Of the remaining 6 railroads in our review, 1 received an exception from installing PTC on its track because it is operating at restricted speeds, and representatives for four selected commuter railroads and one Class II/III railroad estimated they would have PTC fully operational in revenue service on track that they own by the end of 2015. However, the ability of these five railroads to achieve full PTC implementation may be affected because other railroads they interact with may not be equipped by the deadline. The five railroads that expect to meet the deadline for implementation are the Southeastern Pennsylvania Transportation Authority (SEPTA); Metrolink in Southern California; Caltrain in the San Francisco Peninsula; TriMet in the Portland, Oregon, metro area; and

[27]In addition, one commuter railroad, RTD-Denver, is installing a new rail system that will have PTC operational when it opens after the December 2015 deadline has passed.

[28]Some Class II/III railroads are being required to equip their locomotives with PTC because they are a tenant and their host railroad has indicated they must equip.

Portland and Western Railroad, which owns 10 of the 15 miles of track that TriMet operates on.[29]

For the five railroads that indicated they expect to finish installing PTC on their own tracks and equipment by the deadline, it is important to note that two issues may affect its ability to fully operate with PTC. First, as discussed in more detail later, some of these railroads have host or tenant railroads that do not expect to be equipped by the deadline. FRA officials told us that they might not penalize a tenant railroad if its host railroad has not equipped its tracks with PTC after the deadline passes; but host railroads might be penalized if they allow tenants (that do not have an exception) to operate without PTC on the host's PTC-equipped track. In addition, FRA officials are still determining how to address issues related to interoperability among host and tenant railroads when assessing whether a railroad has met the implementation deadline. Second, as of July 29, 2015, three of the five railroads that told us that they would have PTC fully operational on their own track by the deadline had not yet submitted a safety plan to FRA for review.[30] Thus, their ability to obtain FRA certification will depend, in part, on their submission of a final safety plan to FRA, as well as FRA's reviewing and certifying their plans in less than 180 days. While waiting for final certification from FRA, these railroads will operate PTC in revenue service demonstration, meaning that they have obtained permission from FRA to test PTC while operating so that they can examine and address any remaining defects in the system.

Representatives for each of the 29 railroads provided us with an estimated time frame for full implementation, as well as information on the type of PTC system that they are installing, the number of route miles and locomotives or cab cars that they need to equip, the number of railroads that use their tracks as tenants, the number of host railroads on whose

[29]Portland and Western only needed to equip a portion of its tracks with PTC because TriMet was operating a commuter service on it; and TriMet is paying for and overseeing the installation of PTC on that portion of Portland and Western's track.

[30]As previously noted, FRA's regulations allow for it to take up to 180 days to review and certify each railroad's PTC safety plan. According to FRA documents and representatives we interviewed, Metrolink and SEPTA have submitted their safety plans; TriMet and Portland and Western submitted a draft safety plan in July 2015 and will submit a final plan after they complete their testing; and Caltrain expected to submit its safety plan by October 2015.

track they operate, and their estimated total PTC implementation costs (see app. II, table 1). For example, in total, the railroads we interviewed estimated that they would install PTC on approximately 55,932 route miles and 22,966 locomotives, with estimated total PTC installation costs of at least $11.1 billion.

The railroads we interviewed are a subset of the railroads that are required to implement PTC. For a sense of the scope of PTC implementation, AAR has estimated that Class I freight railroads will spend over $9 billion implementing PTC on over 60,000 miles and 23,000 locomotives; and APTA estimates commuter railroads will spend over $3.5 billion implementing PTC on over 8,300 track miles and 4,700 locomotives and passenger cars. Estimates for Class II/III railroads have not been published. In addition, railroads have made progress installing PTC components since our last report on the implementation of PTC. For example, according to AAR, as of December 31, 2014, freight railroads have fully or partially equipped 13,110 locomotives with PTC, versus 2,623 in 2011 (with 9,936 remaining). AAR also reported that railroads had deployed 19,245 wayside units (versus 3,284 in 2011) and that the industry has finalized 27 of 34 interoperability standards. According to APTA, commuter railroads have made progress in identifying funding, but challenges remain, as described below.

A June 2015 Amtrak Office of Inspector General report found that Amtrak has indicated that it will finish installing ACSES II on track it owns in the Northeast Corridor by the end of 2015, excluding 5 stations and 2 feeder lines.[31] However, the report also noted challenges that Amtrak faces in

[31]We did not ask Amtrak the same level of questions as other railroads, because Amtraks Office of Inspector General recently issued a report providing detailed information on Amtrak's PTC progress and challenges. For detailed information related to Amtrak's implementation of PTC, see: Amtrak Office of Inspector General, *Safety and Security: Progress Made Implementing Positive Train Control, but Significant Challenges Remain*, OIG-A-2015-013 (Washington, D.C.: June 19, 2015). As noted in the Amtrak OIG report, due to technical complexities and high costs, Amtrak does not plan to install PTC in terminal areas in or around Washington's Union Station, Philadelphia's 30th Street Station, New York's Penn Station, Springfield's Terminal, and Boston's South Station. Instead, it will restrict speed in these areas through signals and dispatch orders. In addition, Amtrak does not plan to install PTC by the deadline on a line in Connecticut because Amtrak must first finish major track and signal reconfigurations before installing ACSES. Amtrak also does not plan to install PTC by the deadline on a New York line that runs from Poughkeepsie to Albany, due to a lack of state funding and a delay in executing the lease on the property.

meeting the PTC deadline on the Northeast Corridor, including very tight time frames for Amtrak's testing of the system.[32] In addition, freight railroads operating on the Northeast Corridor are using I-ETMS, which they do not expect to install by the 2015 deadline. Furthermore, there are portions of the Northeast Corridor and other Amtrak routes in which Amtrak does not own the tracks. Thus, Amtrak is dependent on the host railroad to equip the tracks with PTC before it can operate its PTC-equipped locomotives.[33] In addition, the Office of Inspector General noted that outside the Northeast Corridor, some Amtrak-owned track may not meet the 2015 deadline.

Representatives of railroads we interviewed told us that they had made progress in addressing some challenges implementing PTC; however, they continue to face many of the same challenges that we identified in our 2013 report. See app. II, table 2, for more information on the number of railroads that identified particular challenges for their PTC implementation.

- *Developing system components and installing PTC.*
    - I-ETMS complexities: As discussed in our prior report, selected railroads and AAR identified challenges with developing the I-ETMS's back office server as one of the critical factors railroads anticipated would prevent them from meeting the PTC deadline. At that time, they anticipated securing a final version of the back office server in 2014. However, this system is still in final testing and, according to AAR, is expected to be finalized in late 2015. Of the railroads we interviewed, 21 of 29 stated that developing PTC components, including back office systems, is one challenge that is affecting or may affect their PTC implementation. Among the railroads that expect to finish installing PTC on their tracks and locomotives by the end of 2015, 4 of the 5 said they are not installing I-ETMS.[34] Representatives from one of these railroads

[32]Amtrak Office of Inspector General, *Safety and Security: Progress Made Implementing Positive Train Control, but Significant Challenges Remain*, OIG-A-2015-013 (Washington, D.C.: June 19, 2015).

[33]For example, according to Amtrak, PTC is not expected to be installed by 2015 on parts of the Northeast Corridor that Amtrak does not own, such as the Metro-North line between New York City and New Haven.

[34]One railroad is installing ACSES, and the other three railroads are installing other types of PTC systems.

specifically mentioned not installing I-ETMS as one reason that they anticipate being able to meet the deadline. The one railroad that is installing I-ETMS noted that it had to change vendors after difficulties with obtaining a back-office server delayed its implementation. In addition, representatives of industry associations and Class II/III railroads told us that while they previously thought they could use their host railroads' back office systems, there have been indications that in some cases, they may need to obtain their own back office systems. This is a decision being made between host and tenant railroads. Representatives of one Class II/III railroad indicated to us that they will use their Class I host railroad's back office system, but others indicated they may have to develop their own; this may be costly and these railroads may lack in-house resources to maintain such systems. Representatives also told us that they are exploring the use of a virtual back office that would be shared among several railroads and managed by a third party.

- Limited industry capacity: Currently, a limited number of vendors design PTC systems and provide PTC software and hardware, as well as conduct system integration and testing (described in the next bullet). According to railroad industry representatives, there are two vendors creating the back office servers, two vendors for the onboard train management computer, and three vendors for wayside equipment. Representatives from FRA, as well as 11 commuter and Class II/III railroads raised concerns regarding limited industry capacity, with some stating that that vendor resources have been focused on meeting Class I railroads' needs. Some smaller railroads mentioned difficulties securing a vendor, with one noting that it faced challenges in getting vendors to return phone calls until a Class I railroad intervened. In addition, 4 commuter and Class II/III railroads we interviewed mentioned that prices have increased as a result of the limited number of vendors and the increased demand. Representatives from one commuter railroad we interviewed stated that in some cases, costs associated with the provision of PTC expertise and equipment have tripled in recent years.

- *System integration and field testing:*

  - As we noted in 2013, successful PTC implementation will require numerous components to work together, many of which are first-generation technologies being designed and developed for PTC. To ensure successful integration, railroads must conduct multiple

phases of testing—first in a laboratory environment, then in the field—before installation across the network. In addition, when a problem in one aspect of the system is identified, it may require changes to other aspects of the system and retesting. As we found in our last report, railroads have expressed concerns with the reliability of PTC and emphasized the importance of field testing to ensure that the system performs the way it is intended and that potential defects are identified, corrected, and re-tested. Twenty-two of the 29 railroads we interviewed stated that integration and field testing of PTC components was a challenge that was currently affecting or may affect their PTC implementation.

- In some cases, railroads raised concerns regarding the number of defects they are identifying when testing PTC software, which take additional time to address. AAR noted that in the last year, two safety-critical defects were identified in the onboard software during lab testing that resulted in the suspension of revenue service demonstrations. Adding to this challenge is that some railroads have attempted to maintain progress by conducting certain steps in a parallel, rather than sequential fashion, such as installing hardware before software components are finalized. This can introduce operational risks. For example, a Class II/III railroad representative told us it identified thousands of defects when testing its system, and emphasized the difficulties posed by having to move forward with implementation while trying to simultaneously address these issues. Representatives from three Class I railroads echoed these concerns.

- Installing PTC in an operating environment also poses challenges, as opportunities for installation and testing may be limited, and may require that locomotives be taken out of service. For example, a commuter railroad representative told us that since they only have one track, and must provide six-day commuter service, they can only install PTC equipment during 4-hour windows at night, and on Sundays.

- *FRA resources:* Twenty-one of the 29 railroads we spoke to raised concerns regarding FRA's resources in overseeing PTC implementation, particularly if a number of railroads submit safety plans or request field testing at the same time. Safety plans can be over 5,000 pages long, and FRA took about 7 months to review the first safety plan it received. We reported in 2013 that FRA's PTC staff consists of 10 specialists and one supervisor. Most recently, FRA

officials told us that there are 13 staff to provide technical support to railroads. FRA officials noted that the agency plans to use contractors and temporarily use other FRA staff, if necessary, to assist with PTC-related work, including review of safety plans. FRA officials told us that they anticipate reviewing all safety plans within 180 days of receiving them, as required by its regulations. Railroads stated they are taking steps to help address this challenge, such as developing a template that could standardize certain parts of safety plans and make them easier for FRA to review. Similarly, Class I railroads stated they will take FRA's comments on a draft safety plan—which that railroad shared with others—into account when developing their own safety plans.[35] In addition, two of the four Class I railroads we interviewed raised concerns regarding the contractors that FRA hired to review draft safety plans, stating that they were not subject matter experts and that this situation created the need to engage in additional dialogue to address certain issues. However, FRA officials told us that they review any work conducted by contractors and that FRA requires contractors to have several types of subject matter expertise.[36] While reviewing safety plans, FRA may also be conducting other PTC-related work, such as discussing ongoing testing of PTC by railroads and addressing questions or providing technical assistance to railroads. Two railroads we interviewed stated that FRA was either unable to attend or delayed their PTC testing. We also noted this issue in our prior report, and FRA officials confirmed that currently, to use its limited staff resources and travel budgets most efficiently, FRA does not attend all PTC testing and instead reviews railroads' test plans. In addition, FRA officials stated that FRA only attends and evaluates tests if FRA determines that the railroad's testing plan has weaknesses or the railroad has no testing experience. FRA officials stated that in a small number of cases, railroads' tests were delayed due to the need to coordinate FRA and railroad schedules, or because the railroads' test plans were inconsistent or required corrections. On the other hand, 5 railroads mentioned that FRA had been helpful in their PTC implementation process. In addition, while most of the railroads that requested PTC exceptions did not express concerns with the process for doing so, two railroads that submitted

[35]Some railroads have submitted draft PTC safety plans to FRA for preliminary review.

[36]In addition, according to FRA, the contractors do not interact directly with the railroads. FRA technical staff assesses all contractor comments and observations before conveying them to the railroads.

mainline track exclusion requests in 2010 and 2013 noted that they never received a response from FRA as to whether their request was approved, but assumed that they had been. FRA officials told us they had completed their reviews of exclusion requests.

- *Captivity/dependencies:*

  - The interconnected nature of host and tenant railroads and the need to ensure interoperability among PTC systems poses challenges for railroads' implementation of PTC. Tenant railroads cannot operate their locomotives with PTC until the host railroad has equipped the track. For example, Caltrain officials told us they expect to finish equipping their own track and locomotives by the end of 2015, but they are dependent on host railroads to finish installing PTC on portions of their systems' track. Sixteen of the 29 railroads we interviewed stated that their PTC implementation is, or may be, challenged because their schedule is dependent on a Class I railroad or Amtrak. In addition, railroads operating in host/tenant environments must collaborate to ensure their systems are interoperable. For example, one host railroad we interviewed estimated that while its track will be equipped by the deadline, it has multiple tenant railroads that are further behind and that may be implementing a different PTC system. Representatives told us that until the tenants are PTC-equipped and interoperable, they will need to explore how to allow these PTC-unequipped tenants to safely travel across their PTC-equipped tracks. Nineteen of 29 railroads we interviewed cited "ensuring interoperability" of PTC systems and components as a challenge that is affecting, or may affect, their implementation.

  - In addition, tenant railroads are dependent on the host railroad's informing them whether and when they need to equip their locomotives with PTC. According to FRA officials, host railroads must ensure that their tenants are PTC-equipped or PTC-excepted. To make this determination, Class I railroads said they review the statutory requirements regarding the circumstances under which locomotives and track must be PTC-equipped, as well as exceptions established by FRA. In addition, in some cases, host railroads are also requiring tenants to equip their locomotives with PTC not because of statutory requirements, but because allowing the tenant to be unequipped would create operational problems or safety concerns for the host railroad. For example, the tenant could operate without PTC, but it would have to run at a reduced speed, which could cause operational

problems and reduced speed for other locomotives using the track. Or, the tenant may operate on track that is also used to transport hazardous materials. Some host railroads have numerous tenant railroads, and for each, the host railroad must consider the circumstances under which the tenant operates, including the type of tracks it operates on, and whether it could implement operational restrictions in lieu of requiring tenants to equip with PTC. One Class I railroad told us that as of May 2015, it had determined that 4 out of its 260 tenants will need to equip with PTC, and that its assessments are ongoing. Three of the Class II/III railroads and 1 commuter railroad we interviewed said that they have received limited guidance and instruction from their Class I host railroads regarding the extent to which they need to equip with PTC and when they should be equipped, making it difficult for them to begin PTC implementation. However, three Class II/III railroads and thee commuter railroads stated their Class I railroad hosts were communicating with them and, in some cases, had been helpful in addressing vendor issues. FRA officials told us that FRA will not get involved in this issue because it is a commercial arrangement between two private entities.

- *Funding:* Five of the 13 commuter railroads we interviewed identified limited resources as a challenge, and stated that in their view the need to address ongoing capital maintenance, such as bridge repair, took precedence over installing PTC. One commuter railroad we interviewed noted the need to redesign and reissue its request for proposal for a system integrator to design its PTC system after receiving bids that were four times higher than its estimated costs. In contrast, among the 4 commuter railroads that expect to finish installing PTC on their tracks and locomotives by the end of 2015, 3 received state or federal funds that aided their PTC implementation. Representatives from one of these railroads stated that they depleted their capital program in order to fund PTC and were only able to continue operating safely because they received critical funding from the state that allowed them to address existing capital needs while installing PTC. In addition, about half of the Class II/III railroads in our review that are implementing PTC identified funding as a challenge; according to these railroads, Class II/III railroads generally have less funding than other railroads and operate on a thin profit margin. Estimates vary based on the size of the railroad and the scope of their PTC project: according to one Class III railroad we interviewed, its projected PTC cost of $32 million is equivalent to 10 years of capital projects; another Class III railroad that is implementing PTC because of a Class I railroad's requirement projected that its PTC costs will

equal 1 year of maintenance costs.[37] Railroad representatives also raised concerns regarding how costs will be shared among host and tenant railroads. Currently, there are ongoing negotiations between Amtrak and two smaller railroads regarding who should pay for PTC installation, with the host railroads stating that they are only required to implement PTC because Amtrak is a tenant. Class I railroads did not identify funding as a challenge to their PTC implementation.

- *Radio frequency spectrum and radio wayside poles:* We previously found that railroads' PTC implementation could be affected by commuter railroads' ability to obtain radio frequency spectrum for the operation of PTC and by the need to complete an FCC review process prior to installing radio wayside poles for PTC equipment. FCC and railroads have taken some steps to address these challenges, although some issues remain.

  - Of the railroads we interviewed, 1 of 4 Class I railroads, 2 of 13 commuters, and 4 of 12 Class II/III railroads said radio frequency spectrum still posed a challenge to implementation, with some stating that they planned to lease radio frequency spectrum from Class I railroads.[38] APTA reported in April 2015 that more than half of commuter railroads have not obtained the radio frequency spectrum they need for PTC. In addition, FRA and some railroads raised concerns regarding the potential for railroads operating in close proximity to one another to cause interference to each other's radios.[39] AAR has noted that this is particularly of concern in congested metropolitan areas where multiple trains are operating with PTC and that as new users roll out their PTC systems in locations where other railroads are already testing or using PTC, railroads will likely have to re-engineer their radio networks to address potential interference. Amtrak's OIG report

[37]In addition, representatives from the Class II/III industry association noted that many of the Class II/III railroads own old locomotives that may be difficult to equip with PTC systems, which would lead to increased costs.

[38]The 7 Class I railroads created a consortium (PTC 220 LLC) to purchase radio frequency spectrum licenses that would address their needs, and in some cases, the consortium can lease radio frequency spectrum to non-Class I railroads for a fee.

[39]Such interference can negatively affect a receiver's ability to properly capture a transmitted signal and decode the information for use. Harmful interference can occur when two communications systems use the same or adjacent radio frequencies in the same geographic area.

noted that in May 2015, Amtrak and freight railroads identified potential interference when testing their radios on the Northeast Corridor's north end (between Boston, MA and New Haven, CT), and are working with the FCC to address this issue. According to Amtrak, the frequencies Amtrak is using had been approved by FCC and this potential for interference should not delay its plans to implement PTC by December 31, 2015

- According to FCC officials, in 2013, FCC learned that freight railroads had installed about 10,000 radio wayside poles without complying with FCC's review requirements, and FCC requested railroads halt their construction of PTC radio wayside poles to allow FCC to consider how to implement oversight of the radio wayside poles being installed for PTC.[40] According to FRA officials and AAR representatives, FCC requested that railroads halt construction on radio wayside poles that had not gone through the environmental evaluation process, including tribal notice, while FCC considered ways to streamline the process. During our prior review of PTC implementation, FRA officials told us they had not anticipated this issue. In 2014, FCC and railroads worked together to create a streamlined process for the review of PTC radio wayside poles and came to an agreement that allowed railroads to use poles that had already been constructed.[41] However, railroads told us they lost at least a year waiting to install PTC radio wayside poles while the permitting process was resolved. According to FCC officials, as of April 2015, documentation for about 40 percent of the radio wayside poles had been submitted to FCC for a review. In addition, according to FCC, FCC's capacity for reviews exceeds the actual number of submissions by railroads. However, given the size of Class I railroads' networks, which span tribal lands, 3 of the 4 Class I railroads we interviewed

[40]According to FCC officials, FCC has a legal responsibility to review the environmental and historic preservation impacts, including impacts on properties of religious and cultural significance to Tribal Nations, of infrastructure projects, like PTC, that will provide wireless services using FCC-licensed radio frequency spectrum. Under the National Historic Preservation Act (NHPA), as well as the National Environmental Policy Act (NEPA), installation of radio wayside poles must be reviewed to ensure compliance with legal requirements.

[41]As part of this agreement, the freight railroads agreed to create a Cultural Resource Fund totaling $10 million to provide funding directly to Tribal Nations and State Historic Preservation Offices to support cultural and historic preservation projects.

cited approval of radio wayside poles as a remaining challenge.[42] Class I railroad representatives we interviewed varied as to when they expect to finish submitting radio wayside pole locations for review, with one stating this step would be done in 2015 and another stating it would be done in 2017.

Nearly All of the Selected Railroads Support an Extension of the PTC Deadline, but Vary as to the Type of Extension That Should Be Provided

Representatives from 27 of 29 railroads we interviewed indicated that they support an extension of the PTC deadline.[43] Of these 27, 14 support a blanket extension of the PTC deadline that would apply to all railroads equally; 9 support the use of case-by-case extensions provided to individual railroads; 3 support a hybrid approach that provides a blanket extension followed with case-by-case extensions; and 1 did not indicate its preference.[44] Several of the railroads that expressed an opinion stated that their plans and time frames for implementation would not change regardless of whether the deadline was extended, with some noting that significant technical work remains to be done. Some railroads also noted concerns regarding the implications of missing the deadline, including civil penalties from FRA and increased liability if they have accidents.[45]

The railroads that support a blanket approach cited concerns with the use of a case-by-case approach, particularly with respect to the potential challenge of addressing host/tenant and interoperability issues if railroads were working toward different deadlines. In addition, some noted concerns regarding FRA's resources to review and respond to individual extension requests, given the likelihood that most railroads would request an extension and that FRA would need to review the unique circumstances affecting each railroad to determine whether it warranted

[42]Among all railroads we interviewed, 8 responded that this remains a challenge, 16 responded that it is not a challenge, and 5 did not provide an answer, were unsure, or said that this issue was not applicable to them.

[43]One railroad did not answer the question, and one railroad did not support an extension of the PTC deadline.

[44]All of the Class I railroads indicated that they supported a blanket extension of the deadline, while commuter railroads were more mixed, with 5 supporting a blanket extension, and 6 supporting a case-by-case approach. Class II/III railroads tended to favor a blanket extension over a case-by-case approach (5 versus 3) and 3 supported a hybrid approach (one did not specify its preference).

[45]Four railroads raised this issue when responding to various questions; we did not ask a question on this specific issue as part of our structured interviews.

an extension, and if so, for how long. One Class I railroad and the AAR also raised concerns that if the deadline was extended on a case-by-case basis, then a freight railroad that finishes its PTC implementation prior to other freight railroads could be at a competitive operational disadvantage. This would be tied to the fact that any problems that may occur when the PTC system is deployed could reduce the railroad's operational capacity.

The railroad representatives that support a case-by-case approach to PTC extensions noted that railroads have varied in terms of the issues that have affected their implementation, and stated that this approach would allow extensions to be granted when warranted and tailored to specific circumstances. Some also raised concerns that a blanket extension may enable some railroads to delay their PTC implementation. Some railroads that supported a blanket extension stated that some mechanisms should be added, such as reports to FRA on progress on deployment schedules, as well as quantifiable goals.

In its 2012 report to Congress, FRA recommended that if Congress allowed FRA to approve extensions to a railroad's PTC implementation deadline, the legislation should provide for consideration of such factors as the extent to which each railroad demonstrated due diligence to implement PTC. More recently, according to FRA, DOT's Grow America Act proposal, submitted to Congress in April 2014 and March 2015,[46] proposed that Congress provide FRA additional authorities to enhance public safety while bringing railroads quickly, completely, and safely into compliance with PTC requirements. Specifically, FRA requested that Congress authorize FRA to allow incremental use of PTC systems as they are progressively deployed by railroads and PTC system operation under controlled conditions before final system certification and to allow FRA to require railroads to use alternative safety technologies on specified line segments in lieu of PTC until PTC is fully implemented. In addition, through the Grow America Act proposal, FRA requested that Congress provide FRA with the authority to approve extensions to a railroad's PTC implementation deadline on a case-by-case basis based on a consideration of factors such as a determination of progress being made by the railroad and challenges encountered.

[46]The "Grow America Act" is DOT's proposal for the surface transportation reauthorization bill. In the Grow America Act proposal, DOT also requested authority to provide commuter railroads with grants to assist in their funding implementation of PTC.

In our 2013 report on PTC implementation, we suggested that Congress consider providing FRA with additional authority to extend the deadline on individual rail lines—when the need to do so can be demonstrated by the railroad and verified by FRA—on a case-by-case basis. We noted that given the uncertainties in implementing PTC and the unexpected delays already encountered by railroads, additional challenges could prevent railroads from meeting a new deadline. Thus, we concluded that providing FRA with the authority to grant extensions on a case-by-case basis would provide some needed flexibility and could also assist FRA in managing its limited staff resources and help railroads mitigate risks and ensure PTC is implemented in a safe and reliable manner. Congress has not yet provided such authority, and we continue to believe that such authority is needed.

In addition, we also noted in our 2013 report that railroads were at various stages in their implementation, and this status continues to be true. As noted earlier in this report, most of the railroads included in our review estimated to have PTC fully operational in revenue service 1 to 5 years after the 2015 deadline; however, railroads' estimated deadlines are subject to change, and the less formalized completion dates may be more likely to change or change more significantly. As we noted in our prior report, flexibility in extending the deadline for certain railroads acknowledges these differences, may help railroads address any ongoing and emerging challenges, and also may help FRA better manage limited resources by, for example, preventing a potential review backlog resulting from final safety plans being submitted at the same time to meet a new blanket deadline—a concern raised by freight railroads and FRA. According to FRA officials, no such backlog currently exists.

FRA Has Conducted High-Level PTC Implementation Oversight, but the PTC Task Force Provides Opportunity for Improved Oversight in the Future

FRA Used a Variety of Methods to Oversee PTC Implementation

In addition to establishing PTC standards and issuing regulations to govern the implementation of PTC, FRA has employed a number of other efforts to oversee railroads' implementation of PTC. As we found in December 2010,[47] in order to oversee railroads' progress in implementing PTC, FRA provided guidance to the railroad industry by speaking at industry conferences, meeting with railroads to discuss PTC implementation plans and providing railroads with a template for drafting their PTC implementation plans. More recently, FRA's oversight efforts have included the following:

Review of Plans—As discussed earlier, FRA has responsibility for the review and certification of railroad PTC plans, including implementation plans, development plans, and safety plans. FRA officials stated that they have encouraged railroads to submit these plans in a timely manner. RSIA authorizes FRA to assess civil penalties for failure to comply with PTC requirements, including submitting or complying with a plan for implementing PTC.[48] The PTC implementation plan, an important document for tracking a railroad's progress implementing PTC, contains information on a railroad's plan for complying with the installation of mandatory PTC systems. The implementation plan consists of

[47]GAO, *Rail Safety: Federal Railroad Administration Should Report on Risks to the Successful Implementation of Mandated Safety Technology,* GAO-11-133 (Washington, D.C.: Dec. 15, 2010).

[48]Pub. L. No. 110-432, § 104(a).

implementation schedules, narratives, technical documentation, and relevant excerpts of agreements that an individual railroad will use to complete mandatory PTC implementation.[49] According to FRA officials, all railroads that were required to submit implementation plans did so by 2010.[50]

Review of Annual Reports—FRA regulations require railroads to report annually to FRA on the progress being made in meeting the goals identified in their implementation plans and any impediments to meeting those goals.[51] According to FRA officials, the requirement for railroads' annual reporting was to help the agency fulfill its congressional-reporting obligations and otherwise fully and accurately monitor the progress of PTC system implementation. Specifically, these annual reports were to include information on implementation data relating to PTC system components such as wayside interface units and back-end computer systems.[52] According to FRA officials, these annual reports were one of the primary tools FRA used to track progress in implementing PTC, as well as to annually conduct reviews to ensure railroads were complying with their implementation plans, as required by RSIA.

Technical Assistance—RSIA provides for FRA to provide technical assistance and guidance to railroad carriers in developing their implementation plans,[53] and FRA has done so to help railroads address challenges and identify risks as they implement PTC. FRA has participated in railroads' PTC-system design reviews, lab testing, and field testing. For example, FRA officials reviewed some railroads' PTC testing and results to make sure railroads' test processes were conducted in a way the railroads said they would be.

[49]49 C.F.R. § 236.1011.

[50]Most railroads submitted their development plans by 2011. As of July 23, 2015, FRA had only received two final PTC safety plans.

[51] 49 C.F.R. § 236.1009.

[52]See 49 U.S.C. § 236.1009.

[53]Pub. L. No. 110-432, § 104(a).

Review of Industry Association Reports—According to FRA officials, the agency has reviewed reports from industry associations, including AAR[54] and APTA,[55] to obtain industry-wide data and information on railroads' progress in implementing PTC. These reports provide annual updates on the industry's progress in complying with the PTC mandate, including AAR summary data on the number of components installed, significant implementation challenges, and the costs to the industry.

Reporting on Railroads' Progress to Congress—Since the enactment of RSIA in 2008, FRA's reporting on railroads' progress implementing PTC has largely been through the agency's 2012 status report and testimonies requested by Congress. In August 2012, as required by RSIA,[56] FRA submitted a report to Congress discussing the status of PTC implementation, 9 technical and programmatic challenges to implementation, and potential impacts of these challenges.[57] FRA's report highlighted that the significant challenges that railroads had encountered made it unlikely that railroads would be able to fully implement PTC by the December 31, 2015, deadline. In addition to its 2012 report to Congress, FRA has informed Congress of challenges facing railroads in PTC implementation through multiple testimonies requested by Congress as well as in DOT's 2015 Grow America Act proposal. In response to congressional requests for more information on PTC's implementation,[58] FRA issued another PTC progress report in August 2015.[59]

[54]Association of American Railroads, *PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline: April 2015 Update* (Apr. 15, 2015).

[55]American Public Transportation Association, *Positive Train Control: An Assessment of PTC Implementation by Commuter Railroads* (April 2015).

[56]RSIA requires FRA to report on the progress of railroads in implementing PTC. Pub. L. No. 110-432, § 104(a). RSIA did not specify specific contents for FRA's report.

[57]FRA, *Report to Congress: Positive Train Control: Implementation Status, Issues, and Impacts* (Aug. 1, 2012).

[58]The House report accompanying the Department of Transportation, and Housing and Urban Development, and Related Agencies Appropriations Bill, 2015, directed FRA to provide a progress report to the House and Senate Appropriations Committee on the status of railroad compliance with PTC implementation. H.R. Rep. No. 113-464, at 43 (2014).

[59]FRA, *Federal Railroad Administration Status Report to House and Senate Committees on Appropriations: Status of Positive Train Control Implementation* (August 2015).

FRA's Oversight Efforts Were Not Sufficient to Monitor and Report on Individual Railroads' Progress

Much of the information FRA annually collected and reviewed to monitor and report on the railroad industry's overall progress in implementing PTC was high-level information and thus limited in its usefulness to oversee progress made by individual railroads and to hold them accountable for making progress in meeting the mandated PTC deadline. Standards for internal controls in the federal government[60] state that agencies should ensure adequate means to obtain information from stakeholders—such as railroads—and adequate means of communicating with stakeholders—such as railroads and Congress. Furthermore, the standards also state that communications should include quality information that is relevant, reliable, and timely.

Based on our review, the annual reports submitted by railroads and reviewed by FRA did not provide a consistently useful level of detail for FRA to monitor individual railroads' progress. The annual reports were a key method intended to provide ongoing tracking of individual railroad's progress implementing PTC. The contents of PTC annual reports were initially focused on railroads' tracking their progress in equipping locomotives with PTC equipment and installing other components, such as radio wayside poles. However, railroads did not always include information on impediments to completion of certain PTC goals, even though such information is required under FRA's regulation,[61] and as discussed above, railroads have told us they continue to face widespread challenges. For example, one railroad's 2014 plan we reviewed included information on implementation challenges, including obtaining needed funding. However, three other railroads' plans that we reviewed did not include similar information on implementation challenges the railroads faced. In addition, FRA's identification of such challenges may not always have been timely. For example, according to agency officials, FRA worked closely with FCC to help address railroads' radio frequency spectrum needs and help FCC streamline its approval process for PTC radio wayside poles. However, FRA's efforts to address FCC radio wayside pole approval issues began in 2013, as soon as FCC and the railroads raised them, but not long before the 2015 PTC implementation

[60]GAO, *Standards for Internal Control in the Federal Government,* GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999).

[61]49 C.F.R. §236.1009 (a)(5). FRA requires that railroads submit an annual report until implementation is complete and that these reports should include information on the railroad's progress towards filling the goals in its implementation plan, including progress in installing PTC components and impediments to completion of such goals.

deadline.[62] According to FCC officials, the steps needed to mitigate this widespread challenge—which impacted nearly all of the railroads implementing PTC—involved streamlining FCC's review process and resulted in over a year of delay for installing radio wayside poles. According to FRA officials, railroads' annual reports are one of the key tools that FRA uses to conduct its annual reviews of railroads' compliance with their PTC plans and to track progress in implementing PTC. However, FRA officials acknowledged that the annual reports have been insufficient for monitoring railroads' progress and that the information captured by these reports was not adequate to identify implementation challenges or track railroads' progress.

Similarly, FRA's review of industry association reports for updates on railroads' progress has been focused on high-level, industry-wide progress towards PTC implementation, not on the progress of individual railroads. According to FRA officials, industry association reports provide high-level implementation information and were not detailed enough to help monitor and report on an individual railroad's progress or to hold railroads accountable for making progress in meeting the deadline. Furthermore, these reports provided FRA with limited information regarding PTC implementation by Class II/III railroads, which as previously discussed, continue to experience challenges implementing PTC.

In addition, railroads were required to provide certain implementation schedule information in their PTC implementation plans that were submitted in 2010; however, railroads have not updated those plans once they fell behind their anticipated schedule. Consequently, many railroads' implementation plans have become out of date, and as time has progressed, FRA has not always had realistic time frames by which to monitor railroads' progress. As discussed above, RSIA requires certain railroads to submit plans to implement PTC. According to FRA officials, although railroads are required to submit an updated PTC implementation plan if time frames detailed in the plan change, at this time, none have done so to reflect that they expect to implement PTC after the 2015

[62]According to FRA, FCC officials told FRA they had received an Indian tribe's complaint about one unauthorized communication tower on one freight railroad's track. FRA then arranged a meeting between FCC and AAR, which led to the realization that some unauthorized PTC communication antennas had already been installed.

deadline, even though many railroads told us that will be the case.[63] According to FRA officials, in October 2012, railroads asked if FRA could approve a revised implementation plan that did not support the congressionally-mandated implementation date. FRA responded that it could conditionally approve such a plan subject to Congress's amending the implementation deadline, and FRA encouraged class I railroads to submit revised implementation plans with revised dates. FRA officials told us that updated implementation schedules would allow FRA to better monitor railroads' progress in implementation moving forward. In addition, out-of-date plans may hinder FRA's ability to ensure interoperability. FRA regulations require that implementation plans discuss how PTC systems will be interoperable with tenant railroads, and as discussed earlier, many host railroads have not yet fully determined how to address interoperability with tenants or even with which tenants the railroad will need to achieve interoperability. Moving forward, obtaining the required information on interoperability will be essential for FRA to ensure that railroads' PTC systems meet all the functional requirements of RSIA, including interoperability

Some of the limitations in the information FRA has collected on the progress of individual railroads' implementation of PTC have affected its ability to provide detailed and timely information to Congress. For example, most of the data provided in FRA's 2012 report to Congress were industry-wide, and the report generally did not detail progress of individual railroads.[64] In addition, FRA was supposed to issue its August 2015 progress report to Congress earlier in 2015. However, the FRA acting administrator stated in a June 2015 congressional hearing that the reason the report was delayed was because FRA had to respond to requests from congressional committees to provide additional information on the progress of individual railroads in implementing PTC that it was initially not planning to include in the report and did not have readily available. Congressional committees have expressed interest in receiving more frequent information regarding PTC, as seen in the House

[63]As noted earlier only five railroads that we interviewed expect to meet the 2015 deadline. Representatives of one commuter railroad said their railroad filed a PTC implementation plan with FRA, but it is currently in a "suspended state" because FRA cannot approve a plan that indicates that the PTC system will not be finished until after the 2015 deadline

[64]Some detailed information was provided for eight large freight railroads, including data on capital investments made in PTC.

appropriations committee's request for a 2015 status report. As most railroads do not expect to meet the December 31, 2015 deadline, more frequent and detailed reporting to Congress and others may be useful as railroads continue to implement PTC.

FRA's Recently Established PTC Task Force Provides Opportunities for Improved Oversight of PTC Implementation

In May 2015, FRA established an internal task force comprised of seven full-time staff to identify agency needs regarding the oversight of PTC and to help create strategies to ensure the safe and timely implementation of PTC. As the December 2015 implementation deadline nears, FRA officials said they are now focusing on the information the agency will need to enforce the PTC mandate beyond the deadline, and they believe the internal task force will help accomplish this approach. FRA intends for the task force to, among other things, more systematically collect data on railroads' implementation of PTC, facilitate the development of the agency's enforcement strategy and FRA's awareness of implementation challenges, as well as ensure resources are available to support implementation efforts and lead reporting efforts to Congress, the media, and others regarding PTC implementation. According to FRA officials, establishment of the task force will allow other FRA staff dedicated to PTC to focus on other tasks such as reviewing and certifying PTC safety plans. Specifically the task force intends to address issues such as:

- collecting, managing, and disseminating railroad data;
- facilitating the development of the agency's enforcement strategy;
- ensuring resources (e.g., manpower) are available at the right time to support FRA's implementation efforts and capacity needs;
- ensuring correspondence with railroads, Congress, media, and other outlets are planned and coordinated; and
- facilitating the agency's awareness and resolution of implementation issues that arise within the industry.

According to officials, one of the primary objectives of the task force will be to collect new data on individual railroads' progress that can be queried for management purposes or to identify trends. FRA plans to deploy a survey to collect information on the status of individual railroads' PTC implementation as of August 30, 2015. After railroads submit their initial survey responses, due September 15, 2015, railroads must update

their responses on a monthly basis until FRA determines otherwise.[65] The survey is primarily focused on status updates. For example, railroads are being asked to submit information on the status of, among other things, acquiring needed radio-frequency spectrum, installing needed radio towers, and whether any tenant railroads' PTC systems are interoperable. It also asks respondents to rank challenges they may be experiencing.

While this survey information will provide FRA with status updates at a point in time and some transparency over individual railroads' efforts, it does not provide a way to measure progress and hold railroads accountable for meeting scheduled milestones to implement PTC. For example, through the survey, FRA asks about the status of PTC interoperability. Specifically, the survey asks, "If you are a host railroad, are all your tenant railroads fully interoperable with your PTC systems under the regulations?" As we have previously mentioned, some host railroads could have hundreds of tenants for which they have to determine whether they should be PTC-equipped and the process can be time consuming as they collaborate on achieving interoperability. Thus, while the survey provides information on the status of interoperability for the host railroad at a certain point in time, it will not provide FRA with information on the level of incremental and ongoing progress railroads should be making to achieve interoperability. According to FRA, this survey data are intended to provide top-level information that can lead to specific follow-ups with railroads by the PTC task force to determine an appropriate course of action or support.

As we reported earlier, most railroads do not expect to meet the December 2015 deadline and continue to experience challenges. FRA officials previously told us in 2013 that if the deadline were extended the agency would want an increased oversight role.[66] According to FRA officials, while the task force has developed some ideas about the issues it would like to address, the agency has not yet determined any specific strategies or a plan that outlines how the agency, through the task force, will monitor and report on railroads' progress implementing PTC. Developing a plan that outlines how the agency, through the task force,

[65]According to the survey, railroads must submit updates on the 15th of every month to reflect the status as of the 30th of the previous month.

[66]A bill has been introduced that would extend the deadline to implement PTC to December 31, 2020. S. 650, 114th Cong. (2015).

will monitor railroads' progress, could provide meaningful guidance, for among other things, the collection of information and data from railroads. Standards for internal controls in the federal government state management should design control activities to carry out management directives—such as oversight of PTC—to help achieve effective results. Internal controls are a major part of managing an organization. They comprise the plans and methods used to meet goals and objectives and, in doing so, support performance-based management. We have previously reported on the benefits of developing comprehensive plans. Such plans can be used to establish deadlines for achieving objectives and assigning responsibility for program implementation. Planning can also aid in assessing, managing, and mitigating risks, a process that can help an agency identify potential problems before they occur and target limited resources.[67] Developing a plan for PTC oversight could help FRA with the following:

- holding railroads accountable for their PTC implementation by collecting more railroad-specific data on progress;
- determining how to assess civil penalties or otherwise address railroads that do not implement PTC by the mandated deadline;
- determining whether and how to grant railroads extensions to the implementation deadline if FRA is authorized by statute to do so;
- ensuring detailed information is readily available to support reporting to Congress and others in a timely manner;
- providing timelier and better understanding of the challenges railroads face in PTC implementation and how those challenges may affect the time frame for an individual railroad's implementation and allow FRA to be more proactive in helping the industry address challenges to move toward full implementation; and
- addressing some areas of uncertainty such as railroads' progress in ensuring interoperability with other railroads and determining when a railroad's PTC system is considered fully implemented.

[67]GAO, *Digital Television Transition: Increased Federal Planning and Risk Management Could Further Facilitate the DTV Transition*, GAO-08-43 (Washington, D.C.: Nov. 19, 2007).

Conclusions

Most railroads report that they continue to face challenges and do not expect to meet the December 31, 2015, PTC implementation deadline. As a result, FRA's role overseeing railroads' PTC implementation is critical. We found that some railroads continue to face challenges similar to what we had reported in 2013. However to some extent the nature of the challenges railroads are facing have changed. For example, some railroads have installed, or are working toward the completion of installing, PTC components on their own track, but are now working to navigate complex host and tenant relationships and achieving interoperability.

Since the enactment of RSIA, FRA has used a variety of methods to oversee PTC implementation, including conducting reviews of railroads' PTC implementation plans and annual reports, and relying on industry associations' reports on progress. While these efforts provided some insights into progress being made implementing PTC, their usefulness in monitoring and reporting on an individual railroad's progress and holding an individual railroad accountable for implementing PTC was limited. For example, we found some of the annual reports submitted by railroads did not contain detailed information on challenges the railroads were experiencing in PTC's implementation. Standards for internal controls in the federal government state that agencies should ensure adequate means to obtain and communicate information and that communications should include information that is relevant, reliable, and timely. The recently created PTC task force provides FRA with some opportunities to provide improved monitoring and reporting. The task force plans to more systematically collect data on railroads' progress. For example, through a survey, FRA plans to collect information on railroads' progress in implementation—such as their status in acquiring needed radio frequency spectrum—that will be helpful to identify trends for management purposes. However, the survey doesn't allow for tracking incremental progress—such as steps being taken toward achieving interoperability—limiting FRA's ability to monitor and report on a railroad's ongoing progress implementing PTC. Furthermore, the task force has not yet determined any specific strategies or developed a plan for how the agency will use the information it plans to collect to oversee PTC's implementation. We have previously reported on the benefits of developing comprehensive plans. Developing a plan that outlines how the agency intends to monitor railroads' progress based on an individual railroad's schedule for implementing PTC and how FRA plans to report this information to Congress could provide meaningful guidance for FRA's monitoring and reporting of PTC implementation. As the PTC implementation deadline nears and pending bills authorize extension of

the deadline, better monitoring and reporting could improve FRA's effective oversight of railroads' progress toward achieving full PTC implementation and better ensure the agency holds railroads accountable for their progress.

Recommendation for Executive Action

The Secretary of Transportation should direct FRA to improve its oversight of railroads' PTC implementation by developing a plan that outlines how the agency will hold railroads accountable for making continued progress towards the full implementation of PTC that includes:

- identifying and collecting any additional information needed to effectively track an individual railroad's progress;
- developing the agency's enforcement strategy;
- identifying needed resources to support implementation efforts;
- reporting to Congress and others on the status of railroads' progress implementing PTC and the agency's oversight efforts; and
- identifying and planning for mitigating challenges and risks to implementation.

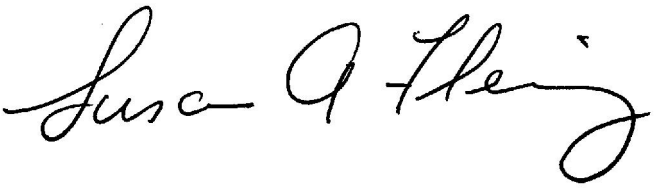
Agency Comments

We provided a draft of this report to the Department Transportation, the Federal Communications Commission, and Amtrak for review and comment. Amtrak and FCC provided technical comments that we incorporated as appropriate. In written comments, reproduced in appendix III, DOT agreed with our recommendation. DOT also provided technical comments that we incorporated, as appropriate.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 5 days from the report date. At that time, we will send copies to the Secretary of Transportation and other interested parties. In addition, the report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or flemings@gao.gov. Contact points for our

Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.



Susan Fleming
Director, Physical Infrastructure Issues

List of Requesters

The Honorable John Thune
Chairman
The Honorable Bill Nelson
Ranking Member
Committee on Commerce, Science and Transportation
United States Senate

The Honorable Bill Shuster
Chairman
The Honorable Peter A. DeFazio
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Jeff Denham
Chairman
The Honorable Michael E. Capuano
Ranking Member
Subcommittee on Railroads, Pipelines, and Hazardous Materials
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Roy Blunt
United States Senate

The Honorable Claire McCaskill
United States Senate

Appendix I: Objectives, Scope, and Methodology

To examine railroads' progress in implementing positive train control (PTC) and addressing challenges, we reviewed relevant laws and regulations, including the Rail Safety Improvement Act of 2008 (RSIA)[1] and PTC regulations. We reviewed documentation provided by railroads that are implementing PTC to the Federal Railroad Administration (FRA) regarding their implementation of PTC, including PTC implementation plans and annual reports. We also reviewed prior GAO reports on PTC. We also interviewed industry associations such as the American Public Transportation Association (APTA), Association of American Railroads (AAR), and the American Short Line and Regional Railroad Association (ASLRRA), and reviewed available reports from these associations, including AAR's April 2015 update on PTC implementation by freight railroads,[2] and APTA's April 2015 update on PTC implementation by commuter railroads.[3] In order to review PTC implementation by Amtrak we also reviewed a report by the Amtrak Office of the Inspector General regarding Amtrak's status in implementing PTC[4] and interviewed officials with that office and Amtrak regarding Amtrak's implementation of PTC.

In addition, we developed a structured interview guide and used it to interview representatives from railroads that are implementing PTC. In total we interviewed 26 railroads identified by FRA to be required by law to implement PTC. Specifically, we interviewed the four largest Class I

[1]Pub. L. No. 110-432, div. A, 122 Stat. 4848.

[2]Association of American Railroads, *PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline: April 2015 Update* (Apr. 15, 2015).

[3]American Public Transportation Association, *Positive Train Control: An Assessment of PTC Implementation by Commuter Railroads* (April 2015).

[4]Amtrak Office of the Inspector General, *Safety and Security: Progress Made Implementing Positive Train Control but Significant Challenges Remain,* OIG-A-2015-013 (Washington, D.C.: June 19, 2015).

freight railroads as determined by revenues,[5] 13 commuter railroads,[6] and 9 smaller Class II/III freight railroads.[7] We selected the four largest freight railroads because we included them as part of our 2013 report on PTC.[8] We selected the Class II/III and commuter railroads by first obtaining, in April 2015, a list from FRA of all such railroads required by RSIA to implement PTC for supporting passenger operations. This list included 10 Class II/III railroads; we decided to interview all but one of them for our current study. (We did not include one that is jointly owned by two Class I railroads that we interviewed separately.) The list also included 27 commuter railroads; we selected 13 to interview by selecting all 7 commuter railroads that we interviewed for our 2013 PTC report as well as 6 others to ensure diversity in size (based on ridership levels reported by APTA) and geographic location. In addition, we used the semi-structured interview guide to interview three Class II/III railroads identified by an industry association as not required by RSIA to implement PTC, but required to do so by larger Class I freight railroads whose track they run on.[9] We selected these three railroads based on recommendations from ASLRRA. During these interviews, among other things, we asked the railroads about their progress in implementing PTC, what challenges they are facing or expect to face in their implementation, and steps they are

[5]Railroads are classified by operating revenues. Class I: Railroad carriers having annual carrier operating revenues of $250 million or more. Class II: Railroad carriers having annual carrier operating revenues of less than $250 million but in excess of $20 million. Class III: Railroad carriers having annual carrier operating revenues of $20 million or less; after applying the railroad revenue deflator formula provided by the regulation. 49 C.F.R. § 1201.1-1. The 4 largest Class I railroads are BNSF Railway, CSX Corporation, Norfolk Southern, and Union Pacific.

[6]Capital Metro, Long Island Railroad, Massachusetts Bay Transit Administration (MBTA), Metro North, New Mexico Rail Runner Express, North East Illinois Commuter Rail (Metra), Peninsula Joint Powers (Caltrain), RTD Denver, South Eastern Pennsylvania Transportation Authority (SEPTA), Southern California Regional Rail Authority (Metrolink), Utah Transit Authority, Virginia Railway Express, TriMet.

[7]Alaska, Belt Railway of Chicago, Kansas City Terminal, Nashville and Eastern, New Orleans Public Belt, Pan Am Railways, Portland and Western, Saratoga and North Creek, and Terminal Rail of Saint Louis. We did not interview Conrail Shared assets as it is jointly owned by two Class I railroads that we interviewed individually. Class II/III railroads are freight railroads with lower revenues than Class I railroads, with Class II railroads having greater revenues than Class III railroads.

[8]GAO, *Positive Train Control: Additional Authorities Could Benefit Implementation,* GAO-13-720 (Washington, D.C.: Aug. 16, 2013).

[9]Indiana Railroad, Twin Cities and Western, and Watco.

taking to address those challenges. Specifically, we provided a list of challenges to PTC implementation that we discussed in our 2013 report and asked railroads to discuss whether these remained challenges and to identify any additional challenges they are facing or expect to face in PTC implementation.

We also reviewed documentation from FCC regarding the approval process for radio wayside poles railroads need to construct for PTC and interviewed FCC officials about that issue and challenges that railroads have faced in acquiring needed radio frequency spectrum. We interviewed FRA officials regarding railroads' progress in implementing PTC and challenges they are facing.

In addition, to examine how the Department of Transportation (DOT) has overseen the implementation of PTC, we reviewed relevant documentation described above, such as PTC annual reports and implementation plans, RSIA, PTC regulations, FRA's 2012 report to Congress on PTC implementation, and recent testimony statements by FRA to Congress. In addition, during the interviews with railroads described above, we asked railroads for their views on FRA's role in PTC implementation, including FRA's review of PTC safety plans. We also interviewed FRA officials regarding FRA's oversight and monitoring of PTC implementation by railroads. We evaluated FRA's oversight efforts based on GAO's *Standards for Internal Control in the Federal Government*.[10]

[10]GAO, *Standards for Internal Control in the Federal Government,* GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999).

Appendix II: PTC Deployment and Challenges Information from Railroads Interviewed

Based on our interviews with 29 selected railroads for this report, 20 estimated they would have PTC fully operational in revenue service on all required track (based on the current requirements regarding what track must have PTC installed) within 1 to 5 years after the 2015 deadline, and 3 stated that they do not have an estimated completion date.[1] Among the 23 railroads are 3 Class II/III railroads that were identified by an industry association as not required by statute to implement PTC on their track, but are equipping locomotives with PTC because they will run on PTC-equipped track.[2] Of the remaining 6 railroads, 1 received an exception from installing PTC on its track because it is operating at restricted speeds (thus, it is not included in table 1). In addition, representatives for 4 selected commuter railroads and one Class II/III railroad estimated they would have PTC fully operational in revenue service on all tracks that they own by the end of 2015. Representatives for each railroad provided us with an estimated time frame for full implementation, as well as information on the type of PTC system that they are installing, the number of route miles and locomotives or cab cars that they need to equip, the number of railroads that use their tracks as tenants, the number of host railroads on whose track they operate, and their estimated total PTC implementation costs (see table 1).

Some of those time frames were based on vendor project schedules, while others were not yet formalized in a schedule because the PTC projects are in their infancy. Thus, while all estimated deadlines are subject to change, those completion dates that are less formalized may be more likely to change or change more significantly. As previously noted, we selected a subset of railroads that are implementing PTC, so this table does not represent the full scope or scale of PTC deployment.

[1]In addition, one commuter railroad, RTD-Denver, is installing a new rail system that will have PTC operational when it opens after the December 2015 deadline has passed.

[2]Some Class II/III railroads are being required to equip their locomotives with PTC because they are a tenant and their host railroad has indicated they must equip.

Table 1: Positive Train Control (PTC) Deployment Information and Estimated Completion Date for Railroads Interviewed, Divided by Railroad Type

The railroads we interviewed varied with respect to the scope, estimated completion date, cost, and type of PTC system being installed (PTC systems included I-ETMS (Interoperable Electronic Train Management System); Advanced Civil Speed Enforcement System (ACSES); Interoperable–Incremental Train Control System (I-ITCS); Enhanced-Automatic Train Control (E-ATC); and existing Automatic Block Signaling (ABS) systems. As noted earlier, we did not ask Amtrak the same level of questions as other railroads, because Amtrak Office of the Inspector General recently issued a report providing detailed information on Amtrak's PTC progress and challenges. As a result, we do not include Amtrak in this table.

	Railroad	PTC System	PTC Route Miles	No. of locomotives/ cab cars to equip	No. of tenant RRs [Note A]	No. of host RRs [Note B]	Total PTC Costs (est.) [Note C]	PTC Completion (est.)
Class I railroads	BNSF	I-ETMS	11,350	6,000	260	10	$2 billion	Dec. 2017
	Union Pacific	I-ETMS	21,009	6,532	204	12	$2.5 billion	Dec. 2018
	CSX	I-ETMS ACSES	11,067	3,900	79	13	At least $1.9 billion	Dec. 2020
	Norfolk Southern	I-ETMS	9,560	3,400	56	16	$1.8 billion	Dec. 2020
Commuter railroads	Caltrain	I-ITCS	52	67	4	1	$231 Million	Dec. 2015
	Metrolink	I-ETMS	225	109	3	4	$216.5 million	Dec. 2015
	Southeastern Pennsylvania Transportation Authority (SEPTA)	ACSES	240	290	4	1	$328 million	Dec. 2015
	TriMet [Note D]	E-ATC	5	33	0	1	$10 million	Dec. 2015
	RTD Denver	I-ETMS	35	56	2	0	$22 million [Note E]	2016 [Note F]
	Virginia Railway Express	I-ETMS	0	41	0	3	$10.5 million	Dec. 2016
	Utah Transit Authority	E-ATC I-ETMS	88	40	2	1	$35 million	Mid 2017
	Long Island Railroad	ACSES	314	776	2	1	$444 million	Dec. 2018
	Metro-North	ACSES	340	681	9	0	$524 million	Dec. 2018
	New Mexico Rail Runner Express	I-ETMS	96	18	3	0	$30-60 million	Dec. 2018
	Capital Metro	E-ATC	32	10	2	0	$32-40 million	2018 - 2019
	North East Illinois Regional Commuter Rail (Metra)	I-ETMS	438	526	11	6	$300-400 Million	2019
	MBTA	I-ETMS ACSES	394	215	5	1	$489.5 million	Dec. 2020
Class II/III railroads	Portland and Western Railroad	E-ATC	10	6—8	2	2	$0 (see TriMet)	Dec. 2015

	Railroad	PTC System	PTC Route Miles	No. of locomotives/ cab cars to equip	No. of tenant RRs [Note A]	No. of host RRs [Note B]	Total PTC Costs (est.) [Note C]	PTC Completion (est.)
	Nashville & Eastern	SAFENET PTC	32	14	1	0	$10-14 million	2017
	Kansas city Terminal	I-ETMS	30	0			$30 million	2016-2017
	Alaska	I-ETMS	535	54			At least $158 million	Dec. 2018
	Belt Railway of Chicago	I-ETMS	28	5—7	13	1	$15-18 million	Dec. 2018
	Terminal Rail of Saint Louis	I-ETMS	14	17	7—9	8	$32 Million	Dec. 2018
	Pan Am Railways	ACSES ABS I-ETMS	28	92			0	Dec. 2020
	Saratoga & North Creek	I-ETMS	N/A	2			$120,000-$200,000	Unknown
Class II/III railroads required by host railroad to equip [Note G]	Twin Cities	I-ETMS	N/A	8	0	2	$1 million	2017
	Indiana	Unknown	N/A	32	1	1	$3.2 million	Unknown
	Watco [Note H]	I-ETMS	N/A	47	0	6	$19 million	Unknown

Source: GAO, based on interviews with railroads. | GAO-15-739

Note A: Refers to the number of other railroads that operate on the named railroad's tracks, as tenants. In some cases, this information was unavailable.

Note B: Refers to the number of railroads that the named railroad operates on as tenant (it does not own the track it operates on). In some cases, this information was unavailable.

Note C: Refers to implementation costs, not ongoing maintenance or operations costs.

Note D: TriMet operates a commuter service on another railroad's track (Portland and Western). TriMet owns 5 of the 15 miles of track, and Portland and Western owns the remaining 10 miles of track. TriMet is paying for and overseeing the installation of PTC on that portion of Portland and Western's track.

Note E: RTD-Denver officials noted this is an imprecise estimate, as its contract was for an entirely new rail system that included PTC.

Note F: RTD-Denver is installing a new rail system that will have PTC operational when it opens after the December 31, 2015 implementation deadline.

Note G: This table lists two types of Class II/III railroads. "Class II/III" are required to implement PTC by the 2015 deadline because they host passenger traffic. In contrast, FRA provided Class II/III railroads operating in certain conditions with the ability to obtain a short-line exception, which would allow them to delay equipping their locomotives with PTC until December 31, 2020. 49 C.F.R §236.1006. And in some cases, Class II/III railroads may be completely excepted from installing PTC. However, some Class II/III railroads are being required to equip their locomotives with PTC because they are a tenant and their host railroad has indicated they must equip. These railroads are listed as "Class II/III required by host railroad to equip" in the table.

Note H: Watco is a holding company that owns 33 individual railroads. The information for Watco includes all its railroads.

Table 2: Identification of Challenges Currently Affecting or Potentially Affecting Railroads' Positive Train Control (PTC) Implementation

Challenge	No. of interviewed railroads stating this was a challenge	No. of interviewed railroads stating this was not a challenge	No answer, N/A, or Unsure
Integration and field testing of PTC components	22	6	1
FRA field testing, certification, and approval of systems and safety plans, including FRA's available resources and timeliness	21	6	2
Development and testing of PTC components, including back office system development	21	7	1
Installing PTC components	19	9	1
Ensuring interoperability of PTC systems and components	19	8	2
Schedule is dependent on Class I (or Amtrak) implementation	16	8	5
Available funding for investments	11	17	1
Obtaining FCC approval for PTC radio tower installation	8	16	5
Obtaining radio frequency spectrum	7	21	1

Source: GAO, based on interviews with railroads. | GAO-15-739

Appendix III: Comments from the Department of Transportation

U.S. Department
of Transportation

Office of the Secretary
of Transportation

Assistant Secretary
for Administration

1200 New Jersey Avenue, SE
Washington, DC 20590

AUG 27 2015

Susan Fleming
Director, Physical Infrastructure Issues
U.S. Government Accountability Office
441 G Street NW
Washington, DC 201548

Dear Ms. Fleming:

The Federal Railroad Administration (FRA) has provided strong oversight of the rail industry's implementation of the safety technology since passage of the Railroad Safety Improvement Act (RSIA). FRA has ramped up that oversight in recent years and months as we close in on the December 2015 deadline. When fully implemented, positive train control (PTC) will have a life-saving impact on rail transportation safety. It will also help railroads reliably and efficiently transport rising numbers of people and goods as the U.S. economy and population grow.

FRA is committed to enforcing the congressionally mandated deadline.

While railroads—and railroads alone—are responsible for implementing PTC consistent with existing law, FRA has executed multiple efforts concurrently to bring them into compliance as quickly and efficiently as possible. The agency has dedicated significant resources to enable PTC development and implementation and assisted railroads with compliance of the PTC statute. As discussed with your auditors, FRA has:

- Provided approximately $650 million in grants and almost $1 billion in loans to support PTC implementation. Additional Railroad Rehabilitation and Improvement Financing (RRIF) loan funds are available to applicants interested in assistance in paying for PTC implementation.
- Actively supported deployment of PTC through the issuance of RSIA-mandated performance-based regulations in January 2010, as well as additional regulations that lightened the regulatory burden, and technical assistance documents to aid railroads, manufacturers, and suppliers to achieve full PTC functionality and interoperability.
- Starting in March 2010, dedicated staff to work on PTC implementation. FRA continually reevaluates personnel requirements and needs to ensure adequate resources are available to support timely implementation of PTC.
- Built a PTC system test bed at FRA's Transportation Technology Center, which is available to railroads for testing PTC technologies.
- Participated in system design and test readiness reviews, lab and field testing, and conducted preliminary reviews of the required submissions to identify regulatory noncompliance as soon as possible to minimize cost and schedule impact.
- Approved all 41 railroads' PTC implementation plans on time;

- Worked directly with the Federal Communications Commission and the Advisory Council on Historic Preservation to resolve issues related to spectrum use and improve the review and approval process related to PTC communication towers and ancillary equipment.
- Provided information on specific items and the level of data quality FRA requires in order to approve safety plans and identify omissions that would result in the plan being rejected and considered incomplete.

FRA's top priority is safety, and we will continue to do all we can to bring railroads into PTC compliance safely and efficiently. We will continue to gather implementation data from the railroads, including annual reports, surveys, plans, and requiring frequent updates on progress. These sources of information help FRA deploy staff and use taxpayer funds wisely to accurately monitor the industry's and individual railroad's progress toward compliance, and support FRA's necessary enforcement actions. Moreover, this layered approach helped FRA identify the implementation challenges described in its 2012 and 2015 reports to Congress.

In recent months, FRA has increased the amount of implementation data it is gathering from railroads and stepped up our oversight of the industry. Recognizing that most railroads will miss Congress' deadline, FRA expects that it will have to use its varied enforcement tools—from civil penalties to compliance agreements—to hold railroads accountable. With its task force and technical staff, FRA continues to ensure that it will have the information necessary to take such enforcement actions.

Upon preliminary review, DOT agrees with GAO's recommendation to continue to develop a plan to hold railroads accountable for progress toward full implementation. The Department will provide a detailed response to the recommendation within 60 days of GAO's final report issuance.

We appreciate this opportunity to offer additional perspective on the GAO draft report. Please contact Patrick Nemons, Deputy Director of Audit Relations, at (202) 366-4986 with any questions or if GAO would like to obtain additional detail about these comments.

Sincerely,

Jeff Marootian
Assistant Secretary for Administration

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Susan A. Fleming, (202) 512-2834 or Flemings@gao.gov

Staff Acknowledgments

In addition to the contact named above, Sharon Silas, Assistant Director; Amy Abramowitz; Crystal Huggins; Delwen Jones; SaraAnn Moessbauer; Madhav Panwar; Matthew Rosenberg; Geo Venegas; Maria Wallace; and Crystal Wesco made key contributions to this report.

Appendix V: Accessible Data

Accessible Text

Accessible Text for Figure 1: Basic Operation of the Interoperable Electronic Train Management System (I-ETMS)

[Illustration summary: Trains departing a rail yard or station while communicating with a satellite dish, a satellite, and a device on the ground.]

Train prepares to leave:

[Illustration: Train communicates with satellite dish on roof of a building in the rail yard via electric signal.]

The back office transmits information such as the track database, speed restrictions, and movement authorities to the locomotive onboard computer.

Train departs:

[Illustration: Train leaving the rail yard communicates with satellite dish, satellite, and a device on the ground.]

The locomotive's train management computer uses GPS positioning integrated with back office information to ensure adherence with authorized train movement.

At the same time, the I-ETMS communicates with wayside devices along the track through a radio network, checking for proper switch alignment and signal aspect information.

Traveling and automatic braking:

[Illustration: Train outside the rail yard applies brakes while being alerted to construction on the railroad ahead of the train.]

As the train moves, the computer continuously calculates a safe braking curve based on the train speed, speed limits, movement authorities, work zones, signals and switch positions. When necessary, the train crew receives a warning on the onboard computer to stop. If the locomotive engineer does not stop the train before the safe stopping distance has been reached, the I-ETMS will automatically stop the train.

Source: GAO. | GAO-15-739

Agency Comments

Department of Transportation

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Accessible Text for Appendix III: Comments from the Department of Transportation

Office of the Secretary of Transportation
Assistant Secretary for Administration
1200 New Jersey Avenue, SE
Washington. DC 20590

August 27, 2015

Susan Fleming
Director, Physical Infrastructure Issues
U.S. Government Accountability Office
441 G Street NW
Washington, DC 201548

Dear Ms. Fleming:

The Federal Railroad Administration (FRA) has provided strong oversight of the rail industry's implementation of the safety technology since passage of the Railroad Safety Improvement Act (RSIA). FRA has ramped up that oversight in recent years and months as we close in on the December 2015 deadline. When fully implemented, positive train control (PTC) will have a life- saving impact on rail transportation safety. It will also help railroads reliably and efficiently transport rising numbers of people and goods as the U.S. economy and population grow.

FRA is committed to enforcing the congressionally mandated deadline.

While railroads-and railroads alone-are responsible for implementing PTC consistent with existing law, FRA has executed multiple efforts concurrently to bring them into compliance as quick l y and efficiently as possible. The agency has dedicated significant resources to enable PTC development and implementation and assisted rai l roads with compliance of the PTC statute. As discussed with your auditors, FRA has:

Provided approximately $650 million in grants and almost $1 billion in loans to support PTC implementation. Additional Railroad Rehabilitation and Improvement Financing (RRIF) loan funds are available to applicants interested in assistance in paying for PTC implementation.

Actively supported deployment of PTC through the issuance of RSIA-mandated performance-based regulations in January 20 10, as well as additional regulations that lightened the regulatory burden, and technical assistance documents to aid railroads, manufacturers, and suppliers to achieve full PTC functionality and interoperability.

- Starting in March 20 I 0, dedicated staff to work on PTC implementation. FRA continually reevaluates personnel requirements and needs to ensure adequate resources are available to support timely implementation of PTC.
- Built a PTC system test bed at FRA's Transportation Technology Center, which is available to railroads for testing PTC technologies.
- Participated in system design and test readiness reviews, lab and field testing, and conducted preliminary reviews of the required submissions to identify regulatory noncompliance as soon as possible to minimize cost and schedule impact.
- Approved all 41 rail roads ' PTC implementation plans on time;

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- Worked directly with the Federal Communications Commission and the Advisory Council on Historic Preservation to resolve issues related to spectrum use and improve the review and approval process related to PTC communication towers and ancillary equipment.
- Provided information on specific items and the level of data quality FRA requires in order to approve safety plans and identify omissions that would result in the plan being rejected and considered incomplete.

FRA's top priority is safety, and we will continue to do all we can to bring railroads into PTC compliance safely and efficiently. We will continue to gather implementation data from the railroad s, including annual reports, surveys, plans, and requiring frequent updates on progress. These sources of information help FRA deploy staff and use taxpayer funds wisely to accurately monitor the industry's and individual railroad 's progress toward compliance, and support FRA's necessary enforcement actions. Moreover, this layered approach helped FRA identify the implementation challenges described in its 2012 and 2015 reports to Congress.

In recent months, FRA has increased the amount of implementation data it is gathering from railroads and stepped up our oversight of the industry. Recognizing that most railroads will miss Congress' deadline, FRA expects that it will have to use its varied enforcement tools-from civil penalties to compliance agreements-to hold railroads accountable. With

its task force and technical staff, FRA continues to ensure that it will have the information necessary to take such enforcement actions.

Upon preliminary review, DOT agrees with GAO's recommendation to continue to develop a plan to hold railroads accountable for progress toward full implementation. The Department will provide a detailed response to the recommendation within 60 days of GAO's final report issuance.

We appreciate this opportunity to offer additional perspective on the GAO draft report. Please contact Patrick Nemons, Deputy Director of Audit Relations, at (202) 366-4986 with any questions or if GAO would like to obtain additional detail about these comments.

Sincerely,

Signed in place of
Jeff Marootian
Assistant Secretary for Administration

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