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POSITIVE TRAIN CONTROL

Many Commuter Railroads Still Have Significant Additional Implementation Work and Opportunities Exist to Provide Federal Assistance

Statement of Susan Fleming, Director,
Physical Infrastructure

March 2018

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GAO Highlights

Highlights of GAO-18-367T, a testimony before the Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

Forty-one railroads including 29 commuter railroads are required by statute to implement PTC. Commuter railroads unable to implement a PTC system by December 31, 2018, may receive a maximum 2-year extension if they meet certain statutory criteria.

GAO was asked to review commuter railroads' PTC implementation. Among other objectives, this statement discusses (1) commuter railroads that may not be positioned to meet the PTC deadline or to qualify for an extension, and factors affecting their progress, and (2) the extent to which FRA's management and oversight approach has helped ensure that commuter railroads meet the deadline or qualify for an extension.

GAO analyzed commuter railroads' most recently available quarterly progress reports and collected information on planned implementation schedules, interviewed 19 commuter railroads—including 14 FRA identified as at-risk and 5 others further ahead with implementation—and interviewed FRA officials.

What GAO Recommends

GAO recommends FRA identify and adopt a method for systematically communicating information to railroads and use a risk-based approach to prioritize its resources and workload.

DOT concurred with the recommendations. The agency also provided technical comments, which were incorporated as appropriate.

View GAO-18-367T. For more information, contact Susan Fleming at (202) 512-2834 or flemings@gao.gov.

What GAO Found

The Federal Railroad Administration (FRA) is responsible for overseeing railroads' (including commuter railroads') implementation of positive train control (PTC) by December 31, 2018. PTC is a communications-based train control system designed to prevent certain types of accidents and involves the installation, integration, and testing of hardware and software components. For example, railroads must install equipment on locomotives and along the track, and complete field testing, including revenue service demonstration (RSD)—an advanced form of testing that occurs while trains operate in regular service.

GAO's analysis of commuter railroads' PTC scheduled milestones for two key activities necessary to meet the 2018 deadline or qualify for an RSD-based extension (one of the statutory options) found that as many as two-thirds of the 29 commuter railroads may not have allocated sufficient time to complete these milestones. Specifically, in comparing the commuter railroads' schedules to FRA's estimates of the time required to complete these milestones and the experiences of railroads that have already completed them, GAO's analysis found that from 7 to 19 commuter railroads may not complete the milestones before the 2018 implementation deadline or qualify for an RSD-based extension. For example, FRA estimates that field testing (one of the milestones) takes at least one year, but GAO found that 14 commuter railroads plan to start this testing less than a year before the 2018 deadline, increasing the potential risk that this milestone will not be completed. However, FRA has the authority to establish alternative criteria for an extension not based on RSD, and several other factors can affect commuter railroads' planned and future progress. As a result, the number of commuter railroads at risk of not meeting the deadline or qualifying for an extension could increase or decrease in the coming year.

FRA's PTC management and oversight includes monitoring commuter railroads' progress, reviewing documentation, and sharing information with them, but the agency has not systematically communicated information or used a risk-based approach to help these railroads prepare for the 2018 deadline or qualify for an extension. GAO found that FRA has primarily used informal assistance, meetings with individual railroads, and participation in industry-convened groups to share information with commuter railroads, and in some cases the information conveyed has been inconsistent according to industry representatives. Some commuter railroads also told GAO that clarification about the agency's planned process for reviewing and approving extension requests would be helpful. Federal internal control standards state that management should externally communicate the necessary quality information to achieve its objectives. While FRA officials have said they are working to identify additional ways to convey extension-related information, they have not yet done so. Moreover, although FRA receives information from commuter railroads on their progress in implementing PTC, it has not used this information to prioritize resources using a risk-based approach. With the year-end 2018 deadline approaching, and an anticipated significant increase in FRA's workload, targeting resources to the greatest risk can help better ensure that FRA effectively fulfills its oversight responsibilities and provides commuter railroads the information they need to prepare for the 2018 deadline or seek an extension.

Chairman Thune, Ranking Member Nelson, and Members of the Committee:

I am pleased to be here today to discuss our review of commuter railroads' implementation of positive train control (PTC).

In the wake of rail accidents such as the 2008 Los Angeles, California, collision between a commuter train and a freight train, resulting in 25 deaths and over 100 injuries, legislation was enacted requiring certain freight, intercity passenger, and commuter railroads[1] to implement PTC—a communications-based train control system designed to help control train movements, including braking—by December 31, 2015.[2] While the safety of the rail industry has improved in recent years, additional accidents, including the recent Amtrak derailment in Washington state in late 2017, have demonstrated the continued need for technological improvements that could help slow or stop a train to reduce the risk of certain types of accidents such as train-to-train collisions and derailments caused by exceeding safe speeds.[3] In total, 41 railroads, including 29 commuter railroads, are currently required to implement PTC. Commuter railroads provide approximately 490-million annual passenger trips over 8,440 miles of track. Their size varies significantly, from rail lines providing approximately one-million passenger trips a year to those providing over 80 million.

Our prior work on PTC implementation has found that it is a complex and lengthy process.[4] It requires the integration of various components—including communication systems, hardware on locomotives and along

[1]"Commuter rail passenger transportation" means short-haul rail passenger transportation in metropolitan and suburban areas usually having reduced fare, multiple-ride, and commuter tickets and morning and evening peak period operations. 49 U.S.C. § 24102(3).

[2]The Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, div. A, 122 Stat. 4848 (2008).

[3]While the cause of the December 18, 2017, Amtrak derailment near DuPont, Washington, is currently under investigation, the National Transportation Safety Board's (NTSB) initial review indicated that speed may have been a factor. NTSB's preliminary report indicates the final recorded speed was 78 miles per hour, while the authorized speed heading into the curve where the derailment occurred was 30 mph.

[4]GAO, *Positive Train Control: Additional Oversight Needed As Most Railroads Do Not Expect to Meet 2015 Implementation Deadline,* GAO-15-739 (Washington, D.C., Sept. 4, 2015) and GAO, *Positive Train Control: Additional Authorities Could Benefit Implementation*, GAO-13-720 (Washington D.C., Aug. 16, 2013).

the side of the track, and software in centralized office locations as well as onboard the train and along the track. In order to implement PTC, railroads must design, produce, and install more than 20 major components that will ultimately communicate trains' locations, movements, and speed, and then slow or stop a train that is not being operated safely. Many of these components are new technologies being designed and developed for PTC, and railroads must integrate them with their existing systems. Full implementation of PTC involves a number of steps, including but not limited to: equipment installation, testing, certification, and achieving interoperability. Interoperability will enable trains to move seamlessly across track owned by different railroads with potentially different PTC systems. U.S. railroads often operate their cars as "tenants" on the track of another railroad, known as the "host." The Federal Railroad Administration (FRA) is responsible for overseeing railroads' implementation of PTC.

As part of our body of work examining railroads' progress in implementing PTC, we found in September 2015 that nearly all railroads did not expect to meet the originally mandated deadline of December 31, 2015.[5] In October 2015, Congress extended the deadline to December 31, 2018, and established criteria that would enable FRA to grant railroads meeting certain requirements a further extension up to 2020.[6]

You requested that we examine commuter railroads' implementation of PTC. This statement describes the results of our review and focuses on:

- commuter railroads' progress in implementing PTC;
- how many, if any, commuter railroads may be at risk of not meeting the mandated PTC deadline or certain extension criteria, and what factors may be affecting implementation progress; and
- the extent to which FRA's management and oversight approach has helped ensure that commuter railroads either meet the deadline or qualify for an extension.

To address these objectives, we reviewed applicable laws as well as applicable FRA and PTC regulations, reports, and guidance. We also interviewed FRA officials involved in PTC monitoring, enforcement, and

[5]GAO-15-739.

[6]The Positive Train Control Enforcement and Implementation Act of 2015, Pub. L. No. 114-73, § 1302, 129 Stat. 568, 576-582 (2015), codified at 49 U.S.C. § 20157.

technical assistance. To describe commuter railroads' progress implementing PTC, we reviewed the most recent available railroad quarterly data that the 29 commuter railroads submitted to FRA that outlines installation and implementation progress in selected areas as of September 30, 2017. We assessed the reliability of the data in these reports by reviewing them for anomalies, outliers, or missing information, among other things. Based on these steps, we determined that these data were sufficiently reliable for our purposes of describing progress in PTC implementation. To identify railroads that may be at risk of not meeting the PTC deadline or qualifying for certain extension criteria, we collected additional information from all 29 commuter railroads related to their planned schedules for key implementation milestones. We then compared this information against FRA estimates for how long these milestones may take and to the experiences of commuter railroads that have already completed these milestones. To obtain perspectives on factors that may affect implementation progress and FRA's oversight approach, we interviewed representatives from 19 commuter railroads. These selected railroads include: (1) 14 railroads that according to FRA were identified in May 2017 as at risk of not meeting the 2018 full implementation deadline and not completing statutory requirements necessary to receive a deadline extension and (2) 5 other railroads that were further ahead with implementation and that varied in geographic location and size of rail system, among other factors. We also interviewed representatives from all 7 of the Class I freight railroads,[7] which are also required to implement PTC; 5 major PTC equipment suppliers and contractors identified by FRA; and 2 railroad industry associations. Information from these interviews is not generalizable to all commuter railroads or all PTC stakeholders but provide valuable insights into implementation issues. Finally, we compared FRA's management and oversight approach to federal internal control standards related to communications and risk assessment. Appendix I describes our scope and methodology in greater detail.

We conducted this performance audit from July 2017 to February 2018 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

[7]Freight railroads are classified by operating revenues. Class I railroads are those carriers having annual carrier operating revenues of $467 million or more.

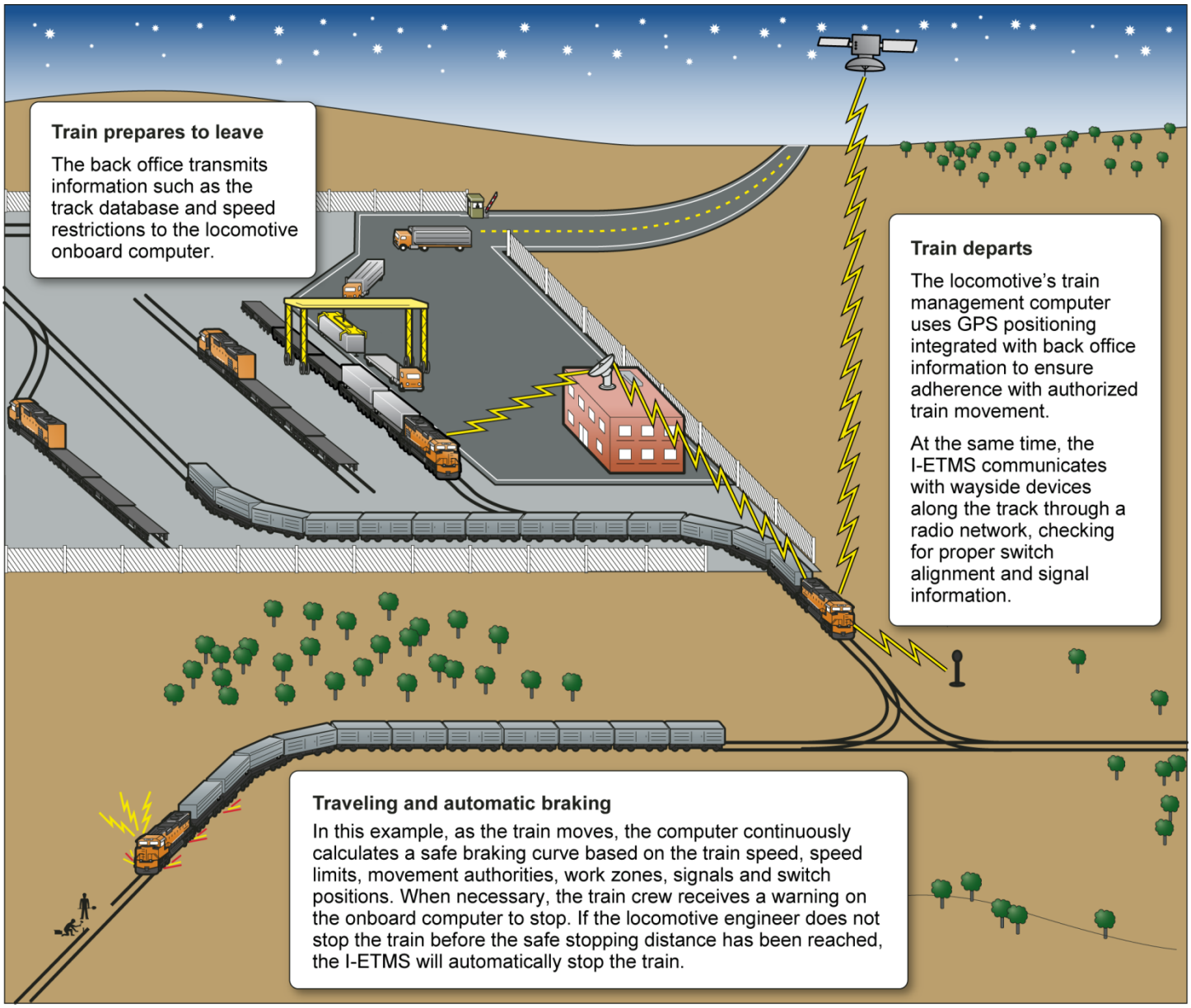
the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Under the Rail Safety Improvement Act of 2008, a PTC system must be designed to prevent train-to-train collisions, derailments due to excessive speed, incursions into work zone limits, and the movement of a train through a switch left in the wrong position. Railroads may implement any PTC system that meets these requirements, and the majority of the 29 commuter railroads are implementing one of three primary types of systems: the Interoperable Electronic Train Management System (I-ETMS), the Advanced Civil Speed Enforcement System, or Enhanced Automated Train Control (E-ATC).[8] PTC's intended safety benefits can only be achieved when all required hardware has been installed and tested, and a train is able to communicate continually and in real time with the software and equipment of its own railroad and also with that of other railroads operating on the same tracks. Real-time communication is needed to account for changing track conditions, which may, for example, include temporary speed restrictions where railroad employees are conducting track maintenance. Figure 1 illustrates how one system is intended to operate.

[8]Fifteen commuter railroads are implementing I-ETMS—the main system used by freight railroads. Six commuter railroads—located throughout the United States—are implementing E-ATC, and 5—on the Northeast Corridor between Boston and Washington, D.C.—are implementing forms of the Advanced Civil Speed Enforcement System. Two of the remaining commuter railroads are implementing different types of PTC systems, and one has yet to determine what PTC system it will implement.

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

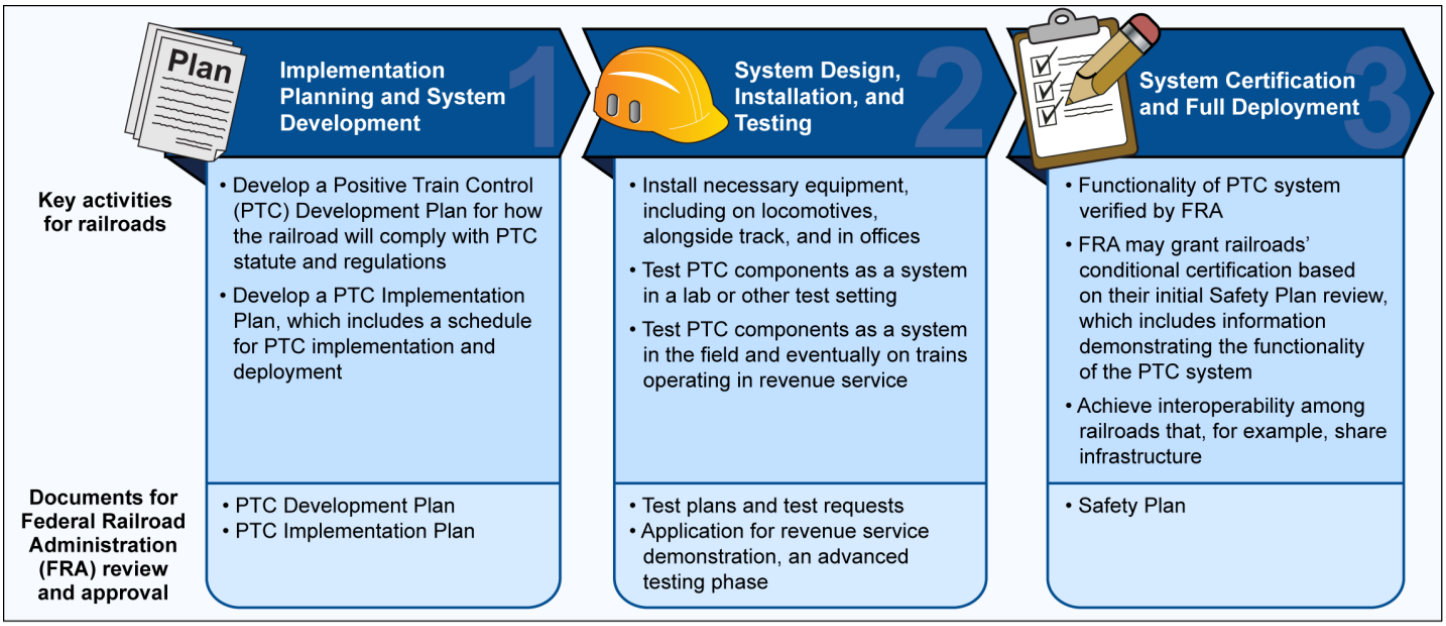


Source: GAO. | GAO-18-367T

PTC's multi-step implementation process can be grouped into three primary phases (see fig.2). Each phase involves key activities for railroads to complete—such as installing PTC equipment—as well as the

submission of key documents for FRA review and approval—such as test plans. Based on railroad data reported to FRA, most commuter railroads are currently in the second phase, which involves system design, installation, and testing. According to a recent FRA presentation, completing key activities within this phase is the near-term focus for many commuter railroads.

Figure 2: Key Activities Railroads Must Complete to Implement Positive Train Control (PTC)



Source: GAO analysis of Federal Railroad Administration information. | GAO-18-367T

According to FRA officials, railroads must complete certain implementation steps sequentially, while other activities can be worked on simultaneously; for example, railroads may work to finish installing locomotive and wayside equipment while also beginning testing on an initial track segment.[9] Furthermore, based on railroads' PTC implementation plans, the scale of implementation activities can vary by railroad, based on the size of the railroad and the number of components

[9]In this statement, we use the term locomotive generally to refer to any of the variety of vehicles, such as cab cars and electric multiple unit trains, that commuter railroads may need to equip. Wayside units, located along the side of the track, include equipment such as communication towers or poles, switch position monitors, wayside radios, wayside interface units, and base station radios.

to be installed. For example, one relatively large commuter railroad must install computer hardware on 528 locomotives and 789 wayside units along 218 route miles, while one relatively small commuter railroad's installation is limited to 17 locomotives and 35 wayside units along 32 route miles.

According to FRA, full implementation of PTC is achieved when a railroad's system is FRA-certified and interoperable, and all hardware, software, and other components have been fully installed and in operation on all route miles required to use PTC. The PTC system is required to be interoperable, meaning the locomotives of any host railroad and tenant railroad operating on the same track segment will communicate with and respond to the PTC system, including uninterrupted movements over property boundaries.[10]

In early 2016, railroads required to install PTC had to submit revised implementation plans to FRA that included a schedule and milestones for specific activities, such as installing locomotive and wayside hardware, acquiring radio spectrum (if necessary), and training employees who will have to use and operate PTC systems.[11] Railroads are required to report annually to FRA certain information on their implementation progress.[12] As part of overseeing railroads' PTC implementation, FRA established a PTC Task Force in May 2015 to track and monitor individual railroads' progress. Railroads are also required to report quarterly to FRA on the status of PTC implementation in several areas such as: locomotives equipped, employees trained, territories where revenue service

[10]*See* 49 U.S.C. § 20157. With certain exceptions, full implementation requires all controlling locomotives to be equipped with a fully operative and functioning onboard PTC apparatus, including the controlling locomotives of each host railroad and each tenant railroad operating on a PTC-equipped track segment. 49 C.F.R. § 236.1006.

[11]The Rail Safety Improvement Act of 2008 required that railroads submit an implementation plan for installing PTC by April 16, 2010. When the PTC implementation deadline was extended to 2018 under the PTC Enforcement and Implementation Act of 2015, railroads were required to submit a revised implementation plan by January 27, 2016, to outline how and when each railroad plans to achieve full PTC implementation.

[12]Each railroad is required to annually report to FRA on PTC implementation progress in areas such as spectrum acquisition, installation progress, and the total number of route miles where revenue service demonstration has been initiated or PTC is in operation. *See* 49 U.S.C. § 20157(c)(1); 49 C.F.R. § 236.1009(a)(5).

demonstration (RSD) has been initiated, and route miles in PTC operation.[13]

FRA's oversight tools include assessing civil penalties if a railroad fails to comply with legal requirements, including a railroad's failure to comply with its implementation plan.[14] FRA has a national PTC director, designated PTC specialists in the 8 FRA regions, and a few additional engineers and test monitors responsible for overseeing technical and engineering aspects of implementation and reviewing railroad submissions of documents and test requests. FRA officials told us they conduct various types of PTC-related work simultaneously, such as providing technical assistance to railroads, addressing questions, and reviewing documentation submitted by railroads. As railroads progress with testing and before completing implementation, FRA must review and approve a safety plan for each railroad and certify the PTC system.[15]

Commuter railroads that will not be able to implement a PTC system by December 31, 2018, may receive a maximum 2-year extension if they meet six criteria set forth in statute. Specifically, commuter railroads must demonstrate, to the satisfaction of the Secretary of Transportation, that they have: (1) installed all PTC system hardware; (2) acquired all necessary spectrum;[16] (3) completed required employee training; (4) included in a revised implementation plan an alternative schedule and sequence for implementing their PTC system as soon as practicable; (5) certified to FRA that they will be in full compliance with PTC requirements by the date provided in the alternative schedule and sequence; and (6) either initiated RSD on at least one territory[17] required to have operations

[13]To effectively monitor each railroad's progress implementing PTC, FRA requires the submission of quarterly progress reports under its investigative authorities. *See*, e.g., 49 U.S.C. §§ 20107, 20902, 20157(c)(2); 49 C.F.R. § 236.1009(h).

[14]49 U.S.C. § 20157(e).

[15]49 C.F.R. § 236.1015.

[16]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.

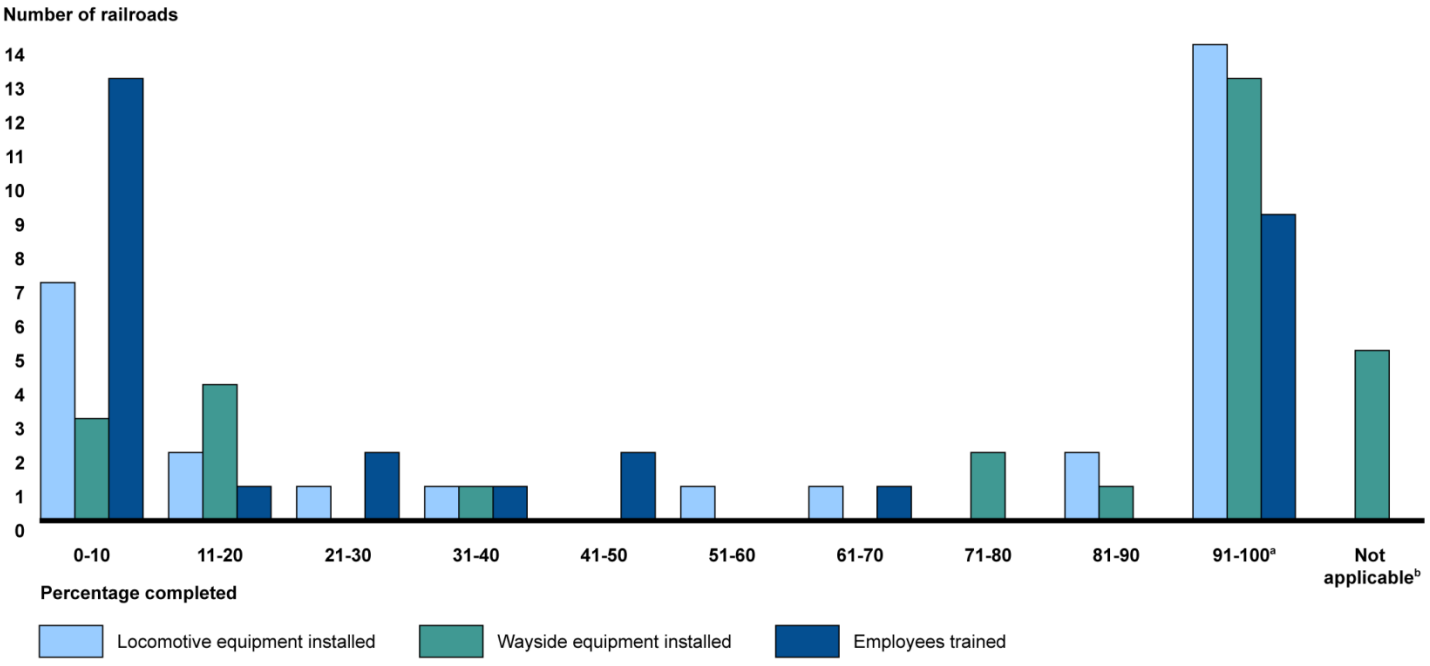
[17]FRA defines a territory as an entire installation/track segment as identified in a railroad's PTC implementation plan (*e.g.*, a track segment, territory, subdivision, district, etc.). *See, e.g.*, 49 U.S.C. § 20157(a)(3)(B)(vi); 49 C.F.R. §§ 236.1003, 236.1011(a)(5).

governed by a PTC system or "met any other criteria established by the Secretary."[18]

Progress Reported in Some Implementation Areas, but Significant Work Remains

Most of the 29 commuter railroads have reported progress in some of the key areas of PTC implementation that FRA monitors, such as locomotive and wayside equipment installation, but the amount of progress reported varies across individual railroads (see fig. 3 below).

Figure 3: Status of Commuter Railroads' Installation of Locomotive and Wayside Equipment and Training of Employees Reported as of September 30, 2017



Source: GAO analysis of commuter railroad data submitted to the Federal Railroad Administration. | GAO-18-367T

[a]Two railroads reported over 100 percent of wayside equipment installed, and three railroads reported over 100 percent of employees trained. We included these railroads in the 91-100 percent complete bin.

[b]Some commuter railroads reported that wayside installation was not applicable because they operate as a tenant railroad and that their host railroad is responsible for installing wayside equipment.

[18]These criteria are contained in 49 U.S.C. § 20157(a)(3)(B)(i)-(v), (vii).

Over half of the commuter railroads reported that they have made substantial progress in some initial implementation activities, while other railroads reported that they have made much more limited progress or have yet to begin equipment installation or employee training. For example, as of the end of September 2017:[19]

- *Locomotive Equipment Installation:* 18 commuter railroads reported 50 percent or more of their locomotive PTC equipment was installed, and of these, 13 had completed installation. In contrast, 6 railroads reported that they had not started installation of locomotive equipment.
- *Wayside Equipment Installation:* 16 commuter railroads reported 50 percent or more of their wayside PTC equipment was installed, and half of them reported that they had completed installation. In contrast, 7 reported that less than 20 percent of this equipment was installed.
- *Employee Training:* 11 commuter railroads reported completing PTC training for 50 percent or more of their employees requiring training. Of these, four reported that they had completed employee training. Thirteen commuter railroads had completed 10 percent or less of their employee training, and of these, 11 reported that they had not started training their employees. However, some commuter railroad representatives we spoke with stated that they are waiting to conduct training until their PTC system is closer to deployment. For example, representatives from one railroad told us they are waiting to conduct training so employees will be recently trained and familiar with PTC as the system is rolled out.

Notably, commuter railroads reported that they have made the most progress in obtaining spectrum, which allows PTC components to transmit information about a train's movements and location. Specifically, 15 of the 17 railroads that require spectrum reported that they have

[19]Railroads submitted quarterly implementation progress information to FRA for the period ending September 30, 2017. At the time of our review, this was the most recent information available.

obtained it.[20] The two other railroads reported that they are in discussions to obtain leased spectrum.[21]

Beyond the initial implementation activities, much work remains for the majority of commuter railroads to complete other key PTC activities that will enable them to complete implementation. PTC implementation requires many additional steps to integrate equipment and software systems that go beyond installing equipment and training employees, and the majority of commuter railroads reported that they continue to work to complete these steps, which are technically complex and time consuming. For example, as of the end of September 2017:

- *Locomotives Fully Equipped and PTC-Operable:* Fifteen commuter railroads reported that half or more of their locomotives were fully equipped and PTC-operable, meaning that all necessary onboard hardware and software is installed and commissioned, and is capable of operating over a PTC-equipped territory. Eight commuter railroads reported that none of their locomotives were fully equipped and operable.
- *Field Testing:* Thirteen railroads reported that they had begun field testing—a key implementation milestone that precedes RSD and allows railroads to assess how PTC components and software function together.[22] FRA officials said that the testing phase can be a long and difficult process, as data obtained during field testing must prove the functionality of the system and be included as part of a railroad's application to enter RSD.
- *RSD:* Following successful field testing, FRA may grant a railroad approval to enter the next level of testing, RSD. In RSD, testing is performed on trains operating PTC as part of regular operations.

[20]Twelve of the 29 commuter railroads do not require spectrum because, for example, they are implementing a PTC system that does not use spectrum or because they operate as a tenant-only railroad.

[21]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. Most commuter railroads installing the I-ETMS system have opted to lease spectrum from PTC 220 LLC.

[22]During the American Public Transportation Association's Commuter Rail Summit in summer 2017, FRA noted that railroads should, at that time, have been installing their systems as well as beginning testing, based on the agency's anticipated time frames necessary to complete the milestones necessary for an extension.

According to FRA, RSD is the final phase of testing that a railroad completes in order to validate and verify its PTC system, and the results from RSD, along with earlier testing, are to be included in the safety plan a railroad submits to FRA. While six commuter railroads reported that they have begun RSD,[23] most had not yet reached this key milestone—including some of the largest commuter railroads.

- *Conditional Certification:* Once FRA approves a railroad's safety plan, the railroad receives a PTC system certification.[24] According to FRA officials, as of September 30, 2017, only two commuter railroads were conditionally certified—meaning FRA has reviewed their safety plans and granted conditional approval for PTC operations, and the railroads are providing regular service in PTC operations—and two additional commuter railroads had submitted a safety plan for FRA review.[25]

Given the variation in commuter railroads' progress, especially related to completing later-stage PTC activities such as testing and developing safety plans, 13 of 29 commuter railroads told us they planned to seek a deadline extension, and the remaining 16 told us they do not intend to seek an extension. However, the number of commuter railroads planning to seek an extension is subject to change before the end of 2018.

[23]As of the end of September 2017, six commuter railroads reported that they had begun RSD on at least one track segment. Five of these railroads reported that all of their track segments were in RSD, while the other railroad reported that it had initiated RSD on 90 percent of its track segments.

[24]49 C.F.R. §§ 236.1009(d), 236.1015. A PTC safety plan may include, among other things, a risk assessment, a hazard mitigation analysis, and a complete description of the railroad's training plan for employees and supervisors.

[25]One of the two commuter railroads submitted its safety plan jointly with the Class III railroad that provides freight service on the line.

Over Half of Commuter Railroads May Be at Risk of Not Meeting the 2018 Deadline or Criteria for RSD-based Extension, Though Numerous Factors Create Uncertainty

Based on our analysis of the PTC schedules of the 29 commuter railroads, over half may not have sufficient time to complete activities needed to implement PTC by the end of 2018 or to qualify for an extension of that deadline by meeting criteria based on initiating RSD—for the purposes of this statement, referred to as an RSD-based extension. In particular, our analysis focused on the time likely needed for railroads to conduct RSD activities, because RSD is both the final step of field testing required by the 2018 deadline as well as one of the statutory options railroads have in seeking a deadline extension. For our analysis, we compared the amount of time railroads plan for completing two key milestones—installing the back office server and conducting field testing—to the amount of time FRA officials estimate is required for each milestone and to the experiences of railroads that have already completed RSD. However, it is important to recognize that numerous factors could affect railroads' planned and future progress. For example, commuter railroads could face delays due to unexpected issues with PTC components or FRA reviews of documents submitted by the railroads.

Over Half of Commuter Railroads May Be at Risk

In May 2017, FRA sent letters to 14 commuter railroads and their respective state departments of transportation and governors informing the recipients that they had not installed at least 50 percent of their required locomotive and wayside equipment. In these letters FRA raised concerns that these railroads were at risk of not meeting the 2018 deadline and not completing requirements for a deadline extension.[26] Subsequently, in January 2018, FRA applied a more stringent benchmark—whether a railroad had installed at least 65 percent of all equipment—and determined that 13 commuter railroads remained at risk.[27] Using this more stringent criterion, only one railroad had made enough progress installing equipment to no longer be classified as at risk by FRA.

In addition to FRA's benchmarks for equipment installation, for our analysis we evaluated more broadly railroads' progress in completing other implementation activities that follow equipment installation and that

[26]FRA used railroads' equipment installation data as of the end of calendar year 2016 to make its determinations.

[27]FRA used railroads' data as of the end of September 2017 to make determinations, and our analysis confirmed this finding.

FRA and stakeholders said are more difficult to achieve. Specifically, we analyzed commuter railroads' planned schedules for two key milestones to determine whether these railroads appear to have built sufficient time into their implementation plans to complete these and other activities by the 2018 deadline or to qualify for an RSD-based extension.[28] The two key milestones we examined, both of which need to be completed before a railroad enters RSD, were:

- installing the back office server (BOS) and associated software necessary to connect and interface with wayside, locomotive, and dispatch equipment (the BOS transmits and receives data among this equipment that enables PTC to work); and
- conducting field testing, in particular testing of installed infrastructure and initial assessments of the PTC system's overall functionality on trains that are not transporting passengers or operating during regular passenger service.

Our analysis found that at least one quarter, and potentially up to approximately two thirds, of commuter railroads may not have sufficient time to enter RSD and, thus, may not meet the 2018 PTC implementation deadline or qualify for an RSD-based extension. These railroads vary by size and type of PTC system and by whether they plan to apply for a deadline extension. Specifically, our analysis found the following:

- *Projection based on BOS status:* Between 9 and 19 commuter railroads appear to be at potential risk of not meeting the 2018 deadline or qualifying for an RSD-based extension based on our analysis. Our analysis found that the 6 commuter railroads already in RSD took an average of 10 months from installing the BOS to starting

[28]We assessed all commuter railroads against these milestones, regardless of whether a railroad planned to seek an extension. As noted above, railroads that do not plan to seek an extension have said that they will conduct RSD as the final step of required field testing, and railroads that do plan to seek an extension must by statute either initiate RSD on at least one territory or meet any other alternative criteria established by FRA. While these alternative criteria are not required to be based on RSD, we used RSD as a benchmark for our analysis based on FRA's three "alternative criteria" approvals to date; all of which have used RSD-based criteria (RSD testing on a segment of track versus RSD testing on an entire territory). According to an FRA official, it approved these three requests for alternative criteria because they were based on specific and quantifiable measures that happened to be RSD but could have been other specific, quantifiable measures.

RSD.[29] However, the schedules of 9 railroads indicate that they plan to install a BOS less than 10 months before the 2018 deadline. We believe that given past experience of other railroads, this places these 9 railroads at potential risk. Moreover, FRA officials estimate that it can take 2 to 3 years for a railroad to install and prepare the BOS and associated software to support testing and RSD. Using FRA's 2-year installation estimate (which would require BOS installation before January 1, 2017) further exacerbates the potential risk of not meeting the deadline or of not qualifying for any RSD-based extension for up to 19 railroads.

- *Projection based on time allowed to conduct field testing:* Based on our review of the planned schedules, between 7 and 14 railroads may not have built sufficient time into their plans either to complete field testing ahead of the 2018 deadline or to qualify for an RSD-based extension. Commuter railroads and FRA officials told us that field testing is challenging and can take a substantial amount of time due to, for example, unanticipated issues and limited available track for testing given regular passenger operations. On average, our analysis found that the 6 commuter railroads already in RSD took 7 months to move from starting field testing to starting RSD. However, 7 commuter railroads plan to start their field testing less than 7 months before the 2018 deadline. This situation raises concerns about their ability to conduct field testing before the 2018 deadline. Moreover, FRA officials told us that moving from the start of field testing to the start of RSD can take between 1 and 3 years, averaging about 2 years, and that most railroads under-estimate the amount of time needed for testing. When we applied the lower end of FRA's estimate, we found that it further increases the potential risk for 14 railroads that plan to start field testing less than a year prior to the 2018 deadline. As a result, they could be at risk of not meeting the 2018 deadline or qualifying for an RSD-based extension.

We used RSD as a benchmark for our analysis of key milestones based on the importance of this benchmark in implementing PTC and on the three RSD-based alternative criteria that FRA has approved to date.

[29]The 6 railroads in RSD, on which we based one of our comparisons, vary in system size and PTC implementation system, but many of these railroads are relatively small based on the number of track segments each operates. Specifically, 3 railroads have a single track segment; 1 railroad has 3 track segments, and 2 railroads have 10 or more track segments. In addition, one of these railroads is a tenant railroad and did not have to install wayside PTC equipment.

While the three approved alternative criteria all include RSD, FRA has broad authority to approve "any other" alternative criteria even if not based on RSD, as noted above. One FRA official told us the agency approved these three alternative criteria requests because they were all based on specific, quantifiable measures, rather than because they included RSD in particular. FRA officials stated that they have not issued guidance on uniform alternative criteria because they will strive for railroads to meet the criteria for a deadline extension that are listed in statute and want the discretion to make determinations on a case-by-case basis. In addition, FRA officials said they want to ensure that each railroad's criteria are consistent with the statutory requirements for final implementation by December 31, 2020. Because it is unknown what alternative criteria FRA may establish in the coming months, which may not include RSD, it is difficult to determine at this time whether the railroads we found to be potentially at risk of not qualifying for an RSD-based extension might be more or less likely to qualify for an extension based on other, non-RSD criteria.

Many Factors May Affect Commuter Railroads' Ability to Meet the Deadline or Qualify for an Extension

Much uncertainty exists regarding railroads' ultimate implementation progress and their ability to meet the 2018 deadline or qualify for an extension. This uncertainty is due, in part, to the fact that PTC is a new way of operating and involves technologies that are more complex to implement than many other railroad capital projects. Furthermore, a number of factors can affect commuter railroads' planned and future progress, including unexpected setbacks installing PTC components and resources and capacity issues. Below we highlight some of the factors that that could affect implementation progress.

Limited Industry Expertise and Resources

Three out of five PTC contractors and suppliers and about half of the commuter railroads we spoke with acknowledged that industrywide, there are a limited number of individuals with PTC technical expertise available to successfully implement the technology. This can affect the ability of railroads and contractors to meet planned schedules. For example, one large commuter railroad said it took a year and a half to hire an internal expert to continue work on its PTC project. In addition, five commuter railroads told us that they faced other issues with their prime contractors missing their milestones; such issues, going forward, could impact railroads' progress during the coming year. Also, though most railroads we spoke to are relying on contractors, some commuter railroads may lack the in-house resources and expertise to plan and oversee a project as large and complex as PTC. Representatives from three commuter railroads we interviewed noted that PTC is not a traditional capital or

construction project for a railroad; therefore, it requires additional expertise. FRA officials also stated that small commuter railroads may not have technical capacity or expertise with large contracts for such complex projects, especially given limited industry resources.

In addition to limited expertise and resources, some commuter railroads told us they faced unexpected delays in obtaining PTC equipment, such as radios, from the supplier. Some PTC equipment is only available from a single provider, which can lead to delays executing contracts and obtaining equipment. Three commuter railroads we spoke with said they encountered issues executing contracts for PTC radios, in particular negotiating unique liability requirements sought by the only supplier of this equipment, which resulted in delays or higher overall costs to the railroads. One railroad noted that executing sole-source contracts for such circumstances is particularly problematic for state and public agencies.

Interoperability and Host and Tenant Coordination

As noted above, PTC is being implemented by different types of railroads using different systems, and achieving interoperability among PTC systems can complicate implementation. For example, Northeast Corridor railroads that are implementing versions of the Advanced Civil Speed Enforcement System need interoperability with freight railroads using I-ETMS. Even railroads that are installing the same PTC system have to take significant steps to ensure that systems will communicate and interoperate properly. In one case, a railroad told us that it is equipping its locomotives with equipment for multiple PTC systems to ensure that it can operate on various host railroads' tracks.

Some commuter railroads that only operate as tenants on other railroads' tracks may be able to complete some PTC implementation work more quickly, as these railroads may benefit from work the host railroads already completed as they coordinate to implement PTC. For example, representatives from one commuter railroad we spoke with said they have to acquire and install PTC equipment on their locomotives but rely on the host railroads to install the remainder of the necessary PTC infrastructure. These tenant-only commuter railroads, however, have to coordinate field testing and RSD with the host railroads.

Schedule Changes

Unexpected issues with components or technology can also require additional time to complete certain activities, causing schedules to slip. Such issues could affect railroads currently on schedule as well as railroads pursuing aggressive schedules in an effort to overcome late starts or early setbacks. For example, representatives from 10 railroads

we spoke with said that installing the BOS and associated software, and ensuring it functions properly, can pose a challenge. One contractor told us that once the BOS is delivered to a railroad, a lot of testing work remains, and unexpected issues inevitably arise during testing, even if the BOS works according to all specifications. Representatives from one railroad said that despite strong organizational commitment to implementation and setting internal targets for progress, their PTC project schedule slipped many times over the course of implementation due to a variety of issues, including on-going software updates that caused delays while also straining the budget and burdening staff. Representatives from that commuter railroad also noted that equipping vehicles with PTC components took three times longer than originally expected (3 years instead of 1 year). However, some railroads are looking for ways to accelerate implementation. For example, representatives from one railroad said they made the difficult decision to cut some weekend passenger service to accelerate wayside equipment installation. Therefore, as representatives from one railroad articulated, given the schedule slippage experienced by railroads further along in implementation, railroads with aggressive schedules would have a limited ability to accommodate any additional delays.

FRA's Resources and Capacity

As the 2018 deadline approaches and railroads progress with implementation activities, the amount of documentation railroads will submit to FRA for review and approval is likely to increase significantly. For example, FRA reported in summer 2017 that it had taken between 10 and 100 days to review each of the test requests it received from railroads. As the 2018 deadline approaches, FRA will have to review a considerable amount of additional test plans and procedures as well as applications to begin RSD. In addition, FRA will have to concurrently review any safety plans that are submitted by railroads reaching the certification phase. At the American Public Transportation Association's (APTA) Commuter Railroad Summit in June 2017, FRA officials said that they expect each safety plan review—which involves all the regional specialists and some contract personnel—to take between 6 and 12 months to review. These plans are about 5,000 pages in length. FRA officials told us that reviewing all of the safety plans in a timely manner will be a challenge given staff resources. FRA has 12 technical staff dedicated to the review of railroads' PTC documentation and monitoring of PTC testing. Representatives from 10 out of 19 commuter railroads we interviewed said they are concerned about FRA's ability to review submitted documentation in a timely manner.

Lessons Learned

As railroads continue to progress with their projects and the industry becomes more experienced with PTC, railroads could benefit from lessons learned. For example, representatives from one railroad that is implementing I-ETMS, the system all large Class I freight railroads are implementing, told us that they anticipate being able to capitalize on lessons learned from freight railroads that have operated in RSD. By leveraging the freight railroads' experiences, one commuter railroad hopes to address issues before testing, rather than during, and therefore move more quickly through the testing process. If commuter railroads are able to apply lessons learned from other railroads' testing processes, then they may be able to accelerate their implementation efforts. Railroads may also accelerate implementation schedules as they become more adept at the overall testing process, which involves submitting test documents to FRA and scheduling multiple tests. This could potentially shorten the average time it takes a railroad to complete one or more of the key milestones analyzed. The two commuter railroads that have been conditionally certified told us they have met with other commuter railroads informally and have shared their project experiences as a way to facilitate information sharing.

FRA Monitors Railroads' Progress but Has Not Systematically Communicated with Them or Prioritized Efforts

FRA Monitors Railroads' Implementation Progress, Reviews Documents, and Shares PTC Information

Since 2015, FRA has assumed additional roles and responsibilities—primarily through the PTC Task Force and regional PTC specialists—to monitor railroads' implementation progress, review required documentation, and share information about implementation steps and activities.

- *Monitoring and Document Review:* In response to a recommendation in our September 2015 report, FRA began to identify and collect

additional information from the railroads to enable it to effectively track and monitor railroads' PTC progress.[30] For example, in 2016, the PTC Task Force began collecting quarterly progress data and monitoring railroads' annual reports to track progress in meeting the PTC implementation milestones set out in railroads' implementation plans, such as locomotive equipment installed at the end of the year.[31] As previously noted, the Task Force used this implementation progress data in May 2017 to identify 14 commuter railroads at risk of not meeting the 2018 deadline or requirements for an extension. FRA also monitors railroads' PTC implementation through meetings with railroad and industry associations, visits to individual railroads, and reviewing and commenting on PTC documentation submissions, such as requests to begin field testing and RSD. FRA officials told us that they monitor railroads' progress to determine how much commuter railroads understand about the implementation process and to trigger discussions between FRA and the railroads. Regional PTC specialists are responsible for reviewing and approving requests submitted by railroads preparing to test system functionality as well as individual testing procedures describing the specific equipment and movements involved in each test.[32] In addition, FRA officials told us that assessing civil penalties and sending commuter railroads letters of concern are the primary enforcement mechanisms they have available to oversee PTC.[33]

- *Information Sharing:* FRA officials said that they have primarily used informal assistance and participation in group meetings to convey information related to the implementation process and specific milestones necessary to meet the 2018 deadline or qualify for an extension. FRA officials acknowledged that they do not have the capacity to provide frequent one-on-one assistance to all railroads

[30]GAO-15-739.

[31]The PTC Task Force is comprised of FRA data analysts and subject matter experts responsible for PTC administrative and programmatic support, including collecting and tracking railroads' PTC data, managing documentation, and corresponding with railroads.

[32]Railroads submit certain information to FRA before beginning field testing for a PTC system, such as the date and location for the proposed testing, the planned test procedures, and other information for FRA's review and approval.

[33]To date, FRA has initiated enforcement actions against 10 commuter railroads for either failure to complete one or more hardware-installation milestones that a railroad scheduled to complete during calendar year 2016, or for the failure to submit a timely annual PTC progress report to FRA by the statutory deadline. Thus far, 8 commuter railroads have paid or have agreed to pay civil penalties up to $12,000.

given their growing PTC workload and limited agency resources. As such, FRA officials explained that in order to reach a wide audience given the approaching deadline, their current focus is on presentations at industry group meetings (e.g., APTA's Commuter Rail Summit) and specific PTC systems user-group meetings. FRA's regional PTC specialists told us they also provide direction on technical aspects of PTC implementation and testing, primarily by discussing issues at individual and railroad-industry meetings and providing informal feedback on commuter railroads' PTC documentation, such as testing requests.

FRA Has Not Systematically Communicated Information to Help Railroads Prepare for the 2018 Deadline or to Qualify for Extensions

While the majority of the railroad representatives we met with said FRA officials were consistently available to discuss issues that arise during day-to-day PTC implementation activities, the information conveyed by these officials has sometimes been inconsistent. In particular, FRA's heavy reliance on informal assistance and participation in group meetings to convey information to commuter railroads has led, at least on some occasions, to different or inconsistent information being communicated in different meetings. For example, representatives from one PTC equipment supplier said that FRA has not consistently commented on different railroads' test plans, and as a result, they have not been able to carry lessons learned on to other railroads' plans. In addition, while FRA's officials said their position has been consistent with the regulations stating that the host railroad must submit a safety plan to FRA, representatives from one railroad we met with said they had heard conflicting information from FRA. For example, these railroad representatives told us that FRA officials originally said commuter railroads that are only tenants on other railroads needed to submit their own safety plans but later stated at an industry association meeting that tenant railroads could be included in the host railroads' plans.

In addition, commuter railroads have expressed a need for additional clarification about the criteria for applying for an extension. FRA officials also told us that they have received a lot of questions from commuter railroads about the criteria for an extension related to RSD or other alternative criteria. As noted above, to date, FRA has approved alternative extension criteria for three railroads, and in each case, the

criteria involved RSD testing on a shorter track segment.[34] However, representatives from one contractor working with several commuter railroads said it is unclear what "alternative criteria" FRA will approve to receive an extension. In addition, representatives from one commuter railroad stated that any opportunity to clearly outline FRA's interpretation of the PTC requirements, specifically the alternative extension criteria that could, for example, allow for a shorter test segment, would enable railroads to better position themselves to apply for an extension.

Representatives from some commuter railroads we met with were likewise unclear about the agency's approach to reviewing and granting extension requests. Representatives from three commuter railroads said clarification of FRA's planned approach would be helpful as the deadline approaches. According to FRA officials, the statute does not set a deadline by which railroads have to apply for an extension, and FRA has not set a deadline or indicated the latest date by which a railroad should apply. Nonetheless, for railroads that do not comply with PTC deadlines, FRA officials said they could impose civil penalties for each day a railroad fails to implement a PTC system by the applicable statutory deadline, but the agency has yet to determine how it will handle railroads that do not meet the deadline or receive an extension. With less than a year remaining before the 2018 deadline, FRA officials stated that they anticipate their workload is likely to increase as railroads submit additional documentation to review and continue to progress with testing.[35] More systematic communication that delineates FRA's planned approach for the upcoming deadline and extension process may be critical for the agency to efficiently use its limited resources and convey consistent information to all the railroads.

Standards for internal control in the federal government state that management should externally communicate the quality information necessary to achieve the entity's objectives. These standards also note

[34]FRA officials said that to date, they have directed railroads with questions about qualifying for extensions to review the statutory criteria as well as the alternative criteria the agency has approved to date. An FRA official told us these approvals were based on the railroads' proposing specific, quantifiable alternative criteria, regardless of whether those involved RSD.

[35]In addition, FRA officials said they had begun exploring options to validate the information railroads will submit to demonstrate they have met the statutory requirements for installing PTC equipment to qualify for an extension as the 2018 deadline approaches, but the officials have yet to finalize an approach to verify railroads' information.

that management should select the appropriate form and method of communication, so that information is communicated widely and on a timely basis.[36] As we have previously found, the particular form of the agency's communication—for example, by oral presentation, written guidance, or formal regulation—will depend on multiple factors including the purpose and content of the specific communication and applicable legal requirements.[37] Moreover, internal control standards indicate agencies should have standard processes in place to determine which form of communication is appropriate in each case.[38] FRA officials told us that the agency could issue written guidance explaining how it has decided to apply its deadline extension authority and what type of information railroads will then need to submit to get an extension. However, FRA officials stated this written guidance would require time-consuming approval by the Office of Management and Budget under the Paperwork Reduction Act, and would make timely issuance of such guidance difficult. As noted, however, FRA may have the option to use less formal, less time-consuming methods of communicating key information about the extension process, such as webinars or conference calls, to communicate information more systematically. FRA officials acknowledged they are working to identify mechanisms such as these, but they have yet to do so. Absent systematic communication articulating the agency's planned approach for the extension process, railroads may not have the information they need to effectively prepare for the deadline or seek an extension.

FRA Has Made Limited Use of Implementation Progress to Prioritize Efforts and Mitigate Risks

While FRA has taken steps to more closely monitor railroads' implementation progress, the agency has not prioritized its efforts, including its allocation of resources, based on an assessment of risk. In its 2015 Railroad Accountability Plan, FRA stated that its PTC data collection and monitoring efforts would allow the agency to inform, among other things, its resource allocation and risk mitigation.[39] While FRA has

[36]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-704G (Washington, D.C.: Sept. 2014).

[37]GAO, *Regulatory Guidance Processes: Selected Departments Could Strengthen Internal Control and Dissemination Practices*, GAO-15-368 (Washington, D.C.: Apr. 16, 2015).

[38]GAO-14-704G; GAO-15-368.

[39]FRA developed this plan as an internal document in response to recommendations in GAO-15-739.

used its data to identify at-risk railroads, it has not used this information to prioritize how to allocate its resources or address risks. For example, as discussed earlier after reviewing railroads' data on their progress in installing PTC equipment, FRA notified 14 commuter railroads of their at-risk status in May 2017. However, while FRA officials said that they hold regular meetings with many—but not all—of the at-risk railroads, 9 of these 14 commuter railroads said that the formal letter they received did not ultimately trigger any change in the type of interaction they have with FRA. More recently, in December 2017, the Secretary of Transportation notified all railroads required to implement PTC by letter of the expectation that all possible measures be taken to ensure implementation requirements are met by the 2018 deadline. However, these letters made no distinction between railroads—that is, the same letter was sent to railroads with conditionally certified PTC systems and to railroads that reported completing no training or installing no locomotive equipment to date—nor did the letters describe how FRA's approach to working with the railroads would respond to their particular circumstances and risks.

As noted above, FRA officials have stated that the agency does not have the resources to meet more frequently with or provide additional assistance to railroads. While the PTC Task Force helps monitor railroads' progress, FRA still employs fewer than 12 individuals with the requisite PTC expertise and experience to review technical documents and help railroads implement PTC systems.[40] In an environment with limited agency resources, targeting agency efforts to areas of the greatest risk or highest priority areas is one way to leverage existing resources. According to standards for internal control in the federal government, management should identify, analyze, and respond to risks. In addition, FRA's *Strategic Human Capital Plan* states that developments including the rapid introduction of new technologies, such as PTC, demand that FRA continuously evaluate its programs and resources to adapt to changing demands.

However, FRA has not fully leveraged the implementation progress data that railroads' submit to the agency to identify and develop a risk-based approach to prioritize agency actions. At present, it is unclear whether the agency's priorities are, for example, to help the largest commuter railroads meet the deadline or extension requirements, push those

[40]According to FRA officials, the technical and programmatic staff and contractors supporting PTC implementation have recently expanded, and a procurement is underway for additional contractors to support PTC safety plan reviews.

railroads that are very close to full implementation, or assist railroads that are in the earliest stages of their PTC project. For example, one regional PTC specialist we met with said that if he did not need to be reviewing documentation or observing railroads' field testing, he could spend more time with at-risk railroads. By not effectively targeting actions to help mitigate risks posed by railroads most at risk of not meeting the PTC deadline or qualifying for an extension, FRA misses the opportunity to leverage its limited resources by providing direct assistance in the areas of greatest need.

Conclusions

Much progress has been made in implementing PTC by commuter railroads. Nevertheless, about half of commuter railroads plan to apply for an extension, and many of the railroads' planned schedules raise questions about their ability to complete key implementation milestones and qualify for RSD-based extensions prior to the 2018 deadline. As the 2018 deadline rapidly approaches, the need for clear information that is systematically communicated to all railroads implementing PTC becomes even more critical. FRA cannot expect to provide information and guidance to railroads individually, and therefore, adopting a risk-based communication strategy could help it more efficiently share information in the coming year. Moreover, the information FRA collects on railroads' progress has not been used to inform the agency's resource allocation decisions. Using this information to better allocate resources could help position FRA to better meet its responsibility to monitor and oversee PTC implementation in the future.

Recommendations for Executive Action

We are making the following two recommendations to FRA:

- The Administrator of FRA should identify and adopt a method for systematically communicating information to railroads regarding the deadline extension criteria and process. (Recommendation 1)
- The Administrator of FRA should develop an approach to use the information gathered to prioritize the allocation of resources to address the greatest risk. (Recommendation 2)

Agency Comments

We provided a draft of this statement to DOT for review and comment. In its comments, reproduced in appendix II, the agency concurred with our recommendations. DOT also provided technical comments, which we incorporated as appropriate.

Chairman Thune, Ranking Member Nelson, and Members of the Committee, this completes my prepared statement. I would be pleased to respond to any questions that you may have at this time.

GAO Contact and Staff Acknowledgments

If you or your staff have any questions about this testimony, please contact Susan Fleming, Director, Physical Infrastructure team 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 statement. GAO staff who made key contributions to this testimony are Susan Zimmerman (Assistant Director), Sarah Arnett, Jim Geibel, Delwen Jones, Joanie Lofgren, SaraAnn Moessbauer, Malika Rice, Amy Suntoke, Maria Wallace, Eric Warren, and Crystal Wesco.

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Appendix I: Objectives, Scope, and Methodology

This statement examines commuter railroads' implementation of positive train control (PTC). Specifically, this report addresses:

- commuter railroads' progress in implementing PTC;
- how many, if any, commuter railroads may be at risk of not meeting the mandated PTC deadline or certain extension criteria, and what factors may be affecting implementation progress; and
- the extent to which FRA's management and oversight approach has helped ensure that commuter railroads either meet the deadline or qualify for an extension.

To address these objectives, we reviewed the Rail Safety Improvement Act of 2008, the Positive Train Control Enforcement and Implementation Act of 2015, and applicable Federal Railroad Administration (FRA) regulations, reports, and guidance. Our review focused on the 29 railroads FRA officials identified as commuter railroads required to implement PTC.[1] We also reviewed previous GAO work on PTC[2] and applied *Standards for Internal Control in the Federal Government* to FRA's role overseeing PTC implementation, including the principles that management should externally communicate the necessary quality information to achieve the entity's objectives and that management should identify, analyze, and respond to risks.[3] In addition, we interviewed representatives from 19 commuter railroads to further understand their implementation progress, factors that may be affecting progress, and the interviewees' perspectives on FRA's management and oversight of PTC implementation. We selected the 19 railroads to include the 14 railroads that according to FRA were identified in May 2017 as at risk of both not meeting the 2018 implementation deadline and not completing statutory requirements necessary to receive a deadline extension, as well as 5

[1]Representatives of one of these railroads consider themselves to be an intercity passenger railroad, but we included them in our review because FRA tracks and monitors their progress among the commuter railroads required to implement PTC.

[2]GAO, *Positive Train Control: Additional Oversight Needed As Most Railroads Do Not Expect to Meet 2015 Implementation Deadline,* GAO-15-739 (Washington, D.C.: Sept. 4, 2015), and GAO, *Positive Train Control: Additional Authorities Could Benefit Implementation*, GAO-13-720 (Washington, D.C.: Aug. 16, 2013).

[3]GAO, *Standards for Internal Control in the Federal Government,* GAO-14-704G (Washington, D.C.: Sept. 2014).

other railroads that were further ahead with implementation and that varied in geographic location and size of rail system, among other factors.

We met with relevant FRA officials involved in PTC monitoring, enforcement, and technical assistance including the PTC Staff Director, regional PTC specialists working in each of the FRA regions where commuter railroads selected for interviews operate, and members of the headquarters-based PTC Task Force. In addition, we met with FRA Office of Railroad Safety specialists and engineers, among others. We also interviewed representatives from all 7 of the Class I freight railroads (which are also required to implement PTC), 5 major PTC equipment suppliers and contractors identified by FRA, and representatives from 2 railroad industry associations—the Association of American Railroads and the American Public Transportation Association—to obtain their perspectives on commuter railroads' implementation of PTC, factors affecting implementation progress, and FRA's PTC management and oversight.[4]

To identify commuter railroads' progress in implementing PTC, we reviewed railroads' third quarter progress reports submitted to FRA for the period ending September 30, 2017.[5] We reviewed the most recently available quarterly data outlining the 29 commuter railroads' installation and implementation progress in selected areas as of September 30, 2017, including: locomotive equipment installed, wayside equipment installed, employee training, locomotives fully equipped and PTC-operable, spectrum obtained, the status of field testing, and revenue service initiated. As necessary, we also reviewed the narrative fields in the quarterly reports for additional context related to a given railroad's implementation activities and the extent of progress made in specific implementation areas. We assessed the data in these reports by reviewing it for anomalies, outliers, or missing information, and reviewing supporting narratives to ensure they aligned with the reported data,

[4]Freight railroads are classified by operating revenues. Class I railroads are those carriers having annual carrier operating revenues of $467 million or more. We interviewed all 7 Class I railroads operating in the U.S.: BNSF Railway, CSX Corporation, Kansas City Southern, Norfolk Southern, Union Pacific, Canadian National, and Canadian Pacific. We met with the following PTC contractors and suppliers: Ansaldo-STS, Alstom, Parsons, Siemens, and Wabtec.

[5]The quarterly reports describe commuter railroads' installation and implementation progress from July 1 to September 30, 2017, and were due to FRA on October 31, 2017. In two cases, the quarterly reports include data from both the tenant and host railroad.

among other things. Based on these steps, we determined that these data were sufficiently reliable for our purpose of describing railroads' progress implementing PTC. We also reviewed other sources of information, such as PTC Implementation Plans, railroads' 2016 annual progress reports, and interviews with railroad representatives.

To assess progress on locomotive equipment installation and wayside equipment installation, we compared the quantities installed to the total quantities required for PTC implementation. Similarly, to assess progress on employee training, we compared the number of employees trained to the number of employees required to be trained for PTC implementation. To assess progress in fully equipping locomotives to be PTC-operable, we compared the quantity of locomotives that are fully equipped and PTC-operable to the quantity required for PTC implementation. To assess progress on obtaining spectrum, we reviewed the quarterly update on spectrum. We concluded that a railroad had obtained spectrum if, for one or more area or location, it reported that spectrum was either (1) acquired but not available for use or (2) acquired and available for use. We also reviewed the narrative, as appropriate. For some railroads, we concluded that spectrum was not applicable because they use a PTC system that does not require spectrum, or because their host railroad is responsible for obtaining spectrum. To assess progress on field testing, we reviewed the third quarter status on installation and track-segment progress. We concluded that a railroad initiated field testing if one or more of its segments were reported as (1) testing or (2) operational/complete. To determine which railroads initiated revenue service demonstration (RSD), we reviewed the cumulative territories where RSD had been initiated. If the railroad reported that one or more territories had initiated RSD, we concluded that RSD had been initiated.[6]

Finally, to determine which railroads anticipate completing implementation before the December 31, 2018 deadline and which plan to seek any RSD-based extension, we obtained information from all 29 commuter railroads to identify which railroads plan to implement PTC by the 2018 deadline and which plan to submit an alternative schedule (that is, a request for an extension) to implement PTC after the December 31, 2018 deadline.

[6]For two railroads which used outdated quarterly report forms, we concluded that RSD was initiated if one or more route miles were in testing or revenue service demonstration.

To identify commuter railroads at risk of meeting neither the PTC deadline nor any RSD-based extension criteria, we first reviewed data on railroads' progress installing PTC locomotive and wayside equipment. We did this because FRA used such installation progress to identify 14 commuter railroads as being at risk and notified them via formal letter in May 2017.[7] To confirm FRA's identification of commuter railroads that would be at risk based on an updated benchmark for the third quarter of 2017—railroads with less than 65 percent of total hardware installed—we analyzed railroads' reported locomotive and wayside equipment installation status as of September 30, 2017 to determine the percentage of total hardware installed for each commuter railroad.

To build on this analysis, we collected information from all 29 commuter railroads on their actual and planned schedules for key implementation milestones. For the 19 commuter railroads we met with, we collected this information as part of our interviews, and for the remaining 10 commuter railroads, we collected this information by email using a standard data collection instrument. The key implementation milestones covered procuring a prime contractor for PTC implementation; applying for and entering field testing and RSD, which is the final phase of field testing; installing the back office server (BOS) and associated software; and completing PTC implementation. This schedule information was collected between September 2017 and January 2018.

We compared the amount of time commuter railroads' planned for completing two key milestones to the amount of time that FRA officials estimate is required for each milestone and to the experiences of railroads that already initiated RSD. The two milestones are as follows:

- Install the BOS and associated software necessary to connect and interface with wayside, locomotive, and dispatch equipment.
- Conduct field testing of installed infrastructure, which is an initial assessment of the PTC system's overall functionality on trains that are not transporting passengers or operating during regular passenger service.

We selected these two milestones because (1) each milestone follows equipment installation (which FRA had previously analyzed to assess

[7]FRA identified 14 commuter railroads that, as of December 31, 2016, had installed less than 50 percent of all PTC system hardware required for the railroads' PTC system, as specified in its revised PTC Implementation Plan.

commuter railroads PTC implementation progress); (2) a railroad must complete both to enter RSD; and (3) several interviewees, including PTC contractors and suppliers and FRA officials, said these activities are important project milestones that are complex and time consuming. We calculated the amount of time a commuter railroad planned for each milestone (with initiating RSD as the endpoint for each milestone), and compared that amount of time to two benchmarks:[8] first, the anticipated length of time FRA officials said that the milestones have taken or may take, and second, the average amount of time (in months) that each milestone took the six commuter railroads that had started RSD as of September 2017. Since we used two benchmarks, we present a range of railroads that may not have sufficient time to complete these milestones and thus may be at risk of not meeting the 2018 deadline or qualifying for an RSD-based extension.[9]

[8]We assessed all commuter railroads against these milestones, regardless of whether a railroad planned to seek an extension. Railroads that do not plan to seek an extension have said that they will conduct RSD as the final step of required field testing, making it a meaningful milestone, and railroads that do plan to seek an extension must by statute either initiate RSD on at least one territory or meet any other alternative criteria established by FRA. While these alternative criteria are not required to be based on RSD, we used RSD as a benchmark for our analysis based FRA's three "alternative criteria" approvals to date; all of which have used RSD-based criteria (RSD testing on a segment of track versus RSD testing on an entire territory). According to an FRA official, it approved these three extensions because they were based on alternative, specific, and quantifiable measures which happened to be RSD but could have been other specific, quantifiable measures.

[9]Two commuter railroads were seeking waivers or exemptions for PTC, and neither railroad was able to share planned schedule information for the milestones. Therefore, we included these two railroads in our count of railroads that may be at risk for both milestones, as FRA had not yet decided whether to approve either railroad's request. In addition, two other commuter railroads that operate only as tenants on other railroads' tracks were using the host railroads BOS. Since these railroads lacked a date for installing a BOS, we could not calculate the amount of time each planned for this milestone. One of these railroads is operating PTC in RSD, so we did not categorize it as at risk. The other railroad had begun functional testing, so we categorized this railroad as at risk based for the more stringent comparison.

Appendix II: Agency Comments

U.S. Department of Transportation
Office of the Secretary of Transportation

Assistant Secretary for Administration

1200 New Jersey Avenue SE
Washington, DC 20590

Susan A. Fleming
Director, Physical Infrastructure Issues
U.S. Government Accountability Office (GAO)
441 G Street NW
Washington, DC 20548

FEB 20 2018

Dear Ms. Fleming:

The Federal Railroad Administration (FRA) is committed to actively overseeing the progress of each railroad implementing a positive train control (PTC) system until all railroads have fully implemented an FRA-certified and interoperable PTC system on all required route miles. In addition, we will continue to perform the oversight duties required by Congress and use our oversight role and available technical resources, to the greatest extent possible, to help railroads prepare for the 2018 deadline or qualify for an extension. During calendar year 2018, FRA will also strategically increase its oversight actions and technical assistance to accelerate at-risk railroads' implementation of PTC systems. Examples of these actions include the following:

- Beginning in December 2017 and continuing in calendar year 2018, FRA leadership has met with the executive leadership and technical teams of each of the 41 railroads subject to the statutory mandate to help ensure railroads understand the statutory requirements and deadlines, to discuss the challenges the railroads continue to experience, and the railroads' precise plans for compliance with the statutory mandate.

- FRA will use the information it continues to learn in these 41 meetings and railroads' Quarterly PTC Progress Reports for Quarter 1 of 2018 to support its risk-based strategy for oversight in the remainder of 2018 and beyond. We will continue to provide technical assistance throughout railroads' PTC system installation, testing, and operation.

Upon review of the GAO's draft report, we concur with both recommendations and have already taken steps, as noted above, to identify and adopt a method for systematically communicating information to railroads and use a risk-based approach to prioritize our resources and workload. We will provide a detailed response to each recommendation within 60 days of the final report's issuance.

We appreciate the opportunity to respond to GAO's draft report. Please contact Madeline M. Chulumovich, Director, Audit Relations and Program Improvement, at (202) 366-6512 with any questions or if you would like to obtain additional details.

Sincerely,

Keith Nelson
Assistant Secretary for Administration