

TESTIMONY OF
JEFFREY D. KNUEPPEL, P.E.
GENERAL MANAGER
SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY (SEPTA)
ON BEHALF OF THE
AMERICAN PUBLIC TRANSPORTATION ASSOCIATION (APTA)
BEFORE THE
SUBCOMMITTEE ON RAILROADS, PIPELINES, AND HAZARDOUS MATERIALS
OF THE
HOUSE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
ON
“THE STATE OF POSITIVE TRAIN CONTROL IMPLEMENTATION
IN THE UNITED STATES”

SEPTEMBER 13, 2018

SUBMITTED BY
American Public Transportation Association
1300 I Street NW, Suite 1200 East
Washington, DC 20005
202.496.4800



The American Public Transportation Association is a non-profit international association of more than 1,500 public- and private-sector member organizations, including public transit systems and high-speed, intercity, and commuter rail passenger operators; planning, design, construction, and finance firms; product and service providers; academic institutions, transit associations and state departments of transportation. APTA members serve the public interest by providing safe, efficient, and economical transit services and products.

Introduction

Chairman Denham, Ranking Member Capuano, and Members of the Subcommittee on Railroads, Pipelines, and Hazardous Materials, on behalf of the American Public Transportation Association (APTA) and its more than 1,500 public- and private-sector member organizations, thank you for the opportunity to testify on the state of positive train control (PTC) implementation in the United States.

My name is Jeffrey D. Knueppel, P.E., and I am the General Manager of the Southeastern Pennsylvania Transportation Authority (SEPTA). SEPTA is the nation's six largest transit system, with more than 9,000 employees. We provide more than 1.1 million daily passenger trips through an extensive network of fixed-route services including bus, subway, trolley, and Regional Rail, as well as ADA paratransit and shared ride services that serve Philadelphia, Bucks, Chester, and Montgomery Counties in Pennsylvania. SEPTA's commuter rail system (Regional Rail) is a network of 13 rail lines with 155 stations that provides service to and from Center City Philadelphia and the rest of southeastern Pennsylvania, as well as service into New Jersey and Delaware. We operate 770 weekday trains and serve more than 34 million riders each year, and Regional Rail ridership has increased by more than 50 percent over the last 20 years. I also serve as Chair of APTA's Commuter Rail PTC Subcommittee.

As we sadly recognize the 10th anniversary of the tragic Chatsworth accident this week, I want to begin by reiterating APTA's and the commuter rail industry's long-standing and unwavering commitment to implementing positive train control.

I am pleased to be working with APTA and representing the industry in this important effort. Since APTA last testified before this Subcommittee in February, the nation's commuter railroads have continued to make strong and continuous progress in installing and implementing positive train control. This progress is reflected in the Federal Railroad Administration's (FRA) recently released second quarter PTC Progress report, including reducing by two the number of commuter railroads on FRA's list of at-risk railroads.

The commuter rail industry has been working continuously with freight partners, third-party contractors, Amtrak, and FRA to implement PTC and address and correct technical and interoperability challenges. APTA has also provided a number of forums for collaboration and the sharing of best practices and lessons learned, including the PTC Subcommittee, which has been particularly helpful in providing a cohesive push as the industry works toward a common goal—implementing PTC and making an already safe system even safer.

We greatly appreciate the Subcommittee's focused attention on the critical issues of rail safety and PTC, and the challenges and successes that publicly-funded commuter railroads have experienced in procuring, installing, and implementing this complex signaling and communications technology.

Safety is Our First Priority

For commuter rail operators and the entire public transportation industry, safety is our first priority. Safety is not simply a value we share; it is a core operating principle and a promise to our riders. The men and women responsible for managing and operating public transportation systems are fully committed to the safety of their systems, passengers, employees, and the general public.

Moreover, throughout our 136-year history, APTA and its predecessor associations have been leading advocates for safety improvements. As APTA President and CEO Paul Skoutelas outlined in his testimony before the Subcommittee in February, APTA and its members have led the way in creating an effective safety culture over many decades:

- creating a Rail Safety Audit Program;
- developing Safety Management Program Plans; and
- writing more than 270 standards and recommended practices for public transit, including Passenger Rail Equipment Safety Standards (PRESS) for commuter rail cars.

APTA's PRESS standards help improve the safety of public transportation systems by specifying safety requirements for vehicle crashworthiness, passenger door systems, emergency lighting and evacuation, and new benchmarks to improve the safety of vehicle interiors including seat attachment strength and workstation tables.

With regard to positive train control, APTA publicly supported the concept of PTC prior to enactment of the Rail Safety Improvement Act of 2008 (RSIA), and we advised Members of Congress and other policymakers of the need for proven technology, adequate resources, and the expanded radio spectrum necessary to put PTC into operation. Since enactment of RSIA, APTA has actively worked to assist the commuter rail industry with PTC research, development, installation, and implementation, including by participating in FRA's Rail Safety Advisory Committee (RSAC); establishing "user groups" among different types of commuter rail operators to share information and encourage coordinated actions; and conducting PTC conferences, workshops, and summits with commuter rail Chief Executive Officers, senior engineering staff, FRA senior staff, and Congressional staff.

As a result of this overriding and sustained commitment to safety, today, public transit is the safest form of surface transportation. Every year, 30 commuter railroads across America safely carry passengers on more than 500 million trips. And traveling by commuter and intercity passenger rail is 18 times safer than traveling by car.

Positive Train Control Mandate

Moreover, we are working to make commuter rail even safer by installing and implementing PTC, a complex signaling and communications technology that provides a critical safety overlay on top of already safe commuter rail systems.

In 2015, Congress recognized the implementation challenges that the Government Accountability Office had outlined since RSIA implementing regulations went into effect. In enacting the Positive Train Control Enforcement and Implementation Act of 2015, Congress identified specific installation and implementation milestones. Under current law (49 U.S.C. 20157), commuter railroads are required to implement PTC by December 31, 2018, or, alternatively, to meet the following milestones (as defined in 49 U.S.C. 20157(a)(3)(B)) by that date:

- Installed all PTC hardware (wayside and onboard equipment);
- Acquired all necessary spectrum for PTC implementation;
- Completed all employee training required under the applicable PTC system regulations;
- Initiated revenue service demonstration (RSD) on at least one territory subject to the PTC requirement (or other criteria); and
- Submitted a plan, schedule, and certification to the Secretary of Transportation for implementing a PTC system.

Upon reaching these milestones by the end of 2018, the commuter railroads must implement PTC as soon as practicable, and no later than December 31, 2020.

APTA supports these statutory deadlines and is committed to assisting all our commuter railroads in implementing PTC.

PTC: Unparalleled Technological Challenge

As defined in statute, a positive train control system is a “system designed to prevent train-to-train collisions, over speed derailments, incursions into established work zone limits, and the movement of a train through a switch left in the wrong position.”

Implementing PTC requires changes to four main system components—vehicles, communications, signals, and the back office/control center—and each has to be fully functioning and integrated with the other systems.

When RSIA was enacted in 2008, there was no universal off-the-shelf technology capable of achieving these safety objectives. Although many commuter railroads have long used collision avoidance systems to help protect against certain accidents, these systems did not have all of the required attributes of PTC. Since the enactment of RSIA, APTA and its member commuter railroads have aggressively pursued both the funding and technology necessary to implement the PTC mandate by the statutory deadlines.

PTC is a predictive enforcement system of subsystems overlaid on existing systems. Although commuter railroads are currently in the process of installing these systems, a one-size-fits-all approach to implementation does not exist. Each commuter railroad has its own unique and complex operating environment and PTC systems must be tailored to meet those specific operating requirements.

For instance, commuter railroads interoperating with freight railroads typically use a variant of PTC called I-ETMS. Railroads that operate on the Northeast Corridor are installing an Amtrak-developed system known as ACSES. Railroads without extensive freight interoperability requirements may use a different PTC variant called E-ATC.¹ As such, what works for one commuter railroad may not work for another. Thus, each passenger rail system needs to build its own unique PTC solution, and it is that absence of a proven, off-the-shelf technology that creates uncertainty about whether a new solution will work as intended.

In general, the following components are required for implementation of PTC:

Locomotive Hardware

All locomotives and other operating equipment must be fitted with onboard computers, radios, display units, and event recorders. Numerous configurations of commuter rail equipment are in service including self-propelled cars and push-pull equipment adding to the complexity and cost of deploying these onboard systems.

Wayside Hardware

The wayside equipment that needs to be installed is also extensive and includes Wayside Interface Units (WIU), switch monitors, wayside radios, base stations, and transponders. The

¹ PTC is deployed by commuter railroads in three basic forms:

1. I-ETMSTM (Interoperable – Electronic Train Management System): In general, railroads that share track with freight railroads are installing and implementing a system known as I-ETMS, a GPS-based technology heavily dependent on the nationwide 220 MHz radio network. All wayside elements are monitored and reported to the locomotive. Track conditions and restrictions are delivered to the locomotive and reported to the operator for action. The system monitors the action of the operator and reacts if safety is compromised. I-ETMS supports interoperability with freight railroads. FRA granted type approval to I-ETMS on February 4, 2015.
2. ACSES (Advanced Civil Speed Enforcement System): In general, railroads that operate on the Northeast Corridor are installing and implementing an Amtrak-developed system known as ACSES, which uses track-mounted transponders to deliver information to the locomotive. ACSES monitors actions of the train operator and intervenes if safety is compromised. It facilitates interoperability among operators on the Northeast Corridor. FRA granted type approvals to ACSES variants between 2010 and 2013.
3. E-ATC (Enhanced Automatic Train Control): In general, small commuter railroads that do not require complex interoperability with other operators are installing and implementing E-ATC, a track circuit-based system that is less complex and therefore less expensive than either I-ETMS or ACSES. FRA granted type approval to E-ATC on March 11, 2016.

status of the components is transmitted via WIUs to the locomotive to enable the PTC system to take action as necessary.

Communications (Spectrum and Towers)

PTC implementation typically requires a robust wireless infrastructure that is used for transmission of data between the various subsystems including the onboard, wayside, and back office equipment. The communications architecture includes data radios, antennas, wayside towers, and spectrum.² After enactment of RSIA, many commuter railroads chose to adopt the PTC protocol developed for freight railroads or intercity passenger (Amtrak) operations instead of investing the time and money to develop their own PTC protocol.

Back Office

The back office stores millions of rail network data points as encrypted information (e.g., speed limits, track layouts, speed of other trains on the system, and train compositions) and transmits the authorization for individual trains to move into new track segments. Operating PTC on commuter railroads presents a variety of back office requirements. Railroads that dispatch trains need to invest in a complete set of upgraded dispatch systems and Back Office Servers.

Employee Training

All employees who perform dispatch, operations, and signaling, as well as roadway workers and supervisors, must be trained and are essential for successful PTC implementation and operation. The commuter rail industry must train approximately 15,000 employees for full PTC operations.

PTC Implementation Progress

Commuter railroads are making strong and continuous progress in implementing positive train control. These railroads have faced, and continue to face, a variety of complex challenges in implementing PTC including financial, technological, and logistical challenges. Some commuter railroads have overcome these significant hurdles, but other railroads continue to grapple with PTC implementation issues. Moreover, these railroads are faced with installing, testing, and implementing PTC on an enormous and complicated network of interconnected railroads while still providing daily service to millions of Americans, in and around many of our nation's most important metropolitan regions.

The commuter rail industry continues to make substantial progress in implementing PTC according to updated analyses conducted by APTA, and as of June 30, 2018:

- 91% of spectrum has been acquired;
- 85% of 13,698 pieces of onboard equipment have been installed on locomotives, cab cars, etc.;
- 79% of 14,083 wayside (on-track equipment) installations have been completed;

² Some commuter railroads' PTC systems do not require spectrum and use track-based circuits to communicate data between the onboard and wayside equipment.

- 78% of back office control systems are ready for operation;
- 74% of 14,847 employees have been trained in PTC; and
- 34% of commuter railroads are in testing or revenue service demonstration; or service is fully operational.

These percentages represent significant increases from the status of PTC implementation on commuter railroads compared to six months ago (the end of calendar year 2017).

Overcoming Challenges to PTC Implementation

Total Cost—More than \$4 Billion

PTC will cost commuter rail operators approximately \$4.1 billion to implement, and an estimated additional \$80 million to \$130 million each year to operate and maintain. For publicly-funded agencies that rely on federal, state, and local funding, as well as passenger fares to operate their service, these costs are staggering.

Moreover, these costs are in addition to the existing \$90 billion backlog needed to bring the current public transportation system into a state of good repair, as estimated by the U.S. Department of Transportation. A recent survey of commuter railroad agencies found that many commuter railroads have state-of-good-repair needs that far outweigh their capital budgets, even before including the additional costs associated with implementing PTC. As a result, to fund PTC, commuter railroads have had to divert funds from other critical infrastructure and safety projects, such as replacing bridges (some of which that are more than 100 years old), rehabilitating outdated locomotives, and upgrading tracks and safety systems.

Limited Federal Funding

The enactment of RSIA coincided with the 2008 global financial crisis and a multi-year period of short-term SAFETEA-LU extension acts and transportation appropriations continuing resolutions making it difficult for public transit agencies to plan and fund major projects like PTC. Since Congress mandated PTC, the federal government has directly provided barely one-tenth (\$435 million) of the necessary funding for commuter railroads to implement PTC. Moreover, more than 80 percent of this funding (\$360 million) has only been awarded in the last 16 months (since May 2017). In addition, two commuter rail operators have also secured federal loans to help pay for PTC implementation. While this financing has been helpful, the burden of repaying these loans still falls on public agencies that are already under financial pressure.

We urge Congress and the administration to consider these costs and provide additional funding to enable publicly-funded commuter railroads to quickly implement, operate, and maintain PTC, as well as address the massive backlog of other deferred critical infrastructure and safety projects. Additional funding would not only help commuter railroads continue to achieve the necessary milestones to implement PTC, but it would also allow them to address critical and costly interoperability challenges and system-wide reliability improvements after PTC deployment. As previously noted, the annual ongoing cost of PTC for publicly-funded commuter railroads is estimated to be between \$80 million and \$130 million.

Limited Vendors and Expertise

PTC is specialized rail signaling and communications equipment and there are a very limited number of manufacturers of this technology. A limited number of PTC-qualified vendors are simultaneously in demand by freight, intercity passenger, and commuter rail operators to develop, design, and test this complex safety technology, and it has been a significant challenge for the industry. In addition, the procurement process employed by public transit agencies is more rigorous and time intensive, which hindered some agencies' ability to advance contracts. Moreover, the scale of large freight railroad PTC procurements made it difficult for commuter railroads, which typically contract for much smaller procurements, to compete in the limited market.

Installing and commissioning PTC requires highly-qualified signaling, communications, and software engineers. Workforce development is a critical issue in public transportation generally. With so many railroads implementing PTC at the same time, worker retirements and limited available expertise in the specialized communications and signaling fields, where institutional knowledge is crucial, has taxed the nationwide implementation effort.

Communications (Spectrum and Towers)

Many commuter railroads have also faced significant issues in accessing and acquiring the necessary radio spectrum. Railroads often attempted to secure spectrum on the secondary market, only to encounter issues such as questions about ownership and legal authority to sell, unavailability in required geographic areas, and cost-prohibitive contractual requirements. Some railroads contracted their spectrum usage to the host railroads on which they operate, which created other issues that needed to be addressed.

Commuter railroads also may be subject to contractual constraints imposed by state and local governments. For instance, receiving government approval to use a sole-source procurement to acquire spectrum can take a very long period of time.

Finally, after spectrum is acquired, commuter rail PTC systems are also subject to radio interference from freight railroads operating on or near commuter rail territory that can overwhelm commuter rail PTC signals and render the system vulnerable to failure. Complex, and sometimes costly, solutions must be developed to mitigate this operational problem.

Equipment Installation and Training

Commuter railroads do not have surplus equipment or personnel, and the impact of PTC implementation on daily service has been significant. It is extremely difficult to operate the level of service that our customers rely upon when railroads must remove railcars and personnel from service for onboard equipment installation and training and work on multiple territories simultaneously.

Most locomotives and other operating equipment must be reconfigured to accommodate the installation of PTC components, which has led to higher costs and longer schedules to implement PTC than initially predicted. To provide an example of the level of effort required to install this hardware, it generally takes one person working for one complete month to equip one

locomotive or similar controlling equipment. Moreover, this example does not take into account the design and proof-of-concept work that is needed prior to equipage. Similarly, many railroads must upgrade track components such as switches and signals to be reported by the Wayside Interface Units. Commuter railroads face the same challenges in equipping the wayside components as private-sector freight railroads, but with far more limited development and testing resources.

In addition, railroads installing I-ETMS must maintain extensive back office capability to interact with the overall PTC network. Recognizing this requirement as a key resource constraint for commuter railroads, APTA, in conjunction with FRA, worked with suppliers to develop a cloud-based back office system. In 2015, FRA provided approximately \$5 million for this initiative. The shared back office provides for efficient operations, software maintenance, communications software updates, train initialization, and other key features. Several suppliers now offer this service.

Interoperability

Commuter railroads face different operating environments. Railroads operate as hosts on tracks they own, as tenants on other railroads tracks (e.g., freight railroads, Amtrak), or a combination of the two environments. PTC must have the ability to interface and function with different operators that share use of a section of track. In metropolitan areas, several different carriers often operate on one section of track. For instance, Metra, a Chicago-area commuter rail operator, has 13 required rail partners for its service area. Moreover, interoperability requirements are very complex for both testing and implementation. It continues to be a challenge to ensure compatibility and requires close coordination and communication between host and tenant railroads. Commuter railroads continue to diagnose and resolve software issues and address complex interoperability issues as they begin testing the system in RSD.

Overall, there are 30 commuter railroads vying for a limited number of resources related to PTC. As you can imagine, the systems are at various stages of the process. It is important to note that commuter railroads must continue to serve their customers during this process. Each day, systems must delicately balance PTC installation and serving their customers as they work to continue to safely carry passengers on more than 500 million trips per year.

SEPTA's Experience Implementing PTC

Finally, I would like to outline SEPTA's experience implementing PTC. Despite a period of historically low capital funding at the Authority, our Board was committed to implementing PTC. The Board's support, coupled with proactive decision making and planning, and some good circumstances, combined to drive SEPTA's PTC implementation efforts. Following our implementation plan, SEPTA received FRA approval to operate ACSES II PTC provisional revenue service on our Warminster Line in April 2016, and SEPTA commuter trains have been operating under PTC on all 13 of its Regional Rail Lines since May 1, 2017.

SEPTA began designing its PTC system in November 2009 without really knowing how we were going to pay for it, but we were fortunate to have several circumstances fall into place, and we were positioned to take action, including:

- In 2013, SEPTA received a \$10 million U.S. Department of Transportation TIGER Grant and worked with CSX to physically separate freight and commuter rail operations to address PTC interoperability in a congested corridor where SEPTA's West Trenton Line operated over the freight carrier's Trenton branch.
- Counter to industry trends, we had a qualified and highly skilled in-house team that remained intact throughout implementation; and
- Most importantly, at the end of 2013, Pennsylvania enacted Act 89—Pennsylvania's landmark multi-modal transportation funding bill—which gave SEPTA a future, doubling our annual capital program. The bill provided critical funding to allow SEPTA to begin to address its \$5 billion state-of-good-repair backlog while making it possible for SEPTA to aggressively finish PTC implementation.

Without Act 89, and the other good circumstances, SEPTA's PTC story would be very different.

Implementing PTC at SEPTA has required a series of innovative solutions to myriad challenges—cost, limited federal funding, interoperability, radio spectrum, equipment installation and training, and a limited number of qualified vendors to accommodate the simultaneous, industry-wide implementation of PTC. SEPTA's in-house team has distinguished themselves in responding to the complexities of implementing a new safety system across our extensive network in a finite period of time and maximizing opportunities to install, test, and implement our system. But we would not have been able to execute our plan without close and productive working relationships with Amtrak, CSX and Norfolk Southern, our third-party contractor Hitachi (formerly Ansaldo), and the Federal Railroad Administration.

At a total project cost of more than \$344 million, completing the installation of PTC for a system as large and complex as SEPTA was, and continues to be, a hard and challenging project. After working through a number of technical and operational challenges, SEPTA continues to address interoperability with freight tenants operating on various segments of our territory.

To date, SEPTA has already invested more than \$337 million to implement PTC, following a strategic approach:

- successfully separating SEPTA from CSX on the West Trenton Line;
- systematically rolling out PTC on SEPTA territory beginning in April 2016 and completing PTC implementation on 12 distinct segments by January 2017; and
- activating PTC on the three lines that operate on Amtrak-owned track on May 1, 2017.

SEPTA is proud of its record implementing PTC for our customers and employees, and yet we still have work to do.

With three major phases completed, and with SEPTA trains operating with PTC on all 13 Regional Rail Lines, the final major focus is completing the task of establishing interoperability with the freight lines—CSX and Norfolk Southern—operating along portions of SEPTA territory. Working with our freight partners, this phase of the program is scheduled to be completed by December 2018.

Although we have had success in our implementation efforts, no two commuter railroads are the same—each has different operating environments, equipment, host-tenant relationships, and ridership—so no two PTC experiences are going to be alike. What we do have in common, though, is a commitment to safety and implementing PTC on our systems. That commitment is shared by our employees—who embraced SEPTA’s PTC efforts during training and installation and now in revenue service—and our customers—who experienced schedule adjustments and service changes during implementation. SEPTA’s PTC effort would not be where it is without their professionalism and patience.

Conclusion

Safety is the shared responsibility of every commuter railroad in the country, and the current nationwide effort to implement positive train control is a critical initiative that reflects the industry’s commitment to strengthening safety. The nation’s commuter railroads are aggressively working to implement PTC by the statutory deadlines, and right now, thousands of workers across the country are working trackside or in back offices to make that happen.

APTA is grateful for the work that this Subcommittee has done to make our nation’s railroads safer. We look forward to continuing to work with you and your staff on this and many other issues that face public transportation agencies.

Enclosed is an APTA Fact Sheet on Commuter Rail and Positive Train Control.