Positive Train Control

ASSOCIATION OF AMERICAN RAILROADS **MAY 2015**

WHAT SHOULD BE DONE?	Enact S. 650 (the "Railroad Safety and Positive Train Control Extension Act"), which gives freight and passenger railroads more time to implement positive train control (PTC).
WHY?	Legislation passed by Congress in 2008 mandates that PTC be put into service by the end of 2015 on rail lines used to transport passengers or toxic-by-inhalation materials. Since enactment of the legislation, railroads have devoted enormous human and financial resources to develop a fully functioning PTC system, and progress to date has been substantial. However, despite railroads' best efforts, the immense technological hurdles have been such that a safe, reliable, nationwide, and interoperable PTC network will not be completed by the current deadline. Railroads remain committed to implementing PTC as early as possible and are doing all they can to address the challenges that have surfaced, but more time is needed to ensure safe and effective implementation on the nation's vast freight and passenger rail networks.

What is Positive Train Control?

- "Positive train control" (PTC) describes technologies designed to automatically stop a train before certain accidents caused by human error occur. Specifically, PTC as mandated by Congress must be designed to prevent:
  - ✓ Train-to-train collisions;
  - ✓ Derailments caused by excessive speed;
  - ✓ Unauthorized incursions by trains onto sections of track where maintenance activities are taking place; and
  - ✓ The movement of a train through a track switch left in the wrong position.[1]
- The Rail Safety Improvement Act of 2008 (RSIA) requires passenger railroads and Class I freight railroads to install PTC by the end of 2015 on main lines used to transport passengers or toxic-by-inhalation (TIH) materials.[2]
- The PTC systems that will be installed to meet the statutory mandate are overlay systems, meaning they supplement, rather than replace, existing train control systems.

[1] A switch is equipment that controls the path of trains where two sets of track diverge.

[2] TIH materials are gases or liquids, such as chlorine and anhydrous ammonia, that are especially hazardous if released into the atmosphere. Class I railroads are railroads with 2013 operating revenue of at least $467.1 million.

Positive Train Control is an Unprecedented Technological Challenge

- A properly functioning PTC system must be able to determine the precise location, direction, and speed of trains; warn train operators of potential problems; and take immediate action if the operator does not respond to the warning provided by the PTC system. For example, if a train operator fails to begin stopping a train before a stop signal or slowing down for a speed-restricted area, the PTC system would apply the brakes automatically before the train passed the stop signal or entered the speed-restricted area.

- Such a system requires highly complex technologies able to analyze and incorporate the huge number of variables that affect train operations. A simple example: the length of time it takes to stop a freight train depends on train speed, terrain, the weight and length of the train, the number and distribution of locomotives and loaded and empty freight cars on the train, and other factors. A PTC system must be able to take all of these factors into account automatically, reliably, and accurately in order to safely stop the train.

- **PTC development and implementation constitute an unprecedented technological challenge,** on a scale that has never been attempted anywhere in the world. Tasks that freight railroads must complete include:

  - ✓ A complete physical survey and highly precise geo-mapping of the more than 60,000 miles of railroad right-of-way on which PTC technology will be installed, including geo-mapping of nearly 440,000 field assets (mileposts, curves, grade crossings, switches, signals, and much more) along that right-of-way.

  - ✓ Installing PTC technology on more than 23,000 locomotives.

  - ✓ Installing 34,000 "wayside interface units" (WIU) that provide the mechanism for transmitting information to locomotives and the train dispatching office from signal and switch locations along the right-of-way.

PTC locomotive cab display unit

  - ✓ Installing PTC technology on more than 3,300 switches in non-signaled territory and completing signal replacement projects at 14,700 locations.

  - ✓ Developing, producing, and deploying a new radio system specifically designed for the massive data transmission requirements of PTC at nearly 4,100 base stations, 31,000 trackside locations, and on more than 23,000 locomotives.

  - ✓ Developing back office systems and upgrading dispatching software to incorporate the data and precision required for PTC systems.

- **In all these areas, railroads have made substantial progress.** As of the end of 2014, more than 13,000 locomotives were at least partially equipped with PTC, out of the more than 23,000 that will require it; some 19,000 WIUs were deployed, out of 34,000 that will be required; and 1,500 of the 4,100 base station radios were installed.

- Freight railroads have been working tirelessly to meet the PTC mandate. As of the end of 2014, they've spent more than $5 billion (of their own funds, not taxpayer funds) on PTC development and deployment. The estimated total cost to freight railroads for PTC development and deployment is $9 billion, with hundreds of millions of additional dollars needed each year after that to maintain the system.[3]

- Much of the railroads' efforts to date has been directed toward developing and testing technology that can be scaled to the huge requirements of a national system. This task is made particularly complex by the need to ensure that PTC systems are fully and seamlessly interoperable across all of the nation's major railroads. It is not unusual for one railroad's locomotives to operate on another railroad's tracks. When that happens, the "guest" locomotives must be able to communicate with, and respond to commands from, the "host" PTC system. That's much easier said than done, and ensuring this interoperability has been a significant challenge.

- The many potential failure points in PTC systems must be identified, isolated, and corrected — all without negatively impacting the efficient movement of goods by rail throughout the country. The PTC systems railroads ultimately develop must work flawlessly, day in and day out, or risk shutting down key parts of the U.S. freight rail network. The damage that would cause to the economy would be enormous.

- In addition, the Federal Railroad Administration must review each railroad's PTC safety plan and certify each railroad's PTC systems after the development and testing of the components are complete. Only then can a railroad's PTC installation be completed and placed into operation.

- In the spring of 2013, the Federal Communications Commission ordered railroads to cease the installation of the thousands of wayside antenna poles needed for PTC communications while the Commission sought to develop a process for historic preservation review of the wayside structures. The FCC announced its new process in May 2014. The new process is functional and installation of antenna structures is now going forward, but the 2013 construction season and part of the 2014 construction season were essentially lost for PTC installation.

More Time is Needed to Ensure Safe and Effective PTC Implementation

- Railroads' aggressive installation of PTC will continue. However, it will not be complete by the end of 2015. Adjusting the timeline would more accurately reflect railroads' considerable efforts to design, test, approve, produce, distribute, and install this incredibly complex technology and train nearly 100,000 employees in its use.

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[3] The cost of PTC installation for U.S. passenger railroads is estimated at an additional $3.5 billion.

- For that reason, railroads urge passage of S. 650, the "Railroad Safety and Positive Train Control Extension Act." This legislation grants the Secretary of Transportation the authority to extend the statutory deadline for nationwide PTC installation to December 31, 2020.

- Rushing PTC development and installation and foregoing a logical plan for sequencing its implementation would sharply increase the likelihood that it would not work as it should. Making the PTC implementation deadline more realistic would help ensure that a fully-interoperable PTC system is deployed in a logical manner and thoroughly tested prior to implementation. A reasonable and responsible extension is consistent with the fact that PTC should be implemented as well as possible, not as quickly as possible.

The "Business Benefits" of Positive Train Control

- Some have claimed that railroads will achieve billions of dollars in "business benefits" from PTC because PTC will allow trains to be more tightly spaced, thereby reducing train delays and increasing a rail line's capacity without the need to install new track. Any industry that invests billions of dollars in a new technology will try to leverage those investments into operational improvements. That said, the rail industry has yet to identify any substantial "business benefits" for the foreseeable future attributable to PTC deployment as mandated under RSIA.

- Mainly because of the urgency to comply with an extremely challenging statutory deadline, railroads have not had the luxury of developing and implementing supplemental PTC technologies that, in addition to safety benefits, have the most promising potential operational benefits. It is far less likely that the first-generation PTC systems being deployed now will yield meaningful business benefits compared with second- or third-generation PTC systems that might come a decade or two from now.

- Many of the business benefits some have claimed will be achieved by PTC actually have little or nothing to do with PTC. For example, many of the claims that PTC will reduce train delays and allow more trains to move over a rail line presuppose the use of "precision dispatching." This term refers to the use of complex computer algorithms to analyze a variety of factors (such as the priority levels of different trains, train crew availability, and the location and schedules of other trains) to decide in what order and when trains on a railroad's network should travel. But there is no direct relationship between the use of precision dispatching and PTC implementation: the development of precision dispatching has begun and would continue if PTC did not exist.

- In fact, it's possible that PTC could actually make existing rail operations less efficient, especially if it is put into place without adequate testing. The PTC systems freight railroads have been developing have essentially had to be created from scratch — they don't exist anywhere in the world. By necessity, a fully functioning PTC system is enormously complex, and the failure of a single part within that complex system means the entire PTC system will not work as it should. If that happened, the affected rail line would be operationally degraded until the failure was corrected. The inefficiencies this would create, and the damage it would cause to our economy, are best avoided. That's another key reason why the PTC development and implementation process should not be rushed.