

Steve Ditmeyer Answers Frequently Asked Questions About Positive Train Control

Q. What is the main purpose of positive train control (PTC) systems?

A. PTC systems are designed to:

- (a) prevent collisions between trains,
- (b) prevent train overspeed accidents, and
- (c) protect roadway workers from interactions with trains and each other.

Q. What are PTC systems? What are the components of PTC systems? What benefits, in addition to safety, can they provide to railroads?

A. PTC systems are integrated command, control communications, and information systems for controlling train movements with safety, security, precision, and efficiency. PTC systems are comprised of digital data link communications networks, continuous and accurate positioning systems such as GPS augmented by odometers, on-board computers with digitized maps on locomotives and maintenance-of-way equipment, in-cab displays (both graphical and textual), throttle-brake interfaces on locomotives, sensors and wayside interface units at switches (both powered and manual) and wayside detectors, and train control center computers and displays.

PTC systems can also be used to enable railroads to provide better product in the form of better service to their customers. They will enable railroads to address current problems of capacity constraints and poor service reliability, and to improve running time, asset utilization, fuel consumption, emissions, and security. In addition, locomotive health management systems, work order reporting systems, tactical and strategic traffic planners (to optimize flows, electronically-controlled pneumatic (ECP) brakes, intelligent grade crossing systems, and a variety of other intelligent railroad systems can be easily integrated with PTC systems, but not with cab signal systems.

PTC systems can incorporate modules to permit them to record and retain the precise location, time, and circumstances of unplanned events such as derailments and grade crossing accidents. PTC systems also interface with tactical and strategic traffic planners, work order reporting systems, locomotive health reporting systems, and ECP brakes.

Q. How do PTC systems differ from conventional signal systems?

A. Conventional signal systems provide only a limited number of instructions (two to five different speed levels plus stop, conveyed by either one, two, or three colored lights) to train crews at widely spaced (2- to 20-mile) intervals; PTC can provide instructions to trains or maintenance-of-way vehicles to operate at any speed, and can provide them at any location along the track. PTC system control center computers issue movement

authorities to train and maintenance-of-way crews and keep track of the location of the trains and maintenance-of-way vehicles. On-board computers have the ability to automatically enforce movement authorities, and continually update operating data systems with information on the location of other trains, locomotives, cars, and crews. Conventional signal systems use electrical circuits in track blocks to determine train location by block occupancy. PTC systems use Global Positioning System (GPS), augmented by odometers, to determine train location.

Q. Why is the National Transportation Safety Board (NTSB) so interested in PTC?

A. The NTSB has had PTC on its “most wanted” list of transportation safety improvements since 1990. As the Board says on its website, “Over the last three decades, the Safety Board has investigated a long list of accidents in which crewmembers failed to operate their trains effectively and in accordance with operating rules for a variety of reasons, including fatigue, sleeping disorders, use of medications, or distractions within the operating cab. Because of these human performance deficiencies, the Board has advocated the implementation of a system that compensates for human error and that incorporates collision avoidance to prevent train collisions. The Board believes that this system, known in the industry as positive train control (PTC), is particularly important in places where passenger trains and freight trains both operate. Because of the Board’s longstanding interest in this issue, the area has remained on the Board’s Most Wanted List since the inception of the list in 1990. This safety issue was highlighted when a freight train and a commuter train collided head-on in Placentia, California, in 2002. As a result of that accident, the Board reiterated the need for PTC systems, particularly on high-risk corridors where commuter and intercity passenger railroads operate.”

Q. Would PTC systems prevent collisions such as the one at Chatsworth?

A. Yes, PTC systems would prevent collisions such as the one at Chatsworth. They utilize digital messages conveyed over fixed and mobile radios to deliver movement authorities to trains. On-board computers compare the movement authority with train location determined by GPS and odometers, and enforce the authority if the train is approaching the limit of the authority.

Q. Would cab signal systems prevent collisions such as the one at Chatsworth?

A. Yes, cab signal systems as part of automatic train control (ATC) systems would prevent collisions such as the one at Chatsworth. They utilize communications messages conveyed through the rails to electro-mechanical devices on locomotives to enforce movement authorities shown by the signal system. Such systems have been in use since the 1930’s.

Q. Why not implement cab signal systems instead of PTC?

A. PTC systems employ highly reliable computerized information cross-checks and clearance enforcement mechanisms that do not exist in current signal systems. Cab signal systems cost more than PTC when implemented on a large railroad or nationwide. Because cab signal systems have much less functionality than PTC systems, the rate of return on cab signals is far less than on PTC, assuming PTC is used for more than just safety benefits. The implementation of cab signals would delay the implementation of PTC, thus depriving both the public and the railroads of benefits achievable only with PTC. Given the recent Congressional mandate in the Rail Safety Improvement Act of 2008 for railroads to install PTC, railroads have an opportunity to better manage the allocation of space and time on their trackage in real time, thereby enhancing their service.

Q. Have there been any successful PTC demonstration projects?

A. There was one successful completed demonstration project in the past, and there are several successful ongoing projects. The Burlington Northern Railroad (BN) Advanced Railroad Electronics System (ARES) project involved 17 locomotives, 3 maintenance vehicles, 250 miles of track on the Minnesota Iron Range, and a control center at Northtown Yard, and it was operational from 1987 to 1993. Rockwell International was the system integrator. A portion of the territory had centralized traffic control (CTC) on it, a portion had automatic block signals (ABS), and yet another portion was dark territory. ARES was able to detect trains on double track, and worked equally well on the main line and in yard limits. Both the safety and the business benefits aspects of the project were extensively documented. Donald Henderson, BN's Vice President for Technology, Engineering, and Maintenance (and later, Vice President of Operations) testified under oath at NTSB hearings following collisions at Ledger, Montana, and Kelso, Washington, in the early 1990s that ARES would have prevented those collisions had it been installed.

Gerald Grinstein, BN's Chairman and CEO, made the following public statement in 1990: "We designed ARES in the 1980s and have tested it for more than two years on BN's lines serving the Mesabi Iron Range. The system is now ready for implementation."

BN spent approximately \$30 million and Rockwell spent about \$50 million on the project. No government money was involved. The project was discontinued after the new management decided to spend money on a merger with the Santa Fe rather than on PTC technology.

Rockwell later sold its Railway Electronics Division to Wabtec, which now has PTC demonstration projects underway with the four major railroads, BNSF, CSX, NS, and UP, and Chicago METRA.

Q. How is GPS positioning and speed information used in a PTC system to enforce movement authorities?

A. With PTC, GPS receivers on all locomotives receive continuous transmissions from the GPS satellites, so that the locomotives and their engineers know where they are at all times relative to the end of their authorities and what speed they are going. The information about train location and speed is transmitted from the locomotives to the control center via digital data link over mobile radios and microwave, not by communications satellites. The locomotive on-board computer knows the authority limits and speed restrictions that have been transmitted to it via data link using the same microwave and mobile radios.

When the locomotive approaches the end of its authority, and if the engineer is not slowing down the train, the cab display gives a notice of impending penalty brake application. If the engineer still takes no action, the on-board computer and the throttle-brake interface automatically bring the train to a stop with a full-service brake application. The on-board computer does not permit the train to move beyond the limits of its movement authority transmitted from the control center.

In a situation like Chatsworth, the Metrolink train had a movement authority up to the end of the siding. If the locomotive had been equipped with PTC, the GPS receiver would have informed the locomotive's on-board control computer that it was at the end of the siding. PTC is designed to have stopped the Metrolink train at that point and would have prevented it from going beyond that point.

Q. How does a PTC system keep track of where trains are when they are in tunnels? Are track circuits needed?

A. A properly designed PTC system includes odometers on locomotives and maintenance vehicles, in addition to GPS receivers, and switch position indicators so that longitudinal position along the track can be determined in tunnels and deep canyons where GPS satellite signals are blocked. Track circuits are not needed for location determination purposes in PTC systems. However, if a railroad wants broken rail protection, track circuits are needed for that purpose. Today, slightly less than half the track in the US is without broken rail protection. Railroads can make independent decisions on the installation of PTC and on the maintaining of existing and installation of new track circuits for broken rail protection.

Q. What happens if the US military turns off or degrades GPS in time of war?

A. The US Government has committed to keeping GPS operational and its signals available to the public. President Bush has recently announced that the Department of Defense is eliminating from the next generation of GPS satellites the selective availability

feature that in the past could have been used to degrade GPS signals. When the constellation of Galileo navigation satellites is placed in orbit by the European Union around 2010, the concern about using satellite signals for railroad applications may be reduced further.

Q. How is PTC installed – as an overlay, or free-standing?

A. A PTC system is installed as an overlay on whatever control system is in place on a specific line: ATC, cab signals, CTC, ABS, or track warrant control on dark territory. When the PTC system is installed, the control system software enables trackage with all of those different control systems to be controlled in the same manner, even formerly dark territory. Once there is confirmation that the PTC system is functioning properly, a railroad then has the option of whether on not to turn off the existing signaling system. By doing this, the railroad could then take advantage of the moving block feature of PTC. Most likely, a railroad would maintain whatever track circuits are in place to provide broken rail protection feeding into the PTC system.

Q. What is the cost per mile of a PTC system?

A. Costs for convention signaling systems can be determined on a per-mile basis, because they are installed “along the track.” PTC system costs are computed in a different manner because portions of the systems are installed on locomotives and maintenance vehicles, portions are installed along the track, and portions are installed in control centers.

- * 60% of the cost of a large PTC system is for equipment on locomotives and maintenance vehicles (data radios, GPS receivers, power supplies, on-board computers, throttle-brake interfaces, cab displays, installation),
- * 20% of the cost of a large PTC system for wayside equipment (data radios, and sensors and wayside interface units at switches, bridges, and tunnels, and installation), and
- * 20% of the cost of a large PTC system is for equipment in control centers.

This means that if rail traffic shifts from one line to another, the PTC system will go with the traffic to the new line. A conventional signal system would remain attached to the original line.

The cost elements of a PTS system are shown on page 99 of the 2004 FRA report “Quantification of the Business Benefits of Positive Train Control” and also below:

Segment	Unit	Estimated Cost per Unit	
		Low	High
Vehicle	Each	\$30,000	\$75,000

Wayside	Track-mile	\$16,000	\$24,000
Central Office	Each	\$100 million	\$500 million

These cost elements were based on data provided by multiple PTC vendors and multiple railroads. While these estimates are in 2004 dollars, "learning curve" effects on the costs of electronics equipment have worked to offset the impact of inflation. These estimates also reflect the economies of scale of large procurements.

The cost of placing PTC on-board equipment on new locomotives that already have wiring harnesses and liquid crystal display (LCD) screens in place should be at the lower end of the range, while the cost of placing PTC on-board equipment on old locomotives that do not have wiring harnesses and LCD screens in place should be at the higher end of the range. The cost of installing PTC wayside equipment along the track will vary depending on the current installation of data radios, sensors, and wayside interface units. The cost of installing PTC control center equipment will vary on the size of the center and the nature of the computers and displays currently installed.

Using these numbers, the FRA report "Quantification of the Business Benefits of Positive Train Control" concludes that the total cost of equipping the entire US railroad network with PTC would range from \$2.3 billion to \$4.4 billion, again in 2004 dollars. These costs would be spread out over a 5- to 10-year period, depending on the speed at which railroads would undertake implementation. This suggests the December 31, 2015, deadline for the installation of PTC in the new law is achievable, if the railroads begin the installment immediately and assuming the capital is available, especially for the passenger and commuter operators.

Q. Would PTC be installed only on main lines and secondary main lines? Isn't PTC too expensive to install on branch lines?

A. Installing PTC on main lines and secondary lines involves installing digital data radio base stations along those lines, along with switch position indicators and wayside interface units that would connect those indicators and other wayside sensors into the communications network. All locomotives running on those main and secondary lines would be equipped with full sets of PTC on-board equipment.

Because the digital data radio coverage extends 25 miles or more from a base station, most likely no additional radio base stations would be needed along branch lines. Furthermore, if there is only one train at a time on a branch line, no switch position indicators would be needed. Since the branch line locomotives also operate on main and secondary lines, they would already be equipped with PTC on-board equipment. Only the software in the control center would have to be expanded to cover the branch lines. Therefore, the cost of placing a branch line under PTC control is extremely small.

Q. Is PTC interoperability necessary? Why can't each railroad implement whatever type of system it wants?

A. Amtrak trains run over multiple railroads; a commuter railroad often runs trains over more than one railroad; and freight railroads very often have run-through trains with other railroads. As a result of the practices, PTC interoperability is essential, which is why the new law requires each railroad required to submit a plan for implementing PTC to the Secretary of Transportation must describe how its PTC system will provide for interoperability of the system with other movements of trains of other railroad carriers over its lines.

Q. What is meant by "interoperable" PTC systems?

A. To be "interoperable" or "compatible," PTC systems must transmit the same messages in the same format using the same protocols over the same frequencies, have positioning systems using the same geodetic datum, and have onboard and control center computers that use the same logic to process the information. Without all these attributes present, interoperability of PTC systems cannot be achieved.

When Amtrak locomotives have to travel on railroads that have incompatible cab signal systems, the locomotives are equipped with hardware for each of the systems, and there is a switch in the cab to enable the engineer to activate the correct cab signal system. If, indeed, railroads decide to implement incompatible PTC systems, the only solution is for all the locomotives that traverse them to be similarly equipped with the on-board equipment for each PTC system.

Because the four major railroads - BNSF, CSX, NS, UP - plus Chicago METRA all have PTC demonstration contracts with the same vendor, Wabtec; they have established a *de facto* standard for PTC interoperability

Q. When multiple railroads run trains over the same trackage, which railroad should make the investments in the various components of the PTC system?

A. The investments in PTC equipment will likely be made in the following manner, unless freight railroads, Amtrak, and the commuter railroads make other agreements among themselves:

1. The locomotive-borne (and cab car-borne) equipment gets paid for by the organization that owns the rolling stock,
2. The wayside equipment gets paid for by the organization that owns the track, and
3. The control center equipment gets paid for by the organization that owns the control center and does the dispatching for the railroads that operate over the controlled track.

This approach would assure interoperability.

For example, VRE would only have to purchase and install PTC on-board equipment for its locomotives and cab cars. CSX and NS would install the PTC wayside equipment and the PTC control center equipment. VRE would negotiate with CSX and NS, as it does now, for the costs of the use of the track and for dispatching services.

MARC would have to purchase and install PTC on-board equipment for its locomotives and cab cars that run on CSX track. It already has equipped its locomotives and cab cars that run on Amtrak with cab signaling equipment. CSX would install the PTC wayside equipment and the PTC control center equipment. MARC would negotiate with CSX, as it does now, for the cost of the use of the track and for dispatching services.

The situation gets a little more complicated in southern California. Metrolink would purchase and install the PTC on-board equipment for its locomotives and cab cars. Metrolink would install the PTC wayside equipment on the track it owns, and BNSF and UP would install the wayside equipment on the PTC track each of them own. Metrolink would install PTC control center equipment in its own control center, and BNSF and UP would install PTC control center equipment in each of their control centers. Then the three organizations - Metrolink, BNSF, UP - would have to negotiate, as they do now, for the costs of the use of each others' track and dispatching services.

If a new commuter rail start-up comes along using trackage already equipped with PTC, it would simply have to acquire the PTC on-board equipment for its locomotives and cab cars. When it expands and begins acquiring track, it would also acquire the PTC wayside equipment that comes with the track. When it expands further and sets up its own control center, it would then be responsible for the PTC control center equipment in the control center.

If the new commuter rail start-up comes along using trackage not already equipped with PTC, the railroad owning the track would have to acquire the PTC wayside equipment, although the cost would most likely be borne by the commuter authority, the commuter rail organization would have to acquire the PTC on-board equipment for its locomotives and cab cars, and whichever organization would be dispatching the trains would have to acquire the PTC control center equipment.

Q. Does it make any sense for a short line railroad to consider installing PTC?

A. Most short line railroad trackage would fall under the coverage of digital data radio base stations installed along a Class I railroad. If a short line railroad's locomotives also have to travel on a Class I railroad main line, those locomotives would have to be equipped with a limited set of PTC on-board equipment. The short line and the Class I railroad would have to negotiate who pays for that equipment. The short line railroad could also contract with the Class I railroad for a dispatching terminal tied into the Class I railroad's dispatching terminal. Under the new law, the Secretary of Transportation has

the discretion to order PTC installed on Class II and II railroads, but on a timetable no earlier than the December 31, 2015, requirement for the Class I railroad PTC installations.

Q. What are the business benefits of PTC?

A. The FRA report “Quantification of the Business Benefits of Positive Train Control” gives examples of potential business benefits that include: line capacity enhancement, improved service reliability, faster over-the-road running times, more efficient use of cars and locomotives (made possible by real-time location information), reduction in locomotive failures (due to availability of real-time diagnostics), larger “windows” for track maintenance (made possible by real-time location information), and reduced fuel consumption (and with it, reduced emissions, including CO₂ emissions).

These business benefits would result in annual savings ranging from \$2 billion to \$3.6 billion, once PTC is installed. The rate of return for PTC implementation nationwide would range from 44% to 160%, depending on PTC functionalities implemented and uncertainties in both benefits and costs. The report was based on earlier analyses performed by the Canadian National Railway, the Burlington Northern Railroad, and the Association of American Railroads.

This is perhaps the area of greatest contention regarding PTC implementation. Some feel that there are no business benefits to be gained from PTC (“Our operations are so good now that there is no room for any improvement in running time, running time reliability, capacity or asset utilization.” From a Conrail vice-president in a letter to FRA). Others believe the FRA report underestimates the potential business benefits from PTC.

Q. How will PTC systems enhance railroad security?

A. A key element of Homeland Security is the security of the nation’s railroad network. PTC systems provide railroad domain awareness to railroad managements. They monitor of location and speed of all trains, provide on-board enforcement of all movement authorities, and have the ability to remotely intervene to stop trains. Wayside sensors provide the capability to monitor all switches (both powered and manual), bridges, and tunnels, and the information from them is transmitted from wayside interface units to train control centers. Intelligent grade crossing systems can determine if highway-rail intersections are blocked by accidentally and intentionally stalled vehicles, and notify trains. Crew registration systems insure that only authorized crew members are permitted to control locomotives and maintenance-of-way vehicles. Information from closed-circuit television (CCTV) cameras, infrared presence detectors, and other wayside and on-board sensors, can be integrated into PTC systems.

The integration of waybill databases (showing car contents, shipper, and consignee), the Umler file, and databases receiving data from PTC systems (location of trains), AEI

systems (train lists), and work order reporting systems (cars at customers, in yards, and on repair tracks) will enable railroads to monitor the real-time location of all cars and all shipments, and especially hazmat shipments, and provide that information on a need-to-know basis to their employees, customers, and appropriate federal, state, and local government agencies. Having the real-time information will also enable railroads and security authorities to predict arrival times at specific locations more accurately.

Q. What does the term “vital” mean in the context of PTC?

A. There seem to be two schools of thought regarding the term “vital” when used with PTC. The first school of thought is that “PTC must be vital” in the way that wayside signaling systems are "vital." The second school of thought is that terms like “vital” and “fail-safe” are terms that should be used only when describing hard-wired relay-logic-based railroad signal systems; they are not terms used to describe communications-based control systems like PTC. For example, the terms “vital” and “fail-safe” are not used when describing air traffic control systems or when describing command and control systems for NASA space missions and Navy and Air Force satellite and missile systems and military aircraft. The Nuclear Regulatory Commission does not use "vital" when dealing with control systems for nuclear power plants. The terms used to describe communications- based control systems are “reliability,” “dual-redundancy,” “secure,” and “fault tolerant systems architecture.”

Throughout the first decade or more of PTC (1980s and early 1990s), the term "vitality" was hardly ever used in discussions of PTC. It was only when FRA began its Railroad Safety Advisory Committee (RSAC) process that members of the railroad signaling community introduced signaling terminology into discussions regarding PTC and "vitality" became a dominant issue.

The Charles Stark Draper Laboratory, the organization that developed the control systems for the Apollo moon landings and for Navy submarine-launched ballistic and guided missiles, prepared the report “Safety Analysis of ARES” for the Burlington Northern Railroad. The report has the following statements regarding vitality and PTC:

"Vitality is not provided locally, but rather by the control system as a whole. The reliability of any particular component has meaning (with regard to system safety) only insofar as it relates to the architecture of the system and the reliabilities of all other components in the system." (p. S-2)

"Vitality of data transmission is achieved by the use of error detecting codes applied to the data by a vital component. This adds temporal redundancy to transferred data." (p. S-8)

"ARES software will be certified using procedures for the verification and validation of critical control software which are successfully employed by the FAA, DoD and NASA. The portion of the [control system] and on-board train control software that is 'vital' is of limited size, thus further enhancing the effectiveness of these verification procedures." (p. S-8)

"Dual redundancy is conceptually the simplest way to obtain a very high probability of error detection, although, depending upon the component in question a high probability of error detection can also be obtained by combinations of specialized monitoring equipment. In either case, individually vital elements have been modeled as being dual-redundant so that the coverage parameter used in the safety analysis can be calculated in a tractable manner. Some, and perhaps all of these components will actually be implemented as dual-redundant." (p. 3-8)

Q. If PTC systems must have the same system architecture, how is competition achieved when procuring PTC systems?

A. PTS system integrators have developed PTC so that competition is achieved at the "box" level, the same way that avionics system integrators do. That means the system integrator has developed a form, fit, function specification for each box – data radio, GPS receiver, power supply, on-board computer, throttle-brake interface, etc. – and the railroad can select whatever vendor they choose for the individual boxes. As long as the box meets the form, fit, function specification, the railroad can be certain that the PTC system will work properly.

On the BN ARES system, Rockwell was the system integrator, Harmon supplied the data radios, Trimble supplied the GPS receivers, King Air supplied the power supply boxes, Rockwell itself supplied the onboard computers, and US&S supplied the control center computer.

Q. Why does PTC rely so heavily on digital data communications? Are voice communications going to be eliminated?

A. Just as the next generation of air traffic control is going to be moving to more digital data communication, so will PTC take railroads into the new realm of digital data communications. Today, with voice radio, there are limited communications channels between dispatchers and the field, the channels are congested, the exchange of information is not timely, erroneous information gets passed, and train collisions can be caused by communications mistakes. Dispatchers, train and maintenance crews, and the NTSB all believe poor communications contributes to accidents. Digital data communications can alleviate all these issues.

PTC and digital data link communications will reduce stress and fatigue of dispatchers by reducing their communication load, improving their communication efficiency and speed, increasing their communication precision, and changing their communication focus from information-gathering and movement authorization to traffic planning and problem solving. Data link communications will supplement, but not eliminate, voice radio communications.

Q. Will PTC will slow down trains because crews will brake sooner so they won't get a penalty application?

A. On current trackage equipped with cab signals and/or automatic train control, train crews do not brake sooner to avoid a penalty brake application. On Amtrak's Northeast Corridor, which is equipped with cab signaling, ATC, and the Advanced Civil Speed Enforcement System (ACSES), for example, train crews do not brake sooner to avoid a penalty brake application.

With PTC, the engineer receives on the in-cab display screen a notification – accompanied by sound – fifteen seconds in advance of a penalty brake application. Therefore, there would be no incentive for the engineer to apply brakes prematurely. If the engineer does not apply the brakes by the end of that fifteen-second interval, the PTC system would automatically initiate a full-service brake application.

Q. Will PTC work in yard limits?

A. If railroad wants PTC to work in yard limits, and equips its control center accordingly, PTC will work in yard limits. BN's ARES worked in yard limits.

Q. Do you need alerters with PTC?

A. PTC does not preclude the use of alerters and it probably makes good sense to include them on locomotives equipped with PTC.

Q. Is human activation of PTC required on a locomotive?

A. With PTC, human activation is not required. There is no signal exchange with satellites; there is just the continuous receipt of GPS signal. The digital communications between train, wayside, and the control center occur automatically. The locomotive crew remains “in the loop” with the PTC system, following instructions it receives from the system, just as today a locomotive crew is required to follow instructions from wayside signals an/or track warrants. With PTC, the on-board computer intervenes if the locomotive crew does not follow the instructions.

Q. Are any other industries or other organizations implementing technologies similar to PTC?

A. Intelligent Transportation Systems (ITS) for highways and mass transit are based on the same technologies, as are the Next Generation Air Traffic Control System and Maritime Safety and Security Information System. Major parcel delivery companies, pipeline operators, law enforcement, and emergency response services also use these

technologies. The US Department of Defense has spent billions of dollars to develop these technologies for use in network-centric warfare.

Q. Won't PTC be a threat to rail labor?

A. No, I don't believe it will. The freight railroads, in the last round of labor negotiations, had sought reductions in the size of locomotive crews. This was before PTC implementation was mandated. It is expected that the freight railroads will again seek crew size reductions in the next round of negotiations. The freight railroads may very well suggest that the new law reinforces their pre-existing beliefs regarding crew consist..

PTC will require higher skill levels from railroad employees, and the amount of electronics equipment that has to be installed and maintained will increase significantly. A successful PTC implementation, by improving railroad service quality, should result in increased demand, and, therefore, more trains, train crew members, locomotives, and locomotive maintenance workers will also be required. PTC will produce a far safer work environment for train crew members. And with trains that keep to schedule, the crew members may finally get to enjoy the benefits of having scheduled work assignments.

Q. How long would it take to implement PTC on a major railroad?

A. A seven-year schedule to implement PTC should be feasible, and that would meet the new legislative mandate.. The system integrator or integrators will face a significant workload in getting final agreement on interoperability standards, and the manufacturers of the various components of PTC face development time to increase production rates at their plants to meet implementation schedules.

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Steve Ditmeyer served as a Transportation Economist at the World Bank; General Manager of the Alaska Railroad; Associate Administrator for Policy and for R&D at the Federal Railroad Administration; Chief Engineer – Research, Communications, and Control Systems at Burlington Northern Railroad; Department of Transportation Faculty Chair, Industrial College of the Armed Forces, National Defense University; and is currently Adjunct Professor, Railway Management Programs, Michigan State University.