U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL RAILROAD ADMINISTRATION

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POSITIVE TRAIN CONTROL SYSTEMS

Regulatory Impact Analysis

Federal Railroad Administration
Office of Safety Analysis
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Contents

Executive Summary

In an accompanying Notice of Proposed Rulemaking (NPRM), the Federal Railroad Administration (FRA) proposes amendments to regulations implementing a requirement of the Rail Safety Improvement Act of 2008 (RSIA) that railroads must install Positive Train Control (PTC) systems along certain lines that carry passengers and poison- or toxic-by-inhalation (PIH) materials. FRA is proposing the removal of various regulatory requirements that require railroads to meet two tests in order to avoid PTC system implementation on track segments that were used to transport PIH traffic in 2008 and carried five million gross tons of traffic but that do not transport PIH materials traffic and are not used for intercity or commuter rail passenger transportation as of December 31, 2015. Substantial cost savings would accrue largely from not installing PTC system wayside components or taking mitigation measures along approximately 10,000 miles of track. Although these rail lines would forego some risk reduction measures, the reductions would be likely be small since these lines pose a much lower risk of accidents because they generally do not carry passenger trains or PIH materials and generally have lower exposure, because of lower traffic volumes than an average of all segments subject to the PTC requirement. The following analysis shows that if the assumptions are correct, the savings of the proposed action far outweigh the cost.

The largest part of the cost savings benefit comes from reducing the extent of wayside that must be equipped with PTC. Some of these lines would have qualified for exemption by passing the two tests contained in the 2010 PTC final rule, while others may not have. In addition benefits will come from reducing the number of locomotives belonging to Class II and Class III (small) railroads that must be equipped with PTC because they run on Class I railroads' track that will no longer need to be equipped with PTC. Although these benefits would be small relative to the wayside equipment savings, they would be large relative to the size of the railroads being impacted. Finally, Class III railroads would avoid operational costs associated with having to reduce operating speeds to cross over two railroad-to-railroad crossings at an annual cost of $43,800. These benefits to small railroads are a subset of the total benefits of reduced wayside costs described above. For purposes of assessing the sensitivity of the findings, FRA also analyzed the impacts of scenarios in which the mileage no longer requiring PTC is 7,000 miles (low case) and 14,000 miles (high case). The tables below present the total estimated cost avoided benefits of the proposed rule as well as the breakdown by element.

Table E-1. Summary of Costs Avoided (Rule Benefits) Over 20 Years

Total of all Benefits				
	Total Discounted Benefits		Annualized Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	$619,969,287	$818,031,752	$58,520,715	$54,984,583
High Case	$831,239,473	$1,096,796,723	$78,463,126	$73,721,968
Low Case	$461,516,648	$608,958,024	$43,563,907	$40,931,544
These totals are broken down as follows:				
Reduced Mitigation Costs, Including Maintenance				
	Total Discounted Benefits		Annualized Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	$91,793,822	$121,119,324	$8,664,687	$8,141,121
High Case	$121,704,169	$160,585,172	$11,488,013	$10,793,846
Low Case	$72,197,388	$95,262,390	$6,814,923	$6,403,129
Reduced Wayside Costs, Including Maintenance				
	Total Discounted Benefits		Annualized Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	$515,695,631	$680,445,643	$48,678,019	$45,736,635
High Case	$721,973,883	$952,623,900	$68,149,227	$64,031,290
Low Case	$360,986,942	$476,311,950	$34,074,614	$32,015,645
Reduced Locomotive Costs, Including Maintenance				
Discount Factor	7%	3%	7%	3%
Expected Case	$12,479,834	$16,466,785	$1,178,008	$1,106,827
High Case	$17,471,768	$23,053,498	$1,649,211	$1,549,557
Low Case	$8,735,884	$11,526,749	$824,606	$774,779
Total costs may also be broken down into initial investment and maintenance. FRA estimates avoiding installation on 10,000 miles would let railroads avoid $300.5 million in initial installation costs (not discounted). Maintenance cost savings would be as follows:				
Reduced Total Maintenance Costs				
Discount Factor	7%	3%	7%	3%
Expected Case	$366,044,119	$538,860,239	$34,551,975	$36,219,872
High Case	$490,782,893	$722,490,469	$46,326,433	$48,562,708
Low Case	$272,490,038	$401,137,566	$25,721,132	$26,962,745

Regulatory costs will come from reducing the potential for accident reduction. A substantial part of the accident cost reduction that FRA expects from PTC systems currently required comes from reducing high-consequence accidents involving passenger trains or the release of PIH materials. FRA believes that the lines impacted by this proposal pose significantly less risk because they generally do not carry passenger trains or PIH materials and generally have lower accident exposure because they have relatively lower traffic volumes than an average of all segments subject to the PTC requirement. The following tables present the total costs of the proposed rule as well as the breakdown of the costs by element.

Table E-2. Summary of Costs of the Proposed Rule (Reduced Risk Reduction)

Costs of the proposed rule by category (20-year, 7% discount)			
Foregone Reductions in:	Expected Case	High Case	Low Case
Fatality Prevention	$11,453,106	$16,034,349	$8,017,174
Injury Prevention	$4,254,484	$5,956,278	$2,978,139
Train Delay	$117,793	$164,911	$82,455
Property Damage	$10,163,835	$14,229,369	$7,114,685
Equipment Cleanup	$143,273	$200,583	$100,291
Environmental Cleanup	$430,995	$603,393	$301,696
Evacuations	$138,780	$194,292	$97,146
Total	$26,702,267	$37,383,174	$18,691,587
Costs of the proposed rule by category (20-year, 3% discount)			
Foregone Reductions in:	Expected Case	High Case	Low Case
Fatality Prevention	$16,860,327	$23,604,458	$11,802,229
Injury Prevention	$6,263,104	$8,768,346	$4,384,173
Train Delay	$173,406	$242,768	$121,384
Property Damage	$14,962,367	$20,947,314	$10,473,657
Equipment Cleanup	$210,915	$295,282	$147,641
Environmental Cleanup	$634,475	$888,265	$444,133
Evacuations	$204,301	$286,021	$143,011
Total	$39,308,896	$55,032,454	$27,516,227
Annualized Costs of the proposed rule by category (20-year, 7% discount)			
Foregone Reductions in:	Expected Case	High Case	Low Case
Fatality Prevention	$1,081,092	$1,513,529	$756,765
Injury Prevention	$401,593	$562,231	$281,115
Train Delay	$11,119	$15,566	$7,783
Property Damage	$959,394	$1,343,152	$671,576
Equipment Cleanup	$13,524	$18,934	$9,467
Environmental Cleanup	$40,683	$56,956	$28,478
Evacuations	$13,100	$18,340	$9,170
Total	$2,520,505	$3,528,707	$1,764,354

Table E-2. (continued)			
Annualized Costs of the proposed rule by category (20-year, 3% discount)			
Foregone Reductions in:	Expected Case	High Case	Low Case
Fatality Reduction	$1,133,279	$1,586,590	$793,295
Injury Reduction	$420,979	$589,371	$294,685
Train Delay	$11,656	$16,318	$8,159
Property Damage	$1,005,706	$1,407,989	$703,994
Equipment Cleanup	$14,177	$19,848	$9,924
Environmental Cleanup	$42,647	$59,705	$29,853
Evacuations	$13,732	$19,225	$9,613
Total	$2,642,175	$3,699,045	$1,849,523

In addition, some distributional impacts may result from elimination of the two tests, which may result in certain lines required to be equipped with PTC solely because they carry passenger traffic.

The net annualized benefits (annualized benefits minus annualized costs) under the expected case are $56 million, discounted at 7 percent per year, and $52 million, discounted at 3 percent per year, with 20-year discounted net benefits of $590 million over 20 years, discounted at 7 percent per year; and $780 million over 20 years, discounted at 3 percent per year. The timing of benefits and costs are such that a large benefit in terms of capital investment is avoided in early years, while the benefit of avoided maintenance and the disbenefit (costs) of accidents not avoided would be realized annually in later years. All other scenarios analyzed for sensitivity purposes assuming different levels of lines benefiting from regulatory relief also show net benefits.

Table E-3. Net Societal Benefits of the Proposed Rule (20 years)

	Total Discounted Net Benefits		Annualized Net Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	$593,267,020	$778,722,856	$56,000,210	$52,342,408
High Case	$793,856,299	$1,041,764,269	$74,934,419	$70,022,922
Low Case	$442,825,061	$581,441,797	$41,799,553	$39,082,022

Further, the benefit/cost ratios under various scenarios range between 20:1 and 25:1.

Table E-4. Benefit/Cost Ratio of the Proposed Rule (20 years)

Discount Factor	7%	3%
Expected Case	23.22	20.81
High Case	22.24	19.93
Low Case	24.69	22.13

1.0 Introduction

In an accompanying NPRM, FRA proposes amendments to regulations implementing a requirement of the RSIA that certain passenger and freight railroads install PTC systems. The proposal includes removing certain regulatory requirements that may require railroads to install PTC systems on track segments that carried PIH traffic in 2008 but will no longer carry PIH traffic on December 31, 2015.

2.0 Background

2.1 Regulatory history

As a consequence of the severity of certain very public accidents, coupled with a series of other less publicized accidents, Congress passed the RSIA, mandating implementation of PTC systems by December 31, 2015. Under the RSIA, such PTC implementation must be done by each Class I railroad carrier and each entity providing regularly scheduled intercity or commuter rail passenger transportation on:

49 U.S.C. § 20157(a)(1)

> (A) its main line over which intercity rail passenger transportation or commuter rail passenger transportation, as defined in section 24102, is regularly provided;
> (B) its main line over which poison- or toxic-by-inhalation hazardous materials, as defined in parts 171.8, 173.115, and 173.132 of title 49, Code of Federal Regulations, are transported; and
> (C) such other tracks as the Secretary may prescribe by regulation or order.

The statute further defined "main line" to mean:

49 U.S.C. § 20157(i)(2)

> …a segment or route of railroad tracks over which 5,000,000 or more gross tons of railroad traffic is transported annually, except that—
> (A) the Secretary may, through regulations under subsection (g), designate additional tracks as main line as appropriate for this section; and
> (B) for intercity rail passenger transportation or commuter rail passenger transportation routes or segments over which limited or no freight railroad operations occur, the Secretary shall define the term "main line" by regulation.

To effectuate this goal, the RSIA required the railroads to submit for FRA approval a PTC Implementation Plan (PTCIP) within 18 months (i.e., by April 16, 2010).

Consistent with this statutory mandate, FRA published a final rule with request for further comments on January 15, 2010, which established new regulations codified primarily in Subpart I to Title 49 Code of Federal Regulations (CFR) Part 236 (the "PTC rule"). Subsequently, FRA received a number of petitions for reconsideration to the final rule and a number of comments responding to the request for further comments. In a letter dated July 8, 2010, FRA denied all of the petitions for reconsideration. On September 27, 2010, FRA issued a new final rule with

clarifying amendments to the PTC rule.

Under the current regulations, each PTCIP must include the sequence and schedule in which track segments required to be equipped with PTC will be equipped with PTC and the basis for those decisions. See 49 CFR Section 236.1011. This list of track segments must include all track segments that fit the statutory criteria for calendar year 2008. See §§ 236.1005(b)(1) and (b)(2).

While the statutory PTC implementation deadline is December 31, 2015, FRA recognized a need for a starting point in time to determine when such implementation must occur. The final rule indicates that such a starting baseline should be based on the facts and data known in 2008 (the "2008 baseline"). Using 2009 data would have been difficult given the proximity to the PTCIP submission deadline and the notably atypical traffic levels caused by the down turn in the economy. Although each railroad's initial PTCIP includes a future PTC implementation route map reflecting 2008 data, FRA recognized that PIH traffic levels and routings could change in the period between the end of 2008 and the start of 2016. Accordingly, in the event of changed circumstances, the PTC rule provides railroads with the option to file a request for amendment (RFA) of its PTCIP to not equip a track segment that the railroad was initially, but may no longer be, required to implement a PTC system. If a particular track segment included in a PTCIP no longer carries PIH traffic, and its PTC system implementation is scheduled, but not yet effectuated, then the host railroad might avoid actual PTC system implementation by filing a supported RFA for FRA approval. Each such RFA must be supported with the data defined under §§ 236.1005(b)(2) and (b)(4)(i), and satisfy the two qualifying tests that were promulgated under FRA's statutory authority to require PTC to be installed on lines in addition to those required to be equipped by RSIA. If a track segment fails either of these tests, FRA would deny the request, thus requiring PTC system implementation on the line segment.
The first test, proverbially known as the "alternative route analysis," was initially codified at § 236.1005(b)(4)(i)(A), and subsequently moved to a new section, § 236.1020. Under this test, the railroad must establish that current or prospective rerouting to one or more alternative track segments is justified. If a railroad reroutes all PIH materials off of a track segment requiring PTC system implementation under the 2008 baseline, and onto a new line, PTC system implementation on the initial line may not be required if the new line would have substantially the same overall safety and security risk as the initial line, assuming PTC implementation on both lines. If the initial track segment is determined to pose less overall safety and security risks under this analysis, then a PTC system must still be installed. PTC system implementation may also be required on the new line if it meets the 5 million gross ton of annual traffic threshold and does not qualify under the de minimis PIH risk exception of the rule.

The second test that the railroad must satisfy in order to avoid having to install PTC on a track segment requiring implementation under the 2008 baseline is the so-called "residual risk test." Under this test, the railroad must show that the remaining risk on the 2008 line—pertaining to events that can be prevented or mitigated in severity by a PTC system—is less than the national average equivalent risk per route mile on track segments required to be equipped with PTC systems due to statutory reasons other than passenger traffic presence. When FRA issued its PTC rule amendments on September 27, 2010, FRA indicated that it was delaying the effective date of

§ 236.1005(b)(4)(i)(A)(2)(iii), as revised under § 236.1020, pending the completion of a separate rulemaking to determine how residual risk is to be determined.

2.2 Litigation, Executive Order 13563, and Congressional Hearings

After FRA issued its first PTC rule on January 15, 2010, and denied petitions for reconsideration on July 8, 2010, the Association of American Railroads (AAR) filed a petition for review of the rule with the U.S. Court of Appeals for the District of Columbia Circuit. Once FRA issued its PTC final rule amendments, AAR filed a petition for review of those amendments on October 5, 2010. The court consolidated those two petitions on October 22, 2010.

In its brief, AAR challenged FRA's determination to use 2008 as the baseline year, arguing that it rests on a fundamental legal error and was arbitrary and capricious. The brief also contests § 236.1029(f), which requires that each locomotive crewmember be able to use the PTC display to receive the same PTC information displayed in the same manner and execute any functions necessary to that crew member's duties. AAR claimed that § 236.1029(f) is not supported by substantial evidence and that FRA acted in an arbitrary and capricious manner in adopting it.

After the parties fully briefed the issues, President Obama issued Executive Order 13563 on January 18, 2011 (76 Fed. Reg. 3821 (Jan. 21, 2011)), which outlined a plan to improve regulations and regulatory review. According to the Order, it is intended to reaffirm and build upon governing principles of contemporary regulatory review, including Executive Order 13563, by requiring Federal agencies when issuing safety regulations to design the regulations so that they are cost-effective, evidence-based, and compatible with economic growth, job creation, and competitiveness. The President's plan recognizes that these principles apply to both new and existing regulations. To that end, Executive Order 13563 requires agencies to review existing significant regulations to determine if they are outmoded, ineffective, insufficient, or excessively burdensome. FRA recognizes that the costs associated with PTC rule compliance outweigh the safety benefits by about 20:1 and, therefore, it is appropriate to reexamine whether FRA should require the installation of PTC on lines that will not be carrying PIH traffic or regularly scheduled passenger service as of December 31, 2015.

FRA and AAR entered into a settlement agreement on March 2, 2011 (Settlement Agreement). The terms and conditions of the settlement agreement included the joint filing of a motion to hold the Petition for Review in abeyance pending the completion of the instant rulemaking. That motion was filed on March 2, 2011, and was granted by the court on March 3, 2011.

The Settlement Agreement further provides that FRA will issue two NPRMs. The first NPRM will address one of the two issues involved in the lawsuit, namely whether the PTC rule should be amended by eliminating the two aforementioned tests that would potentially require PTC to be installed on track segments not specifically required to be equipped by Congress. The accompanying NPRM meets this requirement. The Settlement Agreement provides that upon the completion of the instant rulemaking proceeding, the parties will determine whether to file a joint motion to dismiss the lawsuit in its entirety. The Settlement Agreement also states that FRA is to issue a second NPRM that will address the issues of how to handle en route failures of PTC-equipped trains, circumstances under which a signal system may be removed after PTC

installation, and whether yard movements and certain other train movements should qualify for a *de minimis* exception to the PTC rule. This second NPRM will also address any other issues that might be raised by interested parties in a properly filed petition for rulemaking under 49 CFR part 211. These issues are not part of this NPRM and FRA is not seeking comment focused exclusively on these issues at this time, but seeks comments on those issues as they affect either this analysis, or the accompanying NPRM. The settlement agreement notes that FRA will consider all comments submitted during the rulemaking comment periods on both NPRMs in determining whether to issue amendments to the PTC rule and, if so, the contents of those amendments, and FRA will seek comments addressing issues raised by subsequent NPRMs at the time they are published.

On March 17, 2011, FRA and AAR testified before the Subcommittee on Railroads, Pipelines, and Hazardous Materials, Committee on Transportation and Infrastructure, U.S. House of Representatives. In addition to reporting on the Settlement Agreement, FRA's testimony discussed PTC system implementation planning and progress made thus far and highlighted the various ways that FRA has assisted the industry in meeting the statutory and regulatory goals. In particular, FRA has supported PTC implementation by developing and approving certain implementation exceptions, providing technical assistance, and granting financial assistance. During its testimony, made jointly with Norfolk Southern Railway (NS), AAR asserted that, "If unchanged, the 2008 base-year provision means railroads would have to spend more than $500 million in the next few years to deploy PTC on more than 10,000 miles of rail lines on which neither passenger nor TIH materials will be moving in 2015."[1] FRA understands AAR to assume that these 10,000 miles would not require PTC implementation because they would not be able to pass the alternative route analysis and residual risk analysis tests. If this is not correct, FRA seeks AAR's clarification.

However, upon its own analysis, FRA assumes that 50 percent of the 10,000 miles would be able to pass both tests with the implementation of mitigation measures. FRA seeks comment on this assumption. Under the regulatory impact analysis (RIA) that accompanied the PTC final rule, FRA estimated that the railroads would need to implement PTC systems on approximately 70,000 miles of track. However, PTC system implementation could be avoided on 3,204 miles of those 70,000 miles of track because PIH materials traffic will have ceased by 2015 and the subject track segments would pass the residual risk analysis and alternative route analysis tests. During the earlier rulemakings, no entity, including AAR and NS, challenged or otherwise commented on these conclusions.

FRA also estimated, in analyzing the final rule, that PTC system implementation could be avoided on 304 miles of track because PIH tonnage will fall below 5 million gross tons per year,

[1] Hearing Before the Subcommittee on Railroads, Pipelines, and Hazardous Materials of the Transportation and Infrastructure Committee, U.S. House of Representatives, 112th Cong. (2011) (Joint statement of Edward R. Hamberger, President and Chief Executive Officer of the AAT, and Mark D. Manion, Executive Vice President and Chief Operating Officer of the Norfolk Southern Railway, on behalf of the AAR's member railroads) [hereinafter AAR Congressional Testimony].

or passenger service would end so that neither of the two tests above would apply. Between the two categories, FRA estimated that railroads could exclude more than 3,500 miles. Assuming that the 3,500 miles represents about 50% of those tracks where PIH materials traffic will have ceased, FRA was implicitly estimating that there would be about 7,000 miles of track where PIH materials traffic will have ceased. FRA seeks comment on its earlier and newly presented assumptions regarding where PIH materials traffic will have ceased. The AAR and its members appear to have been more effective in reducing PIH materials traffic than FRA had initially estimated based on AAR's Congressional Testimony and subsequent submissions to FRA. In its analysis of this NPRM, FRA estimates that PIH traffic will cease on 10,000 miles of track on which PTC systems would have been required had the traffic not ceased. FRA considers cases where 7,000 miles, 10,000 miles and, 14,000 miles of track might be excluded from PTC requirements because of changes in PIH traffic. As FRA was completing its analysis of this proposal, AAR submitted data that indicates its member railroads believe that they can cease PIH traffic on 11,128, of which 9,566 miles have no passenger traffic. Some of the passenger traffic miles may later qualify for exclusion from the system on which PTC is required. FRA seeks comments and information on the accuracy and likelihood of estimated changes in PIH traffic.

3.0 Section-by-Section Analysis

Unless otherwise noted, all section references below refer to sections in Title 49 of the Code of Federal Regulations. FRA seeks comments on all aspects of this analysis, including any costs and benefits that may not have been considered in this analysis, and particularly seeks comments on the time frame for installation, maintenance, and realization of costs and benefits.

3.1 Proposed amendments to Title 49 Code of Federal Regulations Part 236

Section 236.1003 Definitions

FRA currently defines PIH materials within the rule text at § 236.1005(b)(1)(i), which some may find difficult to locate. Accordingly, for the purposes of clarity, FRA proposes to add the definition for PIH materials to the definitions section of Subpart I. The inclusion of this definition in § 236.1003 would not change the meaning of the term as understood under § 236.1005(b)(1)(i) or its cross-referenced §§ 171.8, 173.115, and 173.132. This amendment would create no new benefits or costs.

Section 236.1005 Requirements for Positive Train Control systems

In the accompanying rulemaking, FRA makes proposals regarding the alternative route analysis and the residual risk analysis tests. When initially published on January 15, 2010, these provisions were included in § 236.1005(b). On September 27, 2010, FRA issued amendments, moving the text to a new section, § 236.1020, and providing more clarifying language. However, to ensure continuity and understanding, § 236.1005 contained various cross-references to § 236.1020. As indicated below, FRA is proposing to eliminate § 236.1020. Accordingly, FRA also proposes rule text changes to § 236.1005 by removing those cross-references. This amendment to § 236.1005 would create no new benefits or costs.

Section 236.1020 Exclusion of track segments for implementation due to cessation of PIH materials service or rerouting

As previously noted, the PTC rule requires that, for each RFA seeking to exclude a track segment from PTC system implementation due to the cessation of PIH materials traffic, a railroad must satisfy both an alternative route analysis, and eventually a residual risk analysis test in order to secure FRA's approval.

FRA's cost benefit analysis of the PTC rule indicates that the railroads will incur approximately $21.60 in PTC costs for each $1 in PTC safety benefits over a 20-year period at a discount rate of 7 percent, or $19.49 in PTC costs for each $1 in PTC safety benefits over a 20-year period at a discount rate of 3 percent. The AAR in its Congressional Testimony testified that (1) 2010 was the safest year for America's railroads, (2) railroads have lower employee injury rates than most other major industries, (3) only around 4 percent of all train accidents on Class I main lines are likely to be prevented by PTC systems, and (4) there are many far less costly ways to provide greater improvements in rail safety than through the implementation of PTC on lines not required by Congress to be equipped. According to the testimony, if the PTC rule remains unchanged, railroads may have to spend more than $500 million in the next few years to deploy PTC on more than 10,000 miles of rail lines on which neither passenger nor PIH materials will be moving in 2015. Benefits and costs would result from eliminating the requirements to perform these tests on segments to be removed from the mandatory PTC network. In addition to eliminating the procedural burden, relief would come from not installing PTC on the segments that would no longer require PTC installation. Further, some cost-saving benefits may accrue from no longer implementing mitigation of residual risk on some segments that are removed from the PTC network. That is railroads that were planning to reduce risk in order to pass the second test, through implementation of other risk mitigation tools, would no longer have to make such investments. Some accident-reduction benefits would also be foregone as such mitigation tools would no longer be implemented. FRA assumes in this analysis that on average the accident reduction from mitigation, which could result from enhancements of other accident prevention strategies, including operating practices and track safety, would be at least as great as the benefits foregone by excluding the track from the PTC network. FRA seeks comment on difference between the accident reduction benefits from mitigation and the accident reduction benefits from PTC implementation.

While FRA believes that the alternative analysis and residual risk tests are legally sustainable, the agency agrees with the railroads that requiring these tests could potentially require the installation of PTC at a great cost to the railroads. FRA also recognizes that the railroads have much work to do to install interoperable PTC systems in accordance with the Congressional mandate. FRA is, therefore, proposing to eliminate the tests that would potentially require the installation of PTC on lines not mandated by Congress. *FRA seeks comments on whether to maintain, amend, or remove the alternative route analysis from the PTC rule. FRA also seeks comments on whether to develop or remove the residual risk analysis. In addition, FRA seeks comments on the economic impacts of removing or amending these two tests.* If FRA were to remove these requirements, it proposes doing so by eliminating § 236.1020 as it currently exists. While FRA will consider removal of these analyses from the PTC rule, FRA reserves its statutory and regulatory authority to require PTC system implementation on additional track

segments in the future based on risk levels or other rational bases.

3.2 Analysis of benefits and costs

As the NPRM reduces burdens imposed by an earlier rulemaking, the benefits of the NPRM are a reduction in regulatory costs, and the costs of the NPRM are a reduction in regulatory benefits. To help avoid confusion, sections are labeled with benefit or cost of the final rule as well as the proposed rule.

In addition, some distributional impacts may result from elimination of the two tests, which may result in certain lines required to be equipped with PTC solely because they carry passenger traffic. For example, a line along which both passengers and PIH materials moved in 2008, but along which PIH traffic is discontinued prior to 2015, is required to have PTC under the 2010 PTC rule due to the movement of both passenger trains and PIH carrying trains in 2008, but would only be required to have PTC under the proposal due to the movement of passengers on the line.

3.3 Benefits of the proposed rule (relevant costs of the final PTC rule)

In its Congressional testimony, AAR said that its members (Class I railroads) would be able to reduce the required installation of PTC on 10,000 miles of their systems. AAR subsequently submitted data to FRA showing as much as 15,355 miles of their systems might be excludable. The AAR later clarified that 11,128 miles would excludable under the proposal to eliminate the two tests and submitted a revised data set. AAR noted that the additional potential excludable mileage contained in the initial submission was dependent on changes in customer demand as well as a broadening of the existing *de minimis* exceptions as requested in its petition to amend FRA's rule.

FRA reviewed the original AAR data when it was first submitted and found that less than 14,000 miles of the 15,355 miles might be excludable under the proposed rule, but that the remaining miles not only had passenger traffic, but also had sufficient volumes to preclude any Main Line Track Exclusion Addendum (MTEA) for the passenger service. Given the uncertainty associated with the initial data set, FRA chose to analyze two cases for sensitivity analysis in addition to the expected case. Thus, for the *high case* analysis, FRA assumed 14,000 miles could potentially be excluded. Although approximately 1,100 of those miles would not meet the criteria for being excluded because they carry passenger trains, for purposes of this analysis FRA assumed that the railroads would be able to pursue an exclusion of those miles from main track, and therefore from the requirement to install PTC, under provisions applying to passenger service, but would then require some kind of mitigation on those miles. This was done purely for analytical purposes and by no means assures that FRA would grant any such exclusion(s). FRA assumed 10,000 excludable miles (of which 550 miles are passenger miles that require some mitigation, based on the AAR's public estimates and a review of the data initially submitted by AAR) as the *expected case* (base case). FRA also assumed 7,000 excludable miles (with no passenger miles) as the *low case*. The 7,000 miles was loosely based on FRA's assumption that 3,204 miles would have passed the two tests in absence of this rulemaking with the implementation of some kind of mitigation to reduce the risk to a level below the threshold of the final rule. This is also

consistent with an assumption that 50 percent of the miles from which PIH is rerouted or eliminated would have passed the two tests under the existing PTC rule. FRA requests comments on the number of passenger miles that would require some mitigation in order to meet the MTEA criteria.

Based on the more recent information submitted by AAR, it seems that railroads would indeed be able to exclude 11,128 miles under the proposed rule. Although this estimate is more robust (less uncertain) than the initial estimate of 10,000 excludable miles, FRA believes that the outcome and findings of the analysis conducted using 10,000 miles would be unchanged. In the interest of expediting this rulemaking, which impacts the railroads ability to meet the statutory deadline for implementing PTC in a more cost effective manner, FRA did not adjust the base case. The two additional cases analyzed to determine sensitivity have also been retained as they continue to be meaningful, as well. FRA continues to believe there is a possibility that railroads will be able to exclude more miles based on changes in customer demand or otherwise and likewise that there is possibility that railroads may not be able to exclude as many miles as they currently anticipate due to unforeseen causes. Based on comments and information received in response to the NPRM and this Regulatory Impact Analysis, FRA may adjust the scenarios analyzed at the final rule stage.

In its analysis of the final rule, FRA estimated that installation of PTC requires about $50,000 per mile in wayside costs along freight lines, in 2009 dollars. AAR has testified and commented that wayside improvements needed for PTC cost $50,000 per mile. FRA is using the estimate of $50,000 per mile in initial costs for purposes of this analysis. FRA is using 2009 dollars throughout this analysis, to aid in comparison to the analysis of the PTC rule, and to avoid inflating accident consequences at a time when FRA continues to use the same value of a statistical life as FRA used in analyzing the 2010 PTC rule.

FRA believes that some of the mileage under all three scenarios would be able to qualify for a main track exclusion under the 2010 PTC rule, but would require mitigation in order to have the exclusion approved. Mitigation treatment measures could include things such as reduction in train operating speeds improvements in track physical infrastructure, elimination of at grade rail - highway or rail -rail crossings, elimination of switches, changes in traffic volumes, changes in the underlying method of operation, introduction of broken rail detection systems, addition of hot box detectors, and addition of other hazard detectors (slide and intrusion detectors, high water detectors). Other measures may include more rigorous operational efficiency testing and training that adapts to observed concerns, temporal separation, and a more rigorous track maintenance program. FRA seeks comments regarding the difference between accident reduction benefits from PTC and accident reduction benefits from other mitigations.

In the economic analysis of the 2010 PTC rule, FRA estimated that 3,204 miles would be excludable from the PTC network if the railroads adopted some mitigation that allowed them to pass the second of the two tests that FRA is now proposing to eliminate, at an average cost of $10,000 per mile. FRA continues to believe that some line segments would have passed the tests with the implementation of some mitigation and is using the average cost of $10,000 per mile in initial costs for segments that might have received mitigation treatment to that end. FRA seeks comment on this assumption. This value (in 2009 dollars) has been subject to public comment,

both at the NPRM stage and in the final rule for the 2010 PTC rule, and there were no objections to use of the value. FRA believes the railroads and their customers have been able to divert or eliminate PIH traffic from more mileage than FRA had assumed in analyzing the PTC rule. The reduction in PIH traffic is partially due to a change in the shipment of commodities, which is an alternative approach to compliance that FRA had not considered in analyzing the PTC rule. For example, On November 2, 2009, the Clorox Company announced that it was transitioning its operations to produce end product bleach from transported high strength bleach instead of from chlorine gas, a PIH material.

For purposes of this analysis, FRA estimates that half of the mileage from which PIH is eliminated or rerouted would have passed both tests under the 2010 PTC rule, and would have qualified for exclusion, but would have required some mitigation to do so. FRA chose 50 percent as a best estimate, because the affected segments would need to pass two tests, one of which has never been fully developed. The first test applies to rerouted PIH traffic, but not to eliminated PIH traffic. Under that test, the new route with PTC must be at least as safe as the existing route would have been if the existing route also been equipped with PTC. FRA believes that more than half of the rerouted traffic could pass this test, in part because railroads are trying to diminish risk with their rerouting. The second test, that would apply to both segments from which PIH is rerouted and segments from which PIH is eliminated, is that residual risk (with mitigations, if needed) is not higher than the average risk for Class I lines in the United States that are required to be equipped with PTC because of gross tonnage and the presence of PIH traffic. As noted below in the discussion of costs through increased accident risk, the segments in question, based on FRA's review of the initial AAR data, appear on average to have lower than average traffic volumes than an average of all segments subject to the PTC requirement. FRA never fully developed that test, but FRA believes that some segments would have passed that test, although many might have needed some kind of mitigation. For purposes of this analysis, FRA continues to estimate the cost of mitigation at $10,000 per mile in initial costs on the average and applies this to half of the segments subjected to the two tests. In other words, this analysis assumes that half of the mileage that may be excludable under the proposed rule would have been excludable under the 2010 PTC rule with some form of mitigation implemented, at an average cost of $10,000 per mile.

Under the expected case, the assumptions presented mean that the mileage excluded (but that would have required mitigation) was 50 percent of 10,000 miles, or 5,000 miles. Therefore, the cost reduction (before the impact of passenger service is considered) would be $10,000 per mile, multiplied by 5,000 miles, for a total of $50 million. However, FRA notes from data submitted by AAR that many of the additional miles have passenger traffic. FRA did not consider those segments where an MTEA would not be available for the passenger traffic; but did consider segments that appeared to be eligible for an MTEA, though probably with some kind of mitigation. FRA used the same cost to estimate mitigation costs for these lines as well. In the expected case, FRA estimates that 550 miles of passenger routes would be affected and thus still requiring some mitigation to meet the MTEA criteria and offsetting the initial cost savings by 550 miles multiplied by $10,000, for a total of $5.5 million. In the expected case, the savings from eliminating the requirement for mitigation on the lines that would have passed the two tests with some mitigation would be $44.5 million in initial costs ($50 million minus $5.5 million). All savings on initial costs would then be coupled with avoided maintenance costs throughout

the remainder of the period analyzed.

FRA also notes that the mileage assumed to be affected by mitigation costs avoided is 3,500 miles at $10,000 per mile in the low case and 7,000 miles at $10,000 per mile in the high case.

As described above, under the 2010 PTC rule, FRA believes that only 50 percent of the segments from which PIH is removed would qualify for exclusion. The remaining segments would still require PTC installation. Under the accompanying proposal the two tests would no longer apply, so all of the segments would be excludable from the PTC network. For those segments that could not be excluded under the PTC rule, but that could be excluded under the proposal, the reduced initial cost would be the full cost of PTC wayside installation, or $50,000 per mile. Therefore, in the expected case of 10,000 miles, 5,000 would have been excludable under the PTC rule (but would have required some mitigation), and the remaining 5,000 miles would now become excludable, with a reduction in initial costs of $50,000 per mile. The initial cost savings from not installing PTC on these segments would be 5,000 miles multiplied by $50,000 per mile, for a total of $250 million.

In this analysis, FRA assumes that the segments removed from the PTC network are relatively lower priority segments for purposes of PTC installation, so costs are avoided in the last 2 years of PTC implementation, half in 2014 and half in 2015.

In discussions with FRA at the RSAC working group that developed the PTC rule, Class I railroads indicated that they would equip all of their over-the-road locomotives with PTC in order to avoid difficulties in managing power units. FRA believes this still holds true under the accompanying proposal. Further, FRA is not aware of any way to decrease any expenditures on central systems or development. FRA believes there will be little or no change on Class I systems in costs to equip locomotives or to develop or install central systems. There is a possibility that some Class I railroads may find a way to equip fewer locomotives in some situations where a captive locomotive fleet makes sense.

A more likely, but relatively small impact is that some Class II or III railroads may be able to avoid equipping locomotives under the proposed rule because the portion of the Class I railroad system on which they have trackage rights would no longer be PTC-equipped. (This is analyzed in the following section.) Further, although the costs of equipping at railroad grade crossings (diamond crossings) is included in wayside costs, there may be some cases in which the Class II or III railroads are required to pay for wayside upgrades at the crossing. To the extent that the Class I railroad's track is removed from the PTC network under this proposal, the portion of the burdens falling on at-grade railroad crossings will also diminish. In data submitted to FRA, it appears that 19 crossings involving Class II or III railroads would be affected in the high case. FRA uses that data to estimate that 13 crossings involving Class II or III railroads would be affected in the expected case, and to estimate that 3 crossings involving Class III railroads would be affected in the expected case, based on data submitted by AAR.

3.4 Locomotive cost savings (benefit of the proposed rule)

In analyzing the economic impacts of the 2010 PTC rule, FRA did not develop a separate

estimate of the number of locomotives affected that belong to Class II and III railroads. They were included in the industry total. However, in analyzing the impact on small entities for purposes of compliance with the Regulatory Flexibility Act, FRA estimated that 240 locomotives belonging to small entities (Class III railroads) would be affected. For the purposes of this analysis, FRA estimates that three times as many locomotives (720) belonging to Class II railroads would be affected, for a total of 960 Class II and Class III locomotives affected. This includes locomotives operating over either Class I railroads or passenger railroads. FRA requests comments regarding this assumption. AAR's aforementioned Congressional testimony indicates that, without exclusions, approximately 73,000 of their miles would be affected. Therefore, if 14,000 miles were excluded as a result of this proposal (the high case), the total mileage impacted would decrease to 56,000 miles, declining by 20 percent. FRA assumes that if PTC mileage were to decline by 20 percent, then Class II and Class III railroads could decrease the number of locomotives to be equipped by 16 percent (80 percent of 20 percent), or 154 locomotives, 39 of which belong to Class III railroads. Applying similar logic[2] will yield a reduction of 110 locomotives equipped under the expected case, of which 28 belong to Class III railroads. Also using similar logic[3] will yield a reduction of 77 locomotives under the low case, of which 19 belong to Class III railroads. In analyzing the 2010 PTC rule, FRA estimated the cost to equip a locomotive at $55,000. Therefore, the initial cost savings related to equipping locomotives would be $6,050,000 for the expected case, $8,470,000 for the high case, and $4,235,000 for the low case.

3.5 Maintenance cost savings (benefit of the proposed rule)

As in the 2010 PTC final rule analysis, FRA assumes that annual maintenance costs are 15 percent of the costs of the installed system as of the end of the previous year. Maintenance costs include training personnel to use and maintain the system, software management plans and implementation, inspection, repair, and testing, replacement parts cost and labor, and requalification of systems after original equipment parts are no longer manufactured, so new hardware must be introduced. The absolute costs of maintenance can be much larger than the original costs of procuring a system. The discounted costs are also larger, but not by as much as the undiscounted costs, because maintenance costs can only occur after a system is procured. The lower the discount rate, the greater the proportion of total costs attributable to maintenance. In this analysis, the initial procurements are evenly divided between 2014 and 2015, and maintenance costs are 15 percent of the installed base. Thus it does not matter which case is examined. Maintenance costs avoided are 59.04 percent of the total costs avoided using a 7 percent discount rate, and 65.87 percent of the total costs avoided using a 3 percent discount rate.

3.6 Timing of savings

FRA assumes that the segments withdrawn from the PTC network under the proposal would have been lower priority segments for purposes of installation; therefore, the savings are toward the end of the 5-year installation period. FRA assumes that half of the initial system savings is in the last year of installation (2015) and the other half in the prior year (2014).

[2] (10,000 miles/14,000 miles) x 154 locomotives.
[3] (7,000 miles/14,000 miles) x 154 locomotives.

3.7 At-grade railroad crossings

The cost savings associated with at grade railroad crossing wayside improvements is included in the wayside cost discussion above, although in some instances the Class I railroad might not have been the party responsible for the costs of equipping the crossing with PTC, so the costs might have fallen on a Class II or III railroad. In analyzing the impacts on small entities for the 2010 PTC rule, FRA estimated operational costs at railroad crossings to be $219,000 per year for Class III railroads. Finally, Class III railroads would avoid operational costs associated with having to reduce operating speeds to cross over two railroad-to-railroad crossings at an annual cost of $43,800. These benefits to small railroads are a subset of the total benefits of reduced wayside costs described above. The cost impacts are discussed in the analysis of impacts on small entities contained in the preamble of the NPRM. FRA estimates that five small railroads will be affected by the reduced requirement to equip locomotives, and another two will be affected by the reduced requirements to take actions at railroad crossings, for a total of seven affected railroads. The total of seven affected Class III railroads is not a substantial number of small entities, given that there are 674 small railroads.

3.8 Total initial cost saving benefits

The total initial cost savings is the sum of the mitigation costs avoided: $44.5 million for the expected case, $59 million for the high case, or $35 million for the low case; plus the initial wayside costs avoided: $250 million for the expected case, $350 million for the high case, or $175 million for the low case; plus locomotive costs avoided: $6.05 million for the expected case, $8.47 million for the high case, or $4.235 million for the low case. These add up to $300,550,000 for the expected case, $402,970,000 for the high case, or $223,735,000, for the low case.

Table 1. Summary of Initial Costs Avoided

PTC miles affected	
Expected case	*10,000*
High case	14,000
Low case	7,000
PTC rule mitigation cost/mile	$10,000
Percent of miles avoidable under 2010 PTC rule	50%
Miles of mitigation installation avoided	
Expected case	*5,000*
High case	7,000
Low case	3,500
Added mitigation, expected case	*550*
Added mitigation, high case	1,100
Total mitigation installation costs avoided	
Expected case	*$44,500,000*
High case	$59,000,000
Low case	$35,000,000
PTC wayside installation costs per mile	$50,000
PTC miles avoided, expected case	*5,000*
PTC miles avoided, high case	7,000
PTC miles avoided, low case	3,500
PTC wayside installation costs avoided	
Expected case	*$250,000,000*
High case	$350,000,000
Low case	$175,000,000
PTC analysis -- locomotive installation cost	$55,000
Locomotives affected, expected case	*110*
Locomotives affected, high case	154
Locomotives affected, low case	77
Initial locomotive savings, expected case	*$6,050,000*
Initial locomotive savings, high case	$8,470,000
Initial locomotive savings, low case	$4,235,000
Total initial costs avoided	
Expected case	*$300,550,000*
High case	$402,970,000
Low case	$223,735,000

As in the analysis of the 2010 PTC rule, FRA also assumed that annual maintenance costs would total 15 percent of the initial installation costs for wayside components as well as locomotive components.

FRA then used these values as input to estimate discounted and annualized costs for expected, high, and low cases for the first 20 years at both 7 percent and 3 percent discount rates.

Table 2a. Expected Case Benefits– Total Costs Avoided, 7% Discount Factor

Year	Discount Factor	Initial Costs Avoided (wayside & locomotive)	Maintenance Avoided	Annual Costs Avoided	Discounted Costs Avoided
2012	1	$0	$0	$0	$0
2013	0.9345794	$0	$0	$0	$0
2014	0.8734387	$150,275,000	$0	$150,275,000	$131,256,005
2015	0.8162979	$150,275,000	$22,541,250	$172,816,250	$141,069,538
2016	0.7628952	$0	$45,082,500	$45,082,500	$34,393,223
2017	0.7129862	$0	$45,082,500	$45,082,500	$32,143,199
2018	0.6663422	$0	$45,082,500	$45,082,500	$30,040,373
2019	0.6227497	$0	$45,082,500	$45,082,500	$28,075,115
2020	0.5820091	$0	$45,082,500	$45,082,500	$26,238,425
2021	0.5439337	$0	$45,082,500	$45,082,500	$24,521,893
2022	0.5083493	$0	$45,082,500	$45,082,500	$22,917,657
2023	0.4750928	$0	$45,082,500	$45,082,500	$21,418,371
2024	0.444012	$0	$45,082,500	$45,082,500	$20,017,169
2025	0.4149644	$0	$45,082,500	$45,082,500	$18,707,635
2026	0.3878172	$0	$45,082,500	$45,082,500	$17,483,771
2027	0.362446	$0	$45,082,500	$45,082,500	$16,339,973
2028	0.3387346	$0	$45,082,500	$45,082,500	$15,271,003
2029	0.3165744	$0	$45,082,500	$45,082,500	$14,271,965
2030	0.2958639	$0	$45,082,500	$45,082,500	$13,338,285
2031	0.2765083	$0	$45,082,500	$45,082,500	$12,465,687
				Total	$619,969,287
			Annualized Costs Avoided		$58,520,715

Table 2b. Expected Case Benefits–Costs Avoided, 3% Discount Factor

Year	Discount Factor	Initial Costs Avoided (wayside & locomotive)	Maintenance Avoided	Annual Costs Avoided	Discounted Costs Avoided
2012	1	$0	$0	$0	$0
2013	0.970873786	$0	$0	$0	$0
2014	0.942595909	$150,275,000	$0	$150,275,000	$141,648,600
2015	0.915141659	$150,275,000	$22,541,250	$172,816,250	$158,151,350
2016	0.888487048	$0	$45,082,500	$45,082,500	$40,055,217
2017	0.862608784	$0	$45,082,500	$45,082,500	$38,888,561
2018	0.837484257	$0	$45,082,500	$45,082,500	$37,755,884
2019	0.813091511	$0	$45,082,500	$45,082,500	$36,656,198
2020	0.789409234	$0	$45,082,500	$45,082,500	$35,588,542
2021	0.766416732	$0	$45,082,500	$45,082,500	$34,551,982
2022	0.744093915	$0	$45,082,500	$45,082,500	$33,545,614
2023	0.722421277	$0	$45,082,500	$45,082,500	$32,568,557
2024	0.70137988	$0	$45,082,500	$45,082,500	$31,619,958
2025	0.68095134	$0	$45,082,500	$45,082,500	$30,698,989
2026	0.661117806	$0	$45,082,500	$45,082,500	$29,804,843
2027	0.641861947	$0	$45,082,500	$45,082,500	$28,936,741
2028	0.623166939	$0	$45,082,500	$45,082,500	$28,093,924
2029	0.605016446	$0	$45,082,500	$45,082,500	$27,275,654
2030	0.587394608	$0	$45,082,500	$45,082,500	$26,481,217
2031	0.570286027	$0	$45,082,500	$45,082,500	$25,709,920
				Total	$818,031,752
			Annualized Costs Avoided		$54,984,583

Table 2c. High Case Benefits–Costs Avoided, 7% Discount Factor

Year	Discount Factor	Initial Costs Avoided (wayside & locomotive)	Maintenance Avoided	Annual Costs Avoided	Discounted Costs Avoided
2012	1	$0	$0	$0	$0
2013	0.934579	$0	$0	$0	$0
2014	0.873439	$201,485,000	$0	$201,485,000	$175,984,802
2015	0.816298	$201,485,000	$30,222,750	$231,707,750	$189,142,544
2016	0.762895	$0	$60,445,500	$60,445,500	$46,113,583
2017	0.712986	$0	$60,445,500	$60,445,500	$43,096,806
2018	0.666342	$0	$60,445,500	$60,445,500	$40,277,389
2019	0.62275	$0	$60,445,500	$60,445,500	$37,642,420
2020	0.582009	$0	$60,445,500	$60,445,500	$35,179,831
2021	0.543934	$0	$60,445,500	$60,445,500	$32,878,347
2022	0.508349	$0	$60,445,500	$60,445,500	$30,727,427
2023	0.475093	$0	$60,445,500	$60,445,500	$28,717,222
2024	0.444012	$0	$60,445,500	$60,445,500	$26,838,525
2025	0.414964	$0	$60,445,500	$60,445,500	$25,082,734
2026	0.387817	$0	$60,445,500	$60,445,500	$23,441,807
2027	0.362446	$0	$60,445,500	$60,445,500	$21,908,231
2028	0.338735	$0	$60,445,500	$60,445,500	$20,474,982
2029	0.316574	$0	$60,445,500	$60,445,500	$19,135,497
2030	0.295864	$0	$60,445,500	$60,445,500	$17,883,642
2031	0.276508	$0	$60,445,500	$60,445,500	$16,713,684
				Total	$831,239,473
			Annualized Costs Avoided		$78,463,126

Table 2d. High Case Benefits–Costs Avoided, 3% Discount Factor

Year	Discount Factor	Initial Costs Avoided (wayside & locomotive)	Maintenance Avoided	Annual Costs Avoided	Discounted Costs Avoided
2012	1	$0	$0	$0	$0
2013	0.970874	$0	$0	$0	$0
2014	0.942596	$201,485,000	$0	$201,485,000	$189,918,937
2015	0.915142	$201,485,000	$30,222,750	$231,707,750	$212,045,415
2016	0.888487	$0	$60,445,500	$60,445,500	$53,705,044
2017	0.862609	$0	$60,445,500	$60,445,500	$52,140,819
2018	0.837484	$0	$60,445,500	$60,445,500	$50,622,155
2019	0.813092	$0	$60,445,500	$60,445,500	$49,147,723
2020	0.789409	$0	$60,445,500	$60,445,500	$47,716,236
2021	0.766417	$0	$60,445,500	$60,445,500	$46,326,443
2022	0.744094	$0	$60,445,500	$60,445,500	$44,977,129
2023	0.722421	$0	$60,445,500	$60,445,500	$43,667,115
2024	0.70138	$0	$60,445,500	$60,445,500	$42,395,258
2025	0.680951	$0	$60,445,500	$60,445,500	$41,160,444
2026	0.661118	$0	$60,445,500	$60,445,500	$39,961,596
2027	0.641862	$0	$60,445,500	$60,445,500	$38,797,666
2028	0.623167	$0	$60,445,500	$60,445,500	$37,667,637
2029	0.605016	$0	$60,445,500	$60,445,500	$36,570,522
2030	0.587395	$0	$60,445,500	$60,445,500	$35,505,361
2031	0.570286	$0	$60,445,500	$60,445,500	$34,471,224
				Total	$1,096,796,723
			Annualized Costs Avoided		$73,721,968

Table 2e. Low Case Benefits–Costs Avoided, 7% Discount Factor

Year	Discount Factor	Initial Costs Avoided (wayside & locomotive)	Maintenance Avoided	Annual Costs Avoided	Discounted Costs Avoided
2012	1	$0	$0	$0	$0
2013	0.934579	$0	$0	$0	$0
2014	0.873439	$111,867,500	$0	$111,867,500	$97,709,407
2015	0.816298	$111,867,500	$16,780,125	$128,647,625	$105,014,783
2016	0.762895	$0	$33,560,250	$33,560,250	$25,602,954
2017	0.712986	$0	$33,560,250	$33,560,250	$23,927,994
2018	0.666342	$0	$33,560,250	$33,560,250	$22,362,612
2019	0.62275	$0	$33,560,250	$33,560,250	$20,899,637
2020	0.582009	$0	$33,560,250	$33,560,250	$19,532,371
2021	0.543934	$0	$33,560,250	$33,560,250	$18,254,552
2022	0.508349	$0	$33,560,250	$33,560,250	$17,060,329
2023	0.475093	$0	$33,560,250	$33,560,250	$15,944,233
2024	0.444012	$0	$33,560,250	$33,560,250	$14,901,152
2025	0.414964	$0	$33,560,250	$33,560,250	$13,926,311
2026	0.387817	$0	$33,560,250	$33,560,250	$13,015,244
2027	0.362446	$0	$33,560,250	$33,560,250	$12,163,779
2028	0.338735	$0	$33,560,250	$33,560,250	$11,368,018
2029	0.316574	$0	$33,560,250	$33,560,250	$10,624,316
2030	0.295864	$0	$33,560,250	$33,560,250	$9,929,267
2031	0.276508	$0	$33,560,250	$33,560,250	$9,279,689
				Total	$461,516,648
			Annualized Costs Avoided		$43,563,907

Table 2f. Low Case Benefits–Costs Avoided, 3% Discount Factor

Year	Discount Factor	Initial Costs Avoided (wayside & locomotive)	Maintenance Avoided	Annual Costs Avoided	Discounted Costs Avoided
2012	1	$0	$0	$0	$0
2013	0.970874	$0	$0	$0	$0
2014	0.942596	$111,867,500	$0	$111,867,500	$105,445,848
2015	0.915142	$111,867,500	$16,780,125	$128,647,625	$117,730,801
2016	0.888487	$0	$33,560,250	$33,560,250	$29,817,847
2017	0.862609	$0	$33,560,250	$33,560,250	$28,949,366
2018	0.837484	$0	$33,560,250	$33,560,250	$28,106,181
2019	0.813092	$0	$33,560,250	$33,560,250	$27,287,554
2020	0.789409	$0	$33,560,250	$33,560,250	$26,492,771
2021	0.766417	$0	$33,560,250	$33,560,250	$25,721,137
2022	0.744094	$0	$33,560,250	$33,560,250	$24,971,978
2023	0.722421	$0	$33,560,250	$33,560,250	$24,244,639
2024	0.70138	$0	$33,560,250	$33,560,250	$23,538,484
2025	0.680951	$0	$33,560,250	$33,560,250	$22,852,897
2026	0.661118	$0	$33,560,250	$33,560,250	$22,187,279
2027	0.641862	$0	$33,560,250	$33,560,250	$21,541,047
2028	0.623167	$0	$33,560,250	$33,560,250	$20,913,638
2029	0.605016	$0	$33,560,250	$33,560,250	$20,304,503
2030	0.587395	$0	$33,560,250	$33,560,250	$19,713,110
2031	0.570286	$0	$33,560,250	$33,560,250	$19,138,942
				Total	$608,958,024
			Annualized Costs Avoided		$40,931,544

The costs that would be avoided under the proposed rule are presented in the table below. FRA analyzed the maintenance costs and found that under the expected case as well as the two additional scenarios analyzed to determine sensitivity, both for wayside and locomotive components, the maintenance costs were 59.04 percent of the total cost savings when discounted at 7 percent, and 65.87 percent of that total when discounted at 3 percent.

Table 3. Summary of Benefits–Costs Avoided (20 years)

Total of all Benefits				
	Total Discounted Benefits		Annualized Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	*$619,969,287*	*$818,031,752*	*$58,520,715*	*$54,984,583*
High Case	$831,239,473	$1,096,796,723	$78,463,126	$73,721,968
Low Case	$461,516,648	$608,958,024	$43,563,907	$40,931,544
1. Reduced Mitigation Costs, Including Maintenance				
	Total Discounted Benefits		Annualized Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	*$91,793,822*	*$121,119,324*	*$8,664,687*	*$8,141,121*
High Case	$121,704,169	$160,585,172	$11,488,013	$10,793,846
Low Case	$72,197,388	$95,262,390	$6,814,923	$6,403,129
2. Reduced Wayside Costs, Including Maintenance				
	Total Discounted Benefits		Annualized Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	*$515,695,631*	*$680,445,643*	*$48,678,019*	*$45,736,635*
High Case	$721,973,883	$952,623,900	$68,149,227	$64,031,290
Low Case	$360,986,942	$476,311,950	$34,074,614	$32,015,645
3. Reduced Locomotive Costs, Including Maintenance				
Discount Factor	7%	3%	7%	3%
Expected Case	*$12,479,834*	*$16,466,785*	*$1,178,008*	*$1,106,827*
High Case	$17,471,768	$23,053,498	$1,649,211	$1,549,557
Low Case	$8,735,884	$11,526,749	$824,606	$774,779

Given the large portion of total benefits comprised of maintenance costs avoided, these are separated out. The table below presents total maintenance cost savings for wayside and locomotive components.

Reduced Total Maintenance Costs				
Discount Factor	7%	3%	7%	3%
Expected Case	*$366,044,119*	*$538,860,239*	*$34,551,975*	*$36,219,872*
High Case	$490,782,893	$722,490,469	$46,326,433	$48,562,708
Low Case	$272,490,038	$401,137,566	$25,721,132	$26,962,745

4.0 Costs – Diminished Benefit of Accident Reduction

The costs associated with the proposed rule come from a reduction of the benefits that would have resulted from implementation of PTC components along certain lines beginning in 2015 and are comprised of foregone accident prevention benefits. In the analysis of the 2010 PTC rule, FRA estimated that the benefit in 2015 would have been $55,351,026 and in subsequent years it would have been $65,118,854. In order to estimate the cost impact of eliminating the two tests in this analysis, the reduced benefit of the 2010 PTC rule in the year 2015 is estimated to be half of the reduced benefit of each of the subsequent years beginning in 2016. Since half of the implementation costs avoided would have been incurred in 2014, and half in 2015, the safety impacts should be considered until 2015 and 2016, respectively. The track removal from the network would not affect the accident reduction that would have taken place in absence of this proposal until after it would have been placed in service.

The proposal to eliminate both tests for exclusion of PTC lines would not come close to eliminating the benefits of the PTC rule to the same extent as the costs for several reasons. For example, the "headline accidents" in the analysis of the PTC rule either involve a passenger train or a substantial release of PIH material, neither of which is likely to occur on the segments that would be withdrawn from the PTC network under the proposed rule. Headline accidents were 41.08 percent of the total accident reduction benefits in the analysis of the 2010 PTC rule, and other accidents comprised the remaining 58.92 percent—only the latter types of accidents are likely to be affected by the proposed rule. FRA seeks comment on the exclusion of headline accidents from foregone benefits of the proposed rule.

The rerouted traffic will not add to the risk on the lines they are rerouted to, as they will be rerouted either to PTC-equipped lines or to relatively low volume lines subject to the de minimis exception, hence to lines with equal or less risk. In other words the risk would be "transferred" from one line to another. However, the remaining traffic on lines no longer equipped with PTC would no longer benefit from the reduced risk.

In the 2010 PTC rule analysis, FRA estimated that PTC wayside components would be installed on roughly 70,000 miles, and AAR Congressional testimony also refers to a PTC network of 70,000 miles. Thus, this analysis also uses a 70,000 mile network as the basis for analysis. As with the cost savings analysis, the benefit reduction analysis presents the expected impacts of 10.000 miles excluded as well as the impacts associated with case in which 7,000 and 14,000 miles are excluded. In the high case, the railroads would reduce their PTC network mileage by 14,000 miles, which is 20 percent of the 70,000 mile network. (20 percent x 70,000 = 14,000) FRA, based on its review of the AAR submitted data, also assumed for this analysis that the segments from which PIH traffic is rerouted or eliminated have relatively less dense traffic, which reduces accident exposure, than the average segment along which PTC must be implemented due to the presence of PIH or passenger trains. Thus, FRA used an estimate of 60 percent of average risk for those segments. FRA requests comments on this assumption.

Therefore, in the high case, the risk increase would be 7.07 percent determined as follows:

58.92 percent (the non-headline accident percentage)
x 20 percent, (14,000 miles excluded divided by the total system of 70,000 miles)
x 60 percent (the relative accident exposure on those segments)
7.07 percent

This means that excluding the segments in the high case would increase risk by 7.07 percent of the total risk avoided as estimated in the analysis of the 2010 PTC rule. The value of the total risk avoided was $65,118,854 per year, beginning in 2016. Therefore, in the years when the full impact of the proposal eventuates, the increased accident risk would be $4,604,163 per year (7.07 percent of $65,116,854). This impact would occur in years 2016 and beyond. In 2015, only half the impact would occur, so the accident risk increase would be half that, or $2,302,082. Similar calculations were applied to the expected and low cases, but because the high case was a relatively even percentage (20 percent of the total system), FRA used the high case in this instance to illustrate the mechanics of the calculations. All the calculations are shown in the following table.

Table 4. Diminished Accident Benefit Reduction (Costs of the Proposed Rule)Accident Benefit Reduction			
From the 2010 PTC Rule			
Annual accident reduction	$65,118,854		
Total PTC miles		70,000	
Proportion of system			
	Expected Case	High Case	Low Case
	14.29%	20.00%	10.00%
Proportion of non-headline accidents			
	58.92%		
Relative traffic risk		60%	
Proportion of risk from PTC study			
	Expected Case	High Case	Low Case
	5.05%	7.07%	3.54%
Percent of benefit reduction in 2015		50%	
Annual PTC Benefit Reduction			
	Expected Case	High Case	Low Case
2015	*$1,644,344*	$2,302,082	$1,151,041
2016 and beyond	*$3,288,688*	$4,604,163	$2,302,082

These annual benefit reduction estimates were then used to calculate 20-year discounted and annualized costs at 7 percent and 3 percent, in Tables 5a and 5b.

Table 5a. Costs–Discounted Diminution of Accident Reduction, 7% Discount Factor (20 years)

		Current Annual Benefit			Discounted Annual Benefit		
	Discount	Expected	High	Low	Expected	High	Low
Year	Factor	Case	Case	Case	Case	Case	Case
2012	1	$0	$0	$0	$0	$0	$0
2013	0.934579	$0	$0	$0	$0	$0	$0
2014	0.873439	$0	$0	$0	$0	$0	$0
2015	0.816298	$1,644,344	$2,302,082	$1,151,041	$1,342,275	$1,879,184	$939,592
2016	0.762895	$3,288,688	$4,604,163	$2,302,082	$2,508,924	$3,512,494	$1,756,247
2017	0.712986	$3,288,688	$4,604,163	$2,302,082	$2,344,789	$3,282,705	$1,641,352
2018	0.666342	$3,288,688	$4,604,163	$2,302,082	$2,191,392	$3,067,949	$1,533,974
2019	0.62275	$3,288,688	$4,604,163	$2,302,082	$2,048,030	$2,867,242	$1,433,621
2020	0.582009	$3,288,688	$4,604,163	$2,302,082	$1,914,046	$2,679,665	$1,339,833
2021	0.543934	$3,288,688	$4,604,163	$2,302,082	$1,788,828	$2,504,360	$1,252,180
2022	0.508349	$3,288,688	$4,604,163	$2,302,082	$1,671,802	$2,340,523	$1,170,262
2023	0.475093	$3,288,688	$4,604,163	$2,302,082	$1,562,432	$2,187,405	$1,093,702
2024	0.444012	$3,288,688	$4,604,163	$2,302,082	$1,460,217	$2,044,304	$1,022,152
2025	0.414964	$3,288,688	$4,604,163	$2,302,082	$1,364,689	$1,910,564	$955,282
2026	0.387817	$3,288,688	$4,604,163	$2,302,082	$1,275,410	$1,785,574	$892,787
2027	0.362446	$3,288,688	$4,604,163	$2,302,082	$1,191,972	$1,668,761	$834,380
2028	0.338735	$3,288,688	$4,604,163	$2,302,082	$1,113,992	$1,559,589	$779,795
2029	0.316574	$3,288,688	$4,604,163	$2,302,082	$1,041,114	$1,457,560	$728,780
2030	0.295864	$3,288,688	$4,604,163	$2,302,082	$973,004	$1,362,206	$681,103
2031	0.276508	$3,288,688	$4,604,163	$2,302,082	$909,350	$1,273,090	$636,545
				Total	$26,702,267	$37,383,174	$18,691,587
				Annualized	$2,520,505	$3,528,707	$1,764,354

Table 5b. Costs–Discounted Diminution of Accident Reduction, 3% Discount Factor (20 years)

		Current Annual Benefit			Discounted Annual Benefit		
	Discount	Expected	High	Low	Expected	High	Low
Year	Factor	Case	Case	Case	Case	Case	Case
2012	1	$0	$0	$0	$0	$0	$0
2013	0.970874	$0	$0	$0	$0	$0	$0
2014	0.942596	$0	$0	$0	$0	$0	$0
2015	0.915142	$1,644,344	$2,302,082	$1,151,041	$1,504,808	$2,106,731	$1,053,365
2016	0.888487	$3,288,688	$4,604,163	$2,302,082	$2,921,957	$4,090,740	$2,045,370
2017	0.862609	$3,288,688	$4,604,163	$2,302,082	$2,836,851	$3,971,592	$1,985,796
2018	0.837484	$3,288,688	$4,604,163	$2,302,082	$2,754,225	$3,855,914	$1,927,957
2019	0.813092	$3,288,688	$4,604,163	$2,302,082	$2,674,004	$3,743,606	$1,871,803
2020	0.789409	$3,288,688	$4,604,163	$2,302,082	$2,596,121	$3,634,569	$1,817,285
2021	0.766417	$3,288,688	$4,604,163	$2,302,082	$2,520,506	$3,528,708	$1,764,354
2022	0.744094	$3,288,688	$4,604,163	$2,302,082	$2,447,093	$3,425,930	$1,712,965
2023	0.722421	$3,288,688	$4,604,163	$2,302,082	$2,375,818	$3,326,146	$1,663,073
2024	0.70138	$3,288,688	$4,604,163	$2,302,082	$2,306,620	$3,229,268	$1,614,634
2025	0.680951	$3,288,688	$4,604,163	$2,302,082	$2,239,437	$3,135,211	$1,567,606
2026	0.661118	$3,288,688	$4,604,163	$2,302,082	$2,174,210	$3,043,894	$1,521,947
2027	0.641862	$3,288,688	$4,604,163	$2,302,082	$2,110,884	$2,955,237	$1,477,619
2028	0.623167	$3,288,688	$4,604,163	$2,302,082	$2,049,402	$2,869,162	$1,434,581
2029	0.605016	$3,288,688	$4,604,163	$2,302,082	$1,989,710	$2,785,595	$1,392,797
2030	0.587395	$3,288,688	$4,604,163	$2,302,082	$1,931,758	$2,704,461	$1,352,230
2031	0.570286	$3,288,688	$4,604,163	$2,302,082	$1,875,493	$2,625,690	$1,312,845
				Total	$39,308,896	$55,032,454	$27,516,227
				Annualized	$2,642,175	$3,699,045	$1,849,523

For purposes of this analysis, FRA assumed that the proportion of costs attributable to each accident cost element would be the same as in the analysis of the 2010 PTC rule. For example, fatality costs ($16,457,143 per year in PTC preventable accidents (PPA) costs avoided) were 42.89 percent of the annual accident reduction benefit ($38,368,895) in the analysis of the 2010 PTC rule. Likewise, they represent 42.89 percent of the foregone accident reduction in this analysis. For a more thorough discussion of PPAs please see FRA's analysis of the PTC Rule.[4] The proportion of costs (by element) are shown in Table 6.

[4] U.S. DOT/FRA–Positive Train Control Systems, Final Rule, Regulatory Impact Analysis, Document ID: FRA-2008-0132-0060.1, Docket ID: FRA-2008-0132.

Table 6. Proportions of Accident Costs used in the 2010 PTC Rule Analysis[5]

PTC Rule Benefits by Category	Total Annual PPA (Volpe Center Analysis)	Percentage
Fatalities	$16,457,143	42.89%
Injuries	$6,113,333	15.93%
Train Delay	$169,259	0.44%
Property Damage	$14,604,570	38.06%
Equipment Clean Up	$205,872	0.54%
Environmental Cleanup	$619,303	1.61%
Evacuations	$199,416	0.52%
Total	$38,368,895	100.00%

The costs of the rule through diminished accident reduction are summarized in Table 7. These were derived applying the proportions in the Table 6 to the totals in Table 5a (for 7 percent discount rate) and Table 5b (for 3 percent discount rate).

[5] U.S. DOT/FRA–Positive Train Control Systems, Final Rule, Regulatory Impact Analysis, Document ID: FRA-2008-0132-0060.1, Docket ID: FRA-2008-0132.

Table 7. Summary of Costs of the Proposed Rule (20 years)

Costs of the proposed rule by category (20-year, 7% discount)			
Foregone Reductions in:	*Expected Case*	High Case	Low Case
Fatality Prevention	*$11,453,106*	$16,034,349	$8,017,174
Injury Prevention	*$4,254,484*	$5,956,278	$2,978,139
Train Delay	*$117,793*	$164,911	$82,455
Property Damage	*$10,163,835*	$14,229,369	$7,114,685
Equipment Clean Up	*$143,273*	$200,583	$100,291
Environmental Cleanup	*$430,995*	$603,393	$301,696
Evacuations	*$138,780*	$194,292	$97,146
Total	***$26,702,267***	**$37,383,174**	**$18,691,587**
Costs of the proposed rule by category (20-year, 3% discount)			
Foregone Reductions in:	*Expected Case*	High Case	Low Case
Fatality Prevention	*$16,860,327*	$23,604,458	$11,802,229
Injury Prevention	*$6,263,104*	$8,768,346	$4,384,173
Train Delay	*$173,406*	$242,768	$121,384
Property Damage	*$14,962,367*	$20,947,314	$10,473,657
Equipment Clean Up	*$210,915*	$295,282	$147,641
Environmental Cleanup	*$634,475*	$888,265	$444,133
Evacuations	*$204,301*	$286,021	$143,011
Total	***$39,308,896***	**$55,032,454**	**$27,516,227**
Annualized costs of the proposed rule by category (20-year, 7% discount)			
Foregone Reductions in:	*Expected Case*	High Case	Low Case
Fatality Prevention	*$1,081,092*	$1,513,529	$756,765
Injury Prevention	*$401,593*	$562,231	$281,115
Train Delay	*$11,119*	$15,566	$7,783
Property Damage	*$959,394*	$1,343,152	$671,576
Equipment Clean Up	*$13,524*	$18,934	$9,467
Environmental Cleanup	*$40,683*	$56,956	$28,478
Evacuations	*$13,100*	$18,340	$9,170
Total	*$2,520,505*	$3,528,707	$1,764,354
Annualized costs of the proposed rule by category (20-year, 3% discount)			
Foregone Reductions in:	*Expected Case*	High Case	Low Case
Fatality Prevention	*$1,133,279*	$1,586,590	$793,295
Injury Prevention	*$420,979*	$589,371	$294,685
Train Delay	*$11,656*	$16,318	$8,159
Property Damage	*$1,005,706*	$1,407,989	$703,994
Equipment Clean Up	*$14,177*	$19,848	$9,924
Environmental Cleanup	*$42,647*	$59,705	$29,853
Evacuations	*$13,732*	$19,225	$9,613
Total	*$2,642,175*	$3,699,045	$1,849,523

5.0 Relationship Between Benefits and Costs

Under the expected case, as well as the two other cases analyzed for sensitivity purposes, the cost-saving benefits are far greater than the foregone accident reduction costs. The net benefits are summarized in Table 8.

Table 8. Summary of Net Benefits of the Proposed Rule Over 20 Years

	Total Discounted Net Benefits		Annualized Net Benefits	
Discount Factor	7%	3%	7%	3%
Expected Case	*$593,267,020*	*$778,722,856*	*$56,000,210*	*$52,342,408*
High Case	$793,856,299	$1,041,764,269	$74,934,419	$70,022,922
Low Case	$442,825,061	$581,441,797	$41,799,553	$39,082,022

In all of the scenarios analyzed the benefit/cost ratio was between 20 and 25.

Table 9. Benefit/Cost Ratios

Discount Factor	7%	3%
Expected Case	*23.22*	*20.81*
High Case	22.24	19.93
Low Case	24.69	22.13

In conclusion, FRA believes that the benefits of the proposed rule to provide regulatory relief are far in excess of the costs. The $593 million (discounted at 7 percent over 20 years) or $779 million (discounted at 3 percent over 20 years) that would not be spent on PTC implementation along lower-risk routes would be freed for use in capacity enhancements and other initiatives with higher economic and safety return. This rulemaking is consistent with the expressed goals of EO 13563 to design regulations so that they are cost-effective, evidence-based and compatible with economic growth, job creation, and competitiveness.

FRA seeks comments on all aspects of this analysis.