1. Mixing Of Costs And Benefits

FRA's business benefits model erroneously included costs in the benefits side of the ledger. This is a fundamental violation of CBA principles. A simple example shows the ramification of this careless exercise. In Table 8 below, we compare FRA's methodology with a correct CBA methodology to show the effect of FRA incorrectly categorizing costs as benefits before calculating the Cost/Benefit ratio.

Table 8
Demonstration of FRA's Flawed CBA Methodology

Item	FRA Calculation	Correct Calculation
(1	(2)	(3)
INPUTS		
1. RR Direct Costs	($10,007.6)	($10,007.6)
2. RR Safety Benefits	$607.7	$607.7
3. "Business" Costs	($10,572.5)	($10,572.5)
4. "Business" Benefits	$16,702.3	$16,702.3
FRA Calculation		
5. "Net Business" Benefits (L3 + L4)	$6,129.8	xxx
6. FRA Total Costs (L1)	($10,007.6)	xxx
7. FRA Total Benefits (L2 + L5)	$6,737.5	xxx
8. FRA Cost/Benefit Ratio ((L6 x -1) ÷ L7)	1.49	xxx
Correct Calculation		
9. Correct Total Costs (L1 + L3)	xxx	($20,580.1)
10. Correct Total Benefits (L2 + L4)	xxx	$17,310.0
11. Correct Cost/Benefit Ratio ((L9 x -1) ÷ L10)	xxx	1.19

Source: Lines 1-4, 9-11 from Attachment No. B-1, Column (3); Lines 5-8 from FRA's July 2009 economic analysis.

As shown in Table 8 above, FRA's inappropriate treatment of costs in its statement of "net business" benefits leads to a very misleading CBA result (in this case, a 25% overstatement of the Cost/Benefit ratio (1.49 ÷ 1.19)).

2. Shipper Direct Benefits

FRA's calculation of shipper direct benefits is erroneous. This is due to some of the involved dollar amounts being indexed to 2009 using an incorrect index. FRA developed updated direct shipper benefits by averaging the low-case ($900 million) and high-case ($1,400 million) values from the 2004 FRA report (taken directly from the 2004 ZETA-TECH report) and indexing the benefits to 2009 dollars based on the change in GDP from 2003 to 2009 (1.1007) as shown below:

[($900 million + $1,400 million) ÷ 2] x 1.1007 = $1,266 million[36]

The ZETA-TECH low and high case benefits were stated in 2001 dollars. Therefore, FRA should have indexed the values by the change in GDP from 2001 to 2009 (1.1385).

[($900 million + $1,400 million) / 2] x 1.1385 = $1,309 million[37]

3. Other Railroad Direct Benefits

The FRA's calculation of other (railroad) direct benefits is erroneous. After restating the direct shipper benefits, FRA stated that it developed other direct benefits as follows:

> "FRA averaged inflated low and high Direct Benefits from the 2004 report, using the GDP deflator, and is using the average, $2,746,022,666, as the estimate of total direct benefits. Total direct benefits included shipper direct benefits, so to calculate Other Direct Benefits, FRA subtracted the $1,265,805,000 of Shipper Direct Benefits from $2,746,022,666 and arrived at an Other Direct Benefits estimate of $1,481,022,666 per year."[38]

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[36] *See*: Attachment No. B-4 at Column (10), Line 12.
[37] *See*: Attachment No. B-4 at Column (11), Line 12.
[38] 2009 FRA Economic Analysis, page A-4.

The FRA's figures are not supported by its stated methodology. Using FRA's stated methodology and FRA's dollar amounts,[39] the other railroad direct benefits result would be:

[($1,614,751,993 + $2,814,146,206) / 2] x 1.1007 = $2,437,444,124

$2,437,444,124 - $1,265,805,000 = $1,171,639,124

There are several problems with FRA's calculation of other railroad direct benefits as summarized below:

1. FRA did not do what it said it did;

2. As with the calculation of shipper direct benefits, FRA used the incorrect index to restate the dollar amounts on a 2009 basis;

3. The total direct benefits figures purportedly used by FRA in this analysis incorporate mathematical errors[40] and are unreliable;

4. The calculation of other direct benefits in this case should be limited to direct railroad business benefits, not total direct benefits including railroad safety benefits; and

5. The calculation fails to account for (or incorrectly accounts for) a separate fuel adjustment FRA described elsewhere in its methodology discussion.

The corrected methodology and results are shown below.

1. Average of FRA 2004 low- and high-case railroad direct benefits equals $567,855,855.[41]

2. Removal of improperly included annual maintenance costs equals $567,855,855 minus ($428,647,500)[42] or $996,503,355.

3. Removal of 2004 Report fuel savings estimate equals $996,503,355 minus $93,249,625[43] or $903,253,730.

[39] *See*: Attachment No. B-4, Line 16, Columns (4) and (5) and Line 12, Column (10).
[40] Improperly included maintenance costs and erroneous shipper indirect cost calculation.
[41] *See*: Attachment No. B-4 at Column (6), Line 9.
[42] *See*: Attachment No. B-4 at Column (6), Line 8.

4. Index non-fuel benefits to 2009 equals
$903,253,730 times 1.1327[44] or $1,023,145,948.

5. Replacement of 2009 fuel savings estimate equals
$1,023,145,948 plus $437,500,000[45] or $1,460,645,948.[46]

4. **Modal Diversion Factor**

The modal diversion factor developed by FRA in its 2009 restatement is erroneous. This is partly due to some of the involved dollar amounts being indexed to 2009 using an incorrect index and it is partly due to FRA using the wrong benefits elements to derive the factor. FRA states that the modal diversion factor is based on the ratio of direct shipper benefits to derived modal diversion benefits. This is the theoretically correct formula, but FRA did not develop the numbers as it stated it did.

FRA's figures are not supported by its stated methodology. Using FRA's stated methodology and FRA's dollar amounts,[47] FRA's modal diversion factor would be:

Low Case: $531,103,148 / $900,000,000 = 0.59

High Case: $698,970,714 / $1,400,000,000 = 0.50

Average: 0.54

As shown above, FRA's (uncorrected 2001 dollars) statement of low-case shipper direct benefits is $900,000,000 per year. FRA's statement of low-case modal diversion in 2010 (2003 dollars) is $531,103,148. The low-case indirect benefits factor using FRA's 2010 numbers should be 0.59. FRA's (uncorrected) statement of high-case shipper direct benefits is $1,400,000,000 per year. The FRA's statement of high-case modal diversion in 2010 is

[43] *See*: Attachment No. B-4 at Column (6), Line 6.
[44] *See*: Attachment No. B-4 at Column (11), Sum of Lines 1-5 and Line 7. Lines 1-5 are indexed from 2001 to 2009, Line 7 is indexed from 2002 to 2009.
[45] *See*: Attachment No. B-4 at Column (11), Line 6.
[46] *See*: Attachment No. B-4 at Column (11), Line 9.
[47] *See*: Attachment No. B-4 at Lines 12, 17, and 21, Columns (4) and (5).

$698,970,714. Thus the high-case indirect benefits factor using FRA's 2010 numbers should be 0.50. The average of these factors is 0.54.

However, FRA cites the following (unsupported) figures as its derived modal diversion factors:

2010 low-case = 1.02; 2010 high-case = 0.86; 2010 average = 0.94.

FRA overstates the indirect societal benefits by 74%.[48] This problem is compounded by the fact that FRA's direct benefits figures are stated on a 2001 dollars basis and FRA's indirect benefits figures are stated on a 2003 dollars basis. We have corrected the indirect benefits factor in our restatement of indirect benefits. The corrections and restatement are shown on Attachment No. B-3.

5. Inconsistent Application Of Modal Diversion Benefits And Costs

FRA incorrectly and inconsistently applied its erroneous indirect benefits factor to related classes of benefits. As described in detail in Appendix B of the 2004 FRA Report to Congress, the indirect societal benefit derived using FRA's ITIC modal diversion model is related to changes in rail *transit time and reliability*. When shippers realize benefits from improved supply-chain speed and reliability, they adjust their logistics networks to take advantage of those efficiencies. The modal diversion model develops estimates for ton-miles diverted to rail from rail *efficiency* improvements. Then societal benefits are developed from those ton-miles using factors to estimate reductions in highway crashes, highway wear and tear caused by heavy trucks, emissions reductions, etc. FRA explicitly stated in its 2004 report that the indirect benefits calculation was based on changes in operations, not on passed through costs/benefits in the form of rate increases/decreases. Specifically, the first paragraph on page B-1 of Appendix B in FRA's 2004 report reads:

[48] This comparison is made for ease of discussion. There are other problems with FRA's data that result in the actual statement of the 2010 factor as 0.52 (*See*: Attachment No. B-4, Line 21, Column (11).

> "This model is dependent on the Zeta-Tech study estimates of improved transit time and reliability, and none of the estimated benefits in this model would be realized if the transit time and reliability do not improve."

Although FRA incorrectly calculated the indirect benefits factor as described above, it did apply the factor correctly to one specific class of benefits: direct shipper benefits. This is the only class of benefits to which this specific factor is directly applicable. Yet, FRA did not apply the factor only to direct shipper benefits (as it had in 2004). Rather, FRA developed a new set of indirect shipper costs to which this factor was also applied. Although the indirect shipper costs FRA developed are likely real, application of this specific factor to them is not appropriate, as explained below. Furthermore, even if it were appropriate, FRA erred in that it failed to also develop a parallel surrogate for indirect shipper benefits and apply the same factors to that set of benefits. As a result, FRA's methodology improperly increased the cost side of the ledger and did not apply any parallel adjustment to the benefits side.

The indirect shipper costs developed by FRA are based on the premise that the railroads will pass on 80%[49] of all incurred costs to shippers in the form of increased rates. Certainly the railroads will attempt to do so, as would any rational business. FRA then applies the indirect benefits factor to these costs to estimate modal diversion from rail to truck as shippers adjust to higher rail rates. The logic is reasonable, but the mechanics of using the specific factors used are problematic. Specifically, the 2004 modal diversion calculation measures rail demand elasticity relative to changes in service levels, not rate levels. FRA's assumption that one is a fair proxy for the other rests on the presumption that there is a one-to-one relationship between changes in service levels and changes in rates when restated on a total logistics costs basis. That is, FRA

[49] This 80% cost pass-through figure is a FRA estimate based on its observations of railroad behavior since passage of the *Staggers Rail Act of 1980*. The FRA believes that in the time since, railroads have passed on roughly 80% of productivity gains to shippers in the form of reduced rates. See, e.g., 2004 FRA Report to Congress, page D-1, notes.

assumes that a 1% increase in rail transit time will have the same impact on total logistics costs as a 1% increase in rail rates. This is, at best, a huge leap of faith. FRA made no attempt to analyze the very complex relationships between changes in transit time, rail rates, and total logistics costs. As such, the proper treatment of this questionable benefit calculation may be to exclude it from the analysis.

Barring that, at an absolute minimum, the FRA should have developed a corresponding and largely offsetting estimate of the indirect benefits associated with the direct railroad benefits that will also theoretically be passed on to shippers in the form of rate reductions. FRA's logic supporting its included calculation is as follows: as railroad costs increase, 80% of those costs are passed on to shippers (indirect shipper costs) in the form of rate increases, and some percentage of those indirect shipper costs represent the indirect societal costs resulting from modal diversion from rail to truck. If this is an acceptable proposition, then FRA must also support the opposite notion. Namely that, as railroad costs decrease through the realization of efficiency gains, 80% of those cost reductions (direct rail benefits) are passed on to shippers (indirect shipper benefits) in the form of rate reductions, and some percentage of those indirect shipper benefits represent the indirect societal benefits resulting from modal diversion from truck to rail.

6. Restatement

We have restated the cost-benefit comparison with a correction that evaluates both indirect shipper costs and indirect shipper benefits. Table 9 below shows the 2009 FRA benefits values corrected and updated to reflect correct inflation, correct direct and indirect benefits, correct indirect benefits factor calculation, and correct application of indirect benefits factors.

Table 9
Restatement of FRA 2009 "Business" Benefits 1/
(2009 Dollars in Millions)

Item (1)	Amount (2)	Notes (3)	Corrected (4)
1. Indirect Societal Cost, Modal Diversion Resulting from Increased Rail Rates	($10,403.8)	Calculated Using Incorrect Indirect Benefits Factor, Overstated by 92%	($5,429.0)
2. Add On Productivity System Costs	($82.0)	Calculation is Correct	($82.0)
3. Add On Productivity System Maintenance Costs	($86.8)	Calculation is Correct	($86.8)
4. Indirect Societal Cost, Modal Diversion Resulting from Further Increased Rail Rates	2/	Improperly Excluded from Analysis	($109.9)
5. Shipper Direct Productivity Benefit	$4,336.3	Calculated Using Incorrect Inflator, Understated by 3%	$4,485.0
6. Indirect Societal Benefit, Modal Diversion Resulting from Increased Rail Efficiency	$7,292.5	Calculated Using Incorrect Indirect Benefits Factor, Overstated by 77%	$4,109.8
7. Railroad Direct Productivity Benefit	$5,073.5	Erroneous Calculation, Overstated by 1%	$5,003.7
8. Indirect Societal Benefit, Modal Diversion Resulting from Reduced Rail Rates	2/	Improperly Excluded from Analysis	$3,668.1
9. Total Costs (Sum of Lines 1-4)	($10,572.5)	xxx	($5,707.6)
10. Total Benefits (Sum of Lines 5-8)	$16,702.3	xxx	$17,266.7

Source: Attachment No. B-1, Columns (3) and (5).
1/ Net Present Value Assuming a 7% Discount Rate.
2/ Not Included by FRA.

As shown above, the compound effect of the errors in the calculation and application of indices and indirect shipper benefits resulted in FRA overstating "business" costs by 85% and understating "business" benefits by 3%.

E. INTERMEDIATE RESTATEMENT OF FRA FINAL RULE RIA

We updated the cost-benefit comparison included in the FRA Final Rule RIA as follows:

1. Accepted FRA's estimate of total PTC implementation costs as included in the Final Rule RIA;

2. Accepted FRA's estimate of total railroad safety benefits as included in the Final Rule RIA; and

3. Included other costs and benefits (collectively referred to as business benefits by FRA) based on updated and corrected calculations contained in the July 2009 FRA Economic Analysis, the 2004 FRA Report to Congress, and the 2004 ZETA-TECH report.

Table 10 below shows the updated and corrected statement of total costs and total benefits associated with PTC implementation.

Table 10
Comparison of FRA CBA to Corrected and Restated CBA
($ in millions)

Item (1)	FRA Final Rule RIA (2)	Restated (3)
1. Railroad Direct Costs [1]	$9,547.5	$9,547.5
2. Other Direct, Indirect, and Societal Costs [2]	Improperly Excluded by FRA	$5,707.6
3. Railroad Safety Benefits [3]	$439.7	$439.7
4. Other Railroad, Shipper, and Societal Benefits [4]	Improperly Excluded by FRA	$17,266.7
5. Total Costs (L1 + L2)	$9,547.5	$15,255.1
6. Total Benefits (L3 + L4)	$439.7	$17,706.4
7. Cost-Benefit Ratio (L5 ÷ L6)	21.71	0.86

1/ Attachment No. B-1, Line 5.
2/ Attachment No. B-1, Column (5) sum of lines 18,19,20,21.
3/ Attachment No. B-1, Line 16.

4/ Attachment No. B-1, Column (5), sum of lines 22,23,24,25.

As shown in Table 10 above, when the total costs and total benefits are evaluated over a 20-year time horizon, the benefits of PTC implementation outweigh the costs. The cost-benefit ratio assuming a 7% discount rate is properly restated as 0.86.

IV. POSITIVE TRAIN CONTROL COST ANALYSIS: UPDATED STATEMENT OF TOTAL COSTS AND RESTATEMENT OF FRA COST-BENEFIT ANALYSIS BASED ON UPDATED FRA COSTS AND BENEFITS

Our updated cost analysis shows that when full costs and benefits are properly included and assessed, the cost-benefit ratio associated with the PTC rule is restated at 0.80 (based on a 7% discount rate). Table 11 below compares FRA's flawed CBA results and our corrected CBA results, based on a 7% discount rate.

Table 11
Comparison of FRA CBA to Corrected and Restated CBA
($ in millions)

Item (1)	FRA Final Rule RIA (2)	Restated (3)
1. Railroad Direct Costs [1]	$9,547.5	$8,393.5
2. Other Direct, Indirect, and Societal Costs [2]	Improperly Excluded by FRA	$5,707.6
3. Railroad Safety Benefits [3]	$439.7	$439.7
4. Other Railroad, Shipper, and Societal Benefits [4]	Improperly Excluded by FRA	$17,266.7
5. Total Costs (L1 + L2)	$9,547.5	$14,101.1
6. Total Benefits (L3 + L4)	$439.7	$17,706.4
7. Cost-Benefit Ratio (L5 ÷ L6)	21.71	0.80

1/ Attachment No. C-1, Line 5, Columns (2) and (6).
2/ Attachment No. C-1, Column (6) sum of lines 18,19,20,21.
3/ Attachment No. C-1, Line 16, Columns (2) and (6).
4/ Attachment No. C-1, Column (6), sum of lines 22,23,24,25.

As shown in Table 11 above, when the CBA is properly expanded to encompass all correct costs and benefits, the benefits outweigh the costs over a 20-year time horizon on a present value basis.

The remainder of this section of our Report summarizes our findings related to total PTC costs and is organized under the following topical headings:

A. Calculation of Total Costs, Historical Overview

B. Problems with the 2010 FRA Cost Estimate

C. Restatement of FRA Final Rule RIA

A. CALCULATION OF TOTAL COSTS, HISTORICAL OVERVIEW

In August 1999, the Railroad Safety Advisory Committee ("RSAC") produced a report for FRA quantifying total costs and benefits of nationwide PTC implementation. RSAC evaluated four different levels of PTC (numbered 1 through 4) with each level becoming progressively more advanced in its structure and benefits and becoming progressively more expensive.

PTC level 1 addressed the core functions required by PTC. PTC level 2 was designed with the same functionality as PTC level 1 and also included a computer-aided dispatch system and digital communications between the dispatch system and the locomotives. PTC level 3 built upon PTC level 2's functionality and also included wayside interface units for monitoring track conditions. PTC level 4 was designed with the functionality of all preceding systems, and also included track force terminals, additional track circuits and additional protective devices.[50] The elements of PTC level 4 in the 1999 report are most comparable to the PTC system being mandated by FRA's final rule. Therefore, we will focus on RSAC's PTC level 4 system evaluation in this section of our Report.

[50] Railroad Safety Advisory Committee. "*Implementation of Positive Train Control Systems.*" In Report of the RSAC to the FRA, August 1999, page 83.

The RSAC identified and quantified PTC implementation costs in the following three (3) areas in its report:

1. Costs Per Locomotive;
2. Costs Per Mile; and
3. System Unit Costs.

Costs per locomotive included the costs to install the required on-board equipment. Costs per mile include the costs of installing equipment along the affected railroad right-of-way. Per-mile costs are estimated on a track-mile basis for items that are installed into individual tracks, and on a route-mile basis for items that are installed adjacent to the track(s) (such as communications devices.) System unit costs "cover hardware for a central office or intellectual property like software/hardware development."[51] Each of the RSAC report cost estimates included initial costs as well as ongoing maintenance costs. The RSAC estimated that maintenance costs would equal 10 percent of the initial annual cost.[52]

For PTC level 4, RSAC estimated that locomotive installation costs would equal $75,000 per unit. In RSAC's discussion of its costs per mile estimates, RSAC stated that the costs were dependent on "the existing infrastructure"[53] along the affected routes, and therefore, RSAC's calculations included a cost-per-mile breakdown for each category of preexisting radio technology (i.e., track with Centralized Traffic Control ("CTC"), Automatic Block Signal Systems ("ABS"), and "Dark" territory each received different cost estimates per mile.) The RSAC system-unit cost estimates included the costs associated with the following activities: "implementing operating rules; building databases; generating software; developing messages;

[51] 1999 RSAC Report, page 83
[52] 1999 RSAC Report, page 84
[53] Id.

designing communication infrastructure; software development and, if needed central office costs."[54]

The RSAC cost estimates were based on its assessment of the five largest railroads (UP, BNSF Railway Company ("BNSF"), CSX Transportation ("CSXT"), Norfolk Southern Railway Company ("NS"), and Consolidated Rail Corporation ("Conrail")) discounted over a twenty-year period using a discount rate of 7%. When calculating the 20-year discounted cost, RSAC assumed all installation costs would occur in the first year. In summarizing its methods for developing costs, RSAC noted that:

> "This is only a demonstration exercise to illustrate an upper bound to costs. No one believes this is a practical implementation. Many of the low density lines on those railroads would be poor candidates for an upgrade to PTC. When railroads implement PTC, the most likely migration path would be to implement PTC first on those corridors where PTC returns the highest net benefit. These probably will be high density lines with passenger or hazardous material traffic. Even if a railroad were to adopt PTC "completely", it might not equip all of its locomotives or power units, and it might not equip lines where traffic density is so low as to preclude collisions."[55]

Table 12 below shows the PTC level 4 implementation costs estimated by RSAC in 1999.

[54] 1999 RSAC Report, page 88.
[55] 1999 RSAC Report, page 96.

Table 12
RSAC August 1999 Implementation of Positive Train Control Systems Analysis Total Acquisition Cost of PTC Level 4
(1999 Dollars in Millions)

Item (1)	Amount (2)
1. Locomotives (Vehicle Adaptation)	$1,390.6
2. CTC (Wayside Equipment)	$1,174.8
3. ABS (Wayside Equipment)	$556.2
4. DTC (Wayside Equipment)	$1,162.7
5. Development Costs (Central Office and Development)	$235.0
6. Total Installation Cost (Sum of Lines 1-5)	$3,965.9
7. Annual Maintenance (10% of Line 6)	$396.6
8. 20-Year Total Discounted at 7% (including maintenance)	$7,796.6

Source: 1999 RSAC Report

1. 2004 Report to FRA (ZETA-TECH)

In March 2004, ZETA-TECH developed a report for FRA quantifying the total costs and benefits of nationwide PTC implementation. In the ZETA-TECH report, and as noted in the previous section of this Report, two PTC systems were evaluated, "PTC A" and "PTC B." PTC A was defined as "an 'overlay' system that provides enforcement of movement authorities, but does not incorporate a 'vital' central safety system." In contrast, PTC B was defined as "a stand-alone vital system."[56] The elements of the PTC B system evaluated by ZETA-TECH in the 2004 report are most comparable to the RSAC's PTC 4 system and the PTC system mandated by FRA's final

[56] 2004 ZETA-TECH Report, page 6.

rule. Therefore, we will focus on ZETA-TECH's PTC B system evaluation in this section of our Report.

ZETA-TECH identified and quantified PTC implementation costs in the following three (3) categories in its PTC B system:

1. Vehicle Adaptation Costs;
2. Wayside Installation Costs; and
3. Central Office Installation and Development Costs.

The three ZETA-TECH cost categories closely mirror the three categories included in the 1999 RSAC report. Vehicle adaptation costs include costs of equipping locomotives with the proper global positioning systems ("GPS"), central processing units ("CPU"), crew equipment, accelerometers, gyroscopes, vehicle control equipment, and related equipment. Wayside installation costs include costs of installing the required communications and detection systems along applicable system track. Central office costs represent the estimated cost of purchasing or building a central office, purchasing and installing the appropriate computer hardware and communications systems and developing software and IT technology required to monitor the entire railroad from one central office. Initial training and staffing costs were included in the central office cost and, beginning in year 6, training costs are included in the "maintenance" costs, which were quantified in this Report, but kept separate from installation costs.[57]

The ZETA-TECH vehicle adaptation and wayside installation cost estimates were drawn primarily from real-world data provided by manufacturers and railroads. Specifically, ZETA-TECH obtained cost estimates from CSXT for adapting locomotives and installing the proper wayside equipment. These cost estimates were based on CSXT's South Carolina pilot project. ZETA-TECH estimated the number of Class I railroad locos in service at 20,506 and

[57] 2004 ZETA-TECH Report, page 12.

route miles in service at 99,250 (in 2001). These factors were applied to the unit cost estimates obtained from CSXT to derive the total vehicle adaptation and wayside installation costs.

In contrast, ZETA-TECH's central office cost estimate was largely speculative. ZETA-TECH's report noted that, "the full cost of the necessary programming, graphical user interface, and other equipment and software will not be clear"[58] until one of the PTC test sites enters full operation. ZETA-TECH assumed that the cost of the central office would vary with the number of track miles and number of trains operated by each central office. Given the uncertainty with respect to central office costs, ZETA-TECH developed high- and low-cost estimates ranging from $2.3 billion to $4.4 billion for PTC B (in 2001 dollars).

ZETA-TECH stated that its initial cost estimates may have been overstated because much of the PTC-compatible equipment had already been purchased by the railroads. Specifically:

> UP had reported that "2,600 of its 6,847 locomotives, or 38%, are equipped with ATCS radio" and "25% of UP route miles (9,600 route miles) are covered by ATCS UHF repeaters. BNSF had reported that "1,900 route miles are covered by ATCS-type radio" and CSX had "3,000 route miles of radio coverage."[59]

At the time of the ZETA-TECH report, it was unclear whether these technologies would need to be upgraded to be compatible with PTC B. Per the FRA's final rule, each railroad may determine how it designs and implements its PTC system as long as the system performs up to the required standard.

Table 13 below shows the PTC B initial costs calculated by ZETA-TECH in 2004.

[58] 2004 ZETA-TECH Report, page 98.
[59] 2004 ZETA-TECH Report, page 100.

Table 13
ZETA-TECH Summary of Estimated PTC B Initial Installation Costs
(All Costs in 2001 Dollars, Millions)

Item (1)	Low Case (2)	High Case (3)
1. Locomotives (Vehicle Adaptation)	$615.2	$1,537.9
2. Route Miles (Wayside Equipment)	$1,588.0	$2,382.0
3. Central Office	$100.0	$500.0
4. Total Estimated System Costs	$2,303.2	$4,419.9

Source: ZETA-TECH 2004 Report, Table 30, Page 100.

ZETA-TECH estimated that annual training, maintenance, and tech obsolescence[60] costs would equal 15% of the total capital cost. ZETA-TECH noted in its analysis that BNSF used a value of 10% of its total capital cost when developing annual training, maintenance and tech obsolescence costs for BNSF's ARES project. However, ZETA-TECH used the electronics industry standard of 15%.[61]

2. 2004 Report to Congress (FRA)

Later in 2004, FRA developed a Report to Congress that contained cost and benefits estimates associated with PTC implementation in response to the Conference Report on the Consolidated Appropriations Resolution, 2003 (P.L. 108-7). FRA used the ZETA-TECH analysis as the basis for its report, and retained most of the cost estimates without revision.[62]

[60] 2004 ZETA-TECH Report, page 100.
[61] Id.
[62] FRA opined that PTC, by itself, would not result in business benefits. However, it followed that if add-on components of relatively modest cost were implemented subsequent to PTC implementation then business benefits would accrue. As such, FRA evaluated "a reasonable version of PTC and add-on components likely to generate business benefits." *See*: 2004 FRA Report to Congress at page 3.

In developing its 2004 Report to Congress, FRA conducted a peer-review workshop where it asked representatives from the railroads, shippers, suppliers and labor organizations to comment on the ZETA-TECH report. Based on comments made in the peer-review workshop by Alan Polivka, director of the North American Joint PTC project, FRA changed the estimated cost per locomotive from the $30,000 to $75,000 estimated in the ZETA-TECH report, to "$20,000 to $35,000 (for PTC B)."[63] This change reduced the total estimated Vehicle Adaptation costs by roughly half.

FRA retained ZETA-TECH's Central Office cost estimates despite comments in the peer-review workshop that no plans were under consideration for a central office like the one envisioned in the ZETA-TECH report. FRA noted that ZETA-TECH's estimates included development costs for software and IT infrastructure for use in the central office. FRA believed "this cost would be reduced substantially if the railroads were to develop only one system and apply it on all major railroads,"[64] but FRA retained the high estimate because it did not believe such a system existed. FRA also adopted ZETA-TECH's Wayside Equipment cost estimate without changes.

FRA introduced and quantified an additional cost category not contained in the ZETA-TECH report: Track Force Terminals ("TFT"). Theoretically, TFT would provide maintenance of way ("MOW") forces with the ability to request authority to occupy track and release authorities in real time. It was believed that these terminals, combined with the functionality of PTC, could yield substantial benefits in the efficiency of MOW work.

FRA also calculated and included a number for annual maintenance fees. However, the maintenance fees were applied as a negative benefit in FRA's corresponding benefits estimate.

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[63] 2004 FRA Report to Congress, page 22.
[64] 2004 FRA Report to Congress, page 23.

Table 14 below shows the PTC B installation costs calculated by FRA in 2004.

Table 14
FRA August 2004 Report to Congress - - Summary of Estimated PTC B Initial Installation Costs
(All Costs in 2001 Dollars, Millions)

Item (1)	Low Case (2)	High Case (3)
1. Locomotives (Vehicle Adaptation)	$307.6	$717.7
2. Route Miles (Wayside Equipment)	$1,588.0	$2,382.0
3. Central Office	$100.0	$500.0
4. Track Force Units	$48.0	$72.0
5. Total Estimated System Costs	$2,043.6	$3,671.7

Source: August 2004 FRA Report to Congress, Table 3, page D-3.

3. July 2009 Notice of Proposed Rule Making (FRA)

In July 2009, FRA finalized its NPRM on PTC implementation, including a 167 page supporting economic analysis with a 16 page appendix which updated each element of the 2004 FRA report. This 2009 analysis retained the same cost categories as the 2004 report. In addition, FRA introduced two new costs: (1) costs associated with developing implementation plans; and (2) Alaska Railroad ("ARR") implementation costs. The estimated costs for the ARR are static in the FRA report at a cost of $30 million and represent costs "for more extensive switch monitoring and track integrity circuits."[65] The ARR cost estimate was kept separate from the primary cost estimate because ARR is not connected to the rail system in the lower 48 and will be implementing a different version of PTC.

[65] 2009 FRA Economic Analysis, page 114.

In the 2009 analysis, FRA abandoned some of the cost estimates it developed in 2004, on the basis that the estimates "were both overly optimistic, and excluded installation costs, as well as higher costs which stem from meeting the [new] performance standards.... in light of current discussions with railroads, the cost estimates in the 1998 report seem more accurate."[66] (The "1998 report" that FRA referenced is actually the RSAC report published in August 1999 and described above.) In developing the restated costs for its 2009 report, FRA stated that it derived its new cost estimates based on "discussions with RSAC participants and others over the course of more than a decade of experience in estimating PTC costs."[67]

For the revised locomotive adaptation costs, FRA derived its locomotive counts from "The Official 2009 Edition, Locomotive Rosters and News" by totaling the locomotive counts for each of the seven Class I railroads. FRA made the assumption that

> "the number of locomotives that Class II and III railroads would have to equip is roughly the same as the small number of locomotives that Class I railroads may not have to equip. Therefore, FRA believed, the total number of Class I locomotives is a good surrogate for the total number of all freight locomotives that would have to be equipped."[68]

For freight locomotives, FRA assumed a V-TMS[69] adaptation cost of $55,000 per locomotive for 29,461 of the 32,264 total locomotive units to be fitted (unit costs for the other 2,793 units ranged from $15,000 to $125,000.) This is a significant change from the decision in FRA's 2004 report to reduce its adaptation cost estimate from approximately $52,500 (per ZETA-TECH) to approximately $27,500 (per comments received at the 2004 peer-review workshop). FRA did not provide support for its 2009 locomotive adaptation cost estimate, however FRA did

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[66] **Federal Register** / Vol. 74, No. 138 / Tuesday, July 21, 2009 / Proposed Rules, page 36003.
[67] 2009 FRA Economic Analysis, page 117.
[68] 2009 FRA Economic Analysis, page 113.
[69] V-TMS stands for Vital Train Management System and is UP's version of PTC. The FRA presumably used this nomenclature to denote all Class I railroad PTC systems.

state that it, "believes that its onboard equipment cost estimates are likely in the upper bound" and suggests a range of $33,000 to $68,750 per unit.[70]

The wayside equipment costs developed in FRA's 2009 analysis include a breakdown of mileages for affected track segments as well as the applicable communications devices to be installed, including new costs for various commuter railroads and cab signals. The largest single cost item in the wayside equipment cost calculation is associated with 68,700 miles to be fitted with V-TMS systems. FRA assumed a cost of $50,000 per track-mile with no clear support for that number, stating only that it "believes that its wayside costs may be in the lower bound" and suggesting a range of $40,000 to 100,000 per unit[71] The 2009 wayside equipment cost estimate ($3.6 billion) is substantially higher than the 2004 estimate ($1.6 to 2.4 billion).

For its 2009 central office cost estimate, FRA assumed there would be 20 "units" required at a cost of $15 million per unit, citing no concrete support for its assumed unit cost. The FRA did state that it "believes that its central office and development costs are likely in the upper bound," and suggests a range of $6.0 to $22.5 million per unit.[72]

The FRA phased in central office costs over the first five years at 20% per year, and phased in on-board equipment and wayside installation costs in years 3 through 7. The FRA treated all ARR costs as wayside installation costs and phased them in years 3 through 7.

The FRA calculated annual maintenance costs starting in year 2 at 15% of the cumulative investment to date.

After the total initial acquisition and annual maintenance costs were calculated, FRA restated the costs on a net-present-value basis over a 20-year time horizon. Table 15 below shows FRA's updated cost calculation as included in the July 2009 NPRM and the supporting analysis.

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[70] 2009 FRA Economic Analysis, page 117.
[71] Id.
[72] Id.

Table 15
FRA July 2009 Proposed Rule NPRM Cost Estimate 1/
(2009 Dollars in Millions)

Item (1)	Amount (2)
1. On-Board Equipment (Vehicle Adaptation)	$1,416.7
2. Wayside Equipment	$2,586.5
3. Central Office and Development	$263.2
4. Maintenance	$5,741.2
5. Total Expected System Cost	$10,007.6

Source: Attachment No. C-1, Column (3).
1/ Net Present Value assuming 7% Discount Rate.

4. January 2010 Final Rule (FRA)

In January 2010, FRA published its Final Rule on PTC implementation. The Final Rule contained a policy change from the NPRM where, in response to comments from the railroads, FRA introduced a new *de minimis* (low-volume) exception for freight railroads in 49 CFR Part 236.[73] The final cost estimates reflect this change, and as a result wayside costs are lower than those estimated in the NPRM RIA. The *de minimis* provision reduced costs by avoiding 304 miles of right-of-way modifications on freight rail lines, and reduced costs by 80% on an additional 3,204 miles on freight rail systems. The Final Rule also includes provisions that permit passenger railroads to exclude 1,900 miles of track from the requirements to install PTC. Altogether, these changes result in a reduction in wayside costs of over $238 million, or roughly 6.7%. Additionally, FRA made some minor adjustments to its on-board installation estimates. Specifically, FRA adjusted costs for certain units based on an assumption that some equipment

[73] §236.1006(b)(4)(ii)

would be installed regardless of the promulgation of the Final Rule. The FRA also slightly adjusted its total locomotive count from 32,254 units to 32,154 units. These costs led to a $34 million reduction (1.8%) in locomotive adaptation costs.

Table 16 below shows FRA's updated costs as included in its January 2010 Final Rule.

Table 16
FRA January 2010 Final Rule Cost Estimate 1/
(2009 Dollars in Millions)

Item (1)	Amount (2)
1. On-Board Equipment (Vehicle Adaptation)	$1,390.6
2. Wayside Equipment	$2,414.8
3. Central Office and Development	$263.2
4. Maintenance	$5,478.9
5. Total Expected System Cost	$9,547.5

Source: Attachment No. C-1, Column (2).
1/ Net Present Value assuming 7% Discount Rate.

B. PROBLEMS WITH THE 2010 FRA COST ESTIMATE

The July 2009 FRA economic analysis contained a restatement of all the costs identified in the 1999 RSAC report and the 2004 FRA Report to Congress (based largely on the 2004 ZETA-TECH report). The economic analysis also contained a new calculation for ARR PTC implementation. There are three main problems with FRA's 2009 restatement of costs:

1. Locomotive costs are overstated;
2. Maintenance costs are overstated; and

3. Wayside equipment costs are likely overstated.

Each of the three issues is discussed below.

1. **Overstated Locomotive Adaptation Costs**

In its 2004 report, FRA adjusted the $30,000 to $75,000 locomotive unit costs estimated by ZETA-TECH (cost range for PTC B) downward to $20,000 to $35,000 per unit based on comments made in its peer-review workshop by Alan Polivka (director of the North American Joint PTC project), who opined that in a PTC B system, locomotives could be equipped at a cost of $25,000 per unit.[74]

In its 2009 economic analysis, FRA increased its estimated locomotive unit costs to $55,000 per unit (in the middle range of the 2004 ZETA-TECH report estimate it rejected in preparing its 2004 Report to Congress.) The FRA stated that it based its new 2009 estimate on "discussions with RSAC participants and others over the course of more than a decade of experience in estimating PTC costs."[75]

Now that PTC is mandated, it is reasonable to assume that locomotive manufacturers will begin to include integrated PTC control systems on their products. Over time, this could simplify or eliminate the PTC vehicle adaptation process and reduce costs associated with installing PTC on new locomotives.[76] FRA is aware of this probability and is in the process of reviewing and enhancing the Locomotive Safety Standards so as not to "restrict the adoption of new locomotive control functions and technologies by imposing regulations on locomotive control systems."[77]

In December 2008, The Virginia Railway Express ("VRE"), which interfaces with CSXT and NS, announced that it would "install [PTC compatible] devices on 41 locomotives at a

[74] FRA 2004 Report to Congress, page 22.
[75] FRA 2009 Economic Analysis, page 117.
[76] FRA 2009 Economic Analysis, page 95.
[77] FRA 2009 Economic Analysis, page 16.

cost between $1.2 million and $2 million."[78] That equates to $29,000 to $49,000 per unit.

Given that: (1) the FRA based its locomotive adaptation cost estimate of roughly $35,000 in its 2004 report based on "actual purchases"; (2) VRE recently reported average equipment purchases of $39,000 per unit; and (3) FRA believes locomotive manufacturers will begin to facilitate the PTC implementation process on new locomotives, FRA's $55,000 per unit estimate is at or very near the upper bound of reasonable estimates. We have thus reduced the estimate to $50,000 per unit (which is higher than VRE's recently reported installation costs but a reduction from FRA's estimate).[79] The result is a $112 million reduction in base-case locomotive adaptation costs over the 20-year analysis period on a net present value ("NPV") basis.[80]

2. **Overstated Maintenance Costs**

All of the reports relied on and analyses developed by FRA were consistent in the methodology used to estimate PTC system maintenance costs. In each case, annual maintenance costs were assumed to equal a percentage of the total investment costs. However, the reports were inconsistent with respect to the percentage used to derive the maintenance cost estimates. FRA noted in its 2004 Report to Congress that "the RSAC report used a figure of 10% of initial acquisition costs, while the ZETA-TECH study used a figure of 15%. There does not seem to be much basis to prefer one number over the other."[81] However, FRA adopted the 15% figure in its 2004 Report to Congress and has retained the use of that figure to develop its maintenance cost estimates through its final rule RIA. In its 2009 economic analysis, FRA supported its use of the 15% figure with the following language:

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[78] "Railroads Set Positive Train Control (PTC) Development & Interoperability Strategies to Meet 2015 Mandate," *Progressive Railroading*, 12/10/2008; Accessed on-line at <<http://www.progressiverailroading.com/news/article.asp?id=18969>> on April 16, 2010.

[79] The restated annual locomotive installation costs are shown on Attachment No. C-2, Column (6).

[80] NPV calculated using a 7% discount rate. See: Attachment No. C-1, Line 3, Columns (5) and (6).

[81] FRA 2004 Report to Congress, page 23.

> "Electronic systems may even have a greater annual maintenance cost if the components must be replaced frequently, because the components are no longer manufactured as technology brings chips and other electronic equipment with greater capabilities to the general market. It is unlikely that a chip maker will maintain production of an obsolete chip just to serve the railroad market, which is very small relative to the total market for processors."[82]

In developing its 2009 estimates for cost categories other than annual maintenance, FRA largely eschewed its 2004 cost estimates (based primarily on the 2004 ZETA-TECH report) and replaced them with estimates based on the preceding RSAC study, stating that, "in light of current discussions with railroads, the cost estimates in the 1998 report seem more accurate."[83] However, the referenced RSAC report included a 10% maintenance rate estimate. FRA did not incorporate all components of "the 1998 report." Additionally, ZETA-TECH noted in its 2004 report that BNSF used a 10% factor for its ARES project.[84]

As noted by FRA in 2004, there is no definitive reason to use either the 10% figure or the 15% figure employed by the various parties over the last decade in estimating ongoing maintenance costs. As such, the proper way to include maintenance costs in the analysis is as a range from 10% (low) to 15% (high). In the base case, the middle of the range (12.5%) should be used to estimate annual maintenance costs.

We have replaced FRA's 15% annual maintenance figures with a restated annual maintenance estimate based on 12.5% of installed system costs.[85] The result is a 16.7% annual

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[82] FRA 2009 Economic Analysis, page 118.
[83] FRA 2009 Economic Analysis, page 119.
[84] 2004 ZETA-TECH Report, page 100.
[85] See Attachment No. C-2, Column (7).

reduction in base-case maintenance costs, which amounts to a reduction of $1.042 billion over the 20-year analysis period on a NPV basis.[86]

3. Overstated Wayside Equipment Installation Costs

In its 1999 report, RSAC attempted to account for existing PTC-compatible wayside equipment when it evaluated PTC costs. However, in 2004 both ZETA-TECH and FRA failed to account for existing equipment that railroads could incorporate into their PTC systems. ZETA-TECH noted that its initial cost estimates may have been overstated because much PTC-compatible equipment had already been purchased. In its 2009 economic analysis as well as in the 2010 final rule, FRA failed to account for existing PTC-compatible equipment when calculating its implementation cost estimates. However, FRA did note in its final rule that BNSF had successfully demonstrated a functional Switch Point Monitoring System ("SPMS") as well as a Track Integrity Warning System ("TIWS"), and that those technologies "are forward-compatible for use with existing and new PTC systems."[87]

As BNSF and other Class I railroads already have PTC-compatible systems installed, implementation costs should properly be adjusted to reflect those system capabilities. However, without inventorying all currently-installed PTC-compatible components on all affected rail systems, it is impossible to restate the wayside costs accurately. Therefore, for purposes of this Report we have retained the FRA cost estimate as included in the final rule, although we believe this cost category is overstated.

4. Restatement

Table 17 below shows the total restated costs including the adjustments to maintenance and locomotive adaptation costs described above.

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[86] NPV calculated using a 7% discount rate. See: Attachment No. C-1, Line 4, Columns (5) and (6).
[87] **Federal Register** / Vol. 75, No. 10 / Friday, January 15, 2010 / Rules and Regulations, page 2601.

Table 17
Restated FRA January 2010 Final Rule Cost Estimate 1/
(2009 Dollars in Millions)

Item (1)	Amount (2)
1. On-Board Equipment (Vehicle Adaptation)	$1,278.1
2. Wayside Equipment	$2,414.8
3. Central Office and Development	$263.2
4. Maintenance	$4,437.3
5. Total Expected System Cost	$8,393.4

Source: Attachment No. C-1, Column (6).
1/ Net Present Value assuming 7% Discount Rate.

As shown in Table 17 above, corrected total costs equal $8.4 billion over the 20-year analysis period. FRA's estimate of $9.5 billion (shown in Table 6 above) is overstated by roughly $1.1 billion.

C. RESTATEMENT OF FRA FINAL RULE RIA

In the restated benefits section of this Report, we evaluated and restated FRA's benefits methodologies and estimates. Coupling our restated benefits analysis with this cost estimate restatement, we are able to restate FRA's overall CBA supporting its final rule RIA. Table 18 below contains a summary of the total costs and benefits (to industry, the government, and society) associated with the final rule.

Table 18
Comparison of FRA CBA to Corrected and Restated CBA
($ in millions)

Item (1)	FRA Final Rule RIA (2)	Restated (3)
1. Railroad Direct Costs [1]	$9,547.5	$8,393.5
2. Other Direct, Indirect, and Societal Costs [2]	Improperly Excluded by FRA	$5,707.6
3. Railroad Safety Benefits [3]	$439.7	$439.7
4. Other Railroad, Shipper, and Societal Benefits [4]	Improperly Excluded by FRA	$17,266.7
5. Total Costs (L1 + L2)	$9,547.5	$14,101.1
6. Total Benefits (L3 + L4)	$439.7	$17,706.4
7. Cost-Benefit Ratio (L5 ÷ L6)	21.71	0.80

1/ Attachment No. C-1, Line 5, Column (2) and (6).
2/ Attachment No. C-1, Column (6) sum of lines 18,19,20,21.
3/ Attachment No. C-1, Line 16, Column (2) and (6).
4/ Attachment No. C-1, Column (6), sum of lines 22,23,24,25.

As shown in Table 18 above, the total benefits expected from the implementation of the PTC final rule exceed the total costs, resulting in a cost-benefit ratio of 0.80.

V. POTENTIAL ECONOMIC HARM TO TIH SHIPPERS RESULTING FROM THE RAILROADS IMPLEMENTATION OF POSITIVE TRAIN CONTROL

Our discussion of potential economic harm to TIH shippers is included below under the following topical headings.

A. Railroads' Position On Cost Recovery

B. Quantification Of Costs Allocated To TIH Shippers

C. PTC Investments Will Impact Regulated TIH Shipper Rates

A. RAILROADS' POSITION ON COST RECOVERY

While the majority of railroad company reports, regulatory filings and commentary around the design and installation of PTC systems has focused on the costs, the railroads have begun to shed light on how they plan to recover the costs of implementation. The Class I railroads and their trade organization, the AAR, have publicly stated that the desired approach for recouping PTC investments is through direct government grants or tax credits. As outlined in its PTC position paper, the AAR believes Congress should consider various funding mechanisms to offset PTC investment, including:

- A 25 percent infrastructure tax incentive to help off-set the initial start-up costs of PTC installation; and
- A fully funded and expanded RSIA Rail Safety Technology Grant program.[88]

So far, Congress has not addressed the AAR's and railroads' funding suggestions.

Without direct government support, the railroads will look to internal sources of funds to pay for the PTC investment, primarily TIH shippers. The most current explanation came from the UP in a case recently decided by the STB. In its evidence filed in *US Magnesium*,[89] UP stated

[88] See "*The Need for Reasonable Implementation of the Positive Train Control Mandate*," AAR, October 2009.

[89] Docket No. 42114, *US Magnesium, L.L.C. v. Union Pacific Railroad Company*, served August 24, 2009 ("*US Magnesium*")

that it is the railroads' position that because the majority of PTC implementation is due to the transportation of TIH materials, TIH shippers should bear the cost of the installation. As indicated by the UP:

> "A large portion of UP's costs to install PTC is caused by UP's transportation of TIH. As a matter of economic efficiency and regulatory precedent, it is reasonable and appropriate for UP's rates to TIH shippers to reflect the PTC costs caused by TIH..."
>
> ****
>
> "In short, if UP did not transport TIH, its costs to install PTC would be substantially lower than the approximately $1.4 billion that will actually be required to install PTC."
>
> ****
>
> "That is, UP is incurring substantial PTC costs to provide service to TIH traffic, and it would not be incurring those costs if it were not providing that service. Thus, he concludes that it is reasonable and appropriate to allow railroads an opportunity to charge higher rates to TIH shippers than to shippers of other freight in order to recover PTC costs."[90]

UP's position is clear in that it places the burden of having to install the majority of its PTC infrastructure on TIH shippers. It is equally as clear that UP, and presumably all the Class I railroads, will attempt to recoup a large portion of PTC costs through higher rates to TIH shippers.

B. QUANTIFICATION OF COSTS ALLOCATED TO TIH SHIPPERS

Using data provided by the individual Class I railroads, by the UP in *US Magnesium*, and contained in FRA's NPRM along with standard financial models used by railroad regulators,

[90] Source: UP Opening Evidence in *US Magnesium*, pages 42 and 43 (internal quotations omitted).

it is possible to develop the estimated annual costs the railroads will impose on TIH shippers to recover their capital outlays for PTC.

FRA included approximately $4.1 billion on a net present value basis in capital investment costs to install PTC in its Final Rule Cost and Safety Benefits Analysis. This figure, when accounting for the impact of discounting, is virtually the same as the figures presented by the railroads in their most recent Securities and Exchange Commission ("SEC") filings about the costs to install PTC systems. To directly tie to the costs, the railroad companies are indicating to the investment community and, by extension, their shipping communities, that the railroads have relied upon these figures to estimate the costs expected to be the responsibility of TIH shippers.

Attachment No. H-1 contains the estimated costs by year and individual Class I railroad to design, develop and install PTC systems. While the railroads' filings indicate their estimated expenditures for the present year and their overall estimates of capital expenditures for PTC installation, they have not indicated the phasing of the expenses over the remaining five-year period from 2011 to 2015. For this estimate, we have assumed that the railroads will roll out their additional estimated investment on a pro-rata basis for the years 2011 to 2015.

Table 19 below contains a breakdown of the railroads estimated timing of PTC investment.

Table 19
Estimated PTC
Installation Capital Costs By Year
(Millions)

Year (1)	PTC Installation Cost By Year (2)
1. 2010	$710
2. 2011	$845
3. 2012	$845
4. 2013	$845
5. 2014	$845
6. 2015	$845
7. Total	$4,933

Source: Attachment No. H-1

As shown in Table 19 above, the railroads are telling the markets and their shippers that they expect to incur approximately $4.9 billion in PTC related capital expenditures.

Because the Congressional mandate requires PTC along main line railroad segments that carry TIH commodities and/or passenger traffic, it is necessary to allocate the costs between those rail lines that will exclusively carry TIH commodities, those carrying passenger traffic but not TIH traffic and rail lines carrying both TIH and passengers.

In its testimony in *US Magnesium*, UP allocated 100 percent of its PTC investment to TIH shippers on the line segments where only TIH shipments occurred, e.g., no passenger traffic. On those segments where TIH traffic and Amtrak traffic would share the UP right of way, UP assumed 75 percent of the costs would be allocated to TIH traffic and 25 percent to Amtrak.[91]

UP indicated in *US Magnesium* that its approach provides an extremely conservative estimate of cost sharing between TIH shippers and passenger rail traffic. This is because based on

[91] There are also rail lines covered by the PTC mandate that transport TIH traffic and passenger traffic other than that carried by Amtrak, including primarily commuter rail lines. This amount of track miles is small when compared against the TIH only traffic and TIH and Amtrak combined traffic segments.

Amtrak's 2010 Grant and Legislative Request, Amtrak is only requesting funds to pay the costs to install PTC on Amtrak-owned track and on its own locomotives, and to not contribute to PTC costs where it is the tenant railroad.[92]

Using these allocation percentages developed by UP and the track miles requiring PTC installation by traffic type (TIH traffic only, passenger traffic only, combination TIH and passenger) as developed by FRA, we were able to estimate the cost allocation factors the railroads will likely use to divide PTC investment costs between its users. As shown in Attachment No. H-2, we estimate that the railroads would allocate 85 percent of its PTC investment costs to TIH shippers if applied on a direct cause of expense basis.

Using the capital costs expected by the railroads for PTC installation and the allocation factors based partly on evidence presented by UP, we estimated the annual capital carrying charges the railroads will seek from TIH shippers to cover their allocated PTC investment. To develop these capital carrying charges, we relied upon the standard discounted cash flow ("DCF") model used by the STB in calculating capital carrying charges in rail rate regulation cases. The STB's DCF model develops the amount of revenue a railroad or collection of railroads would have to earn each year to provide a return on and return of their investment. The STB's model is an infinite life model in that it reflects both the return required on the initial investment, and the return required to maintain capital outlays in the investment into the infinite future. In this way, the model reflects the costs to continuously replace the capital portions of PTC infrastructure as they wear-out over time. Simply stated, the STB's model predicts the railroads' revenue requirements on a continuing basis over time, and not the cost requirement over a finite, defined period of time.[93]

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[92] National Railroad Passenger Corporation FY 2010 Grant and Legislative Request.

[93] UP used a similar methodology in the *US Magnesium* in an endeavor to show the amount of recovery from TIH shippers on its own estimated PTC investment.