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BEFORE THE
SURFACE TRANSPORTATION BOARD

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| E.I. DUPONT DE NEMOURS & COMPANY<br><br>Complainant,<br><br>v.<br><br>NORFOLK SOUTHERN RAILWAY COMPANY<br><br>Defendant. | ) | Docket No. NOR 42125 |

# BRIEF OF NORFOLK SOUTHERN RAILWAY COMPANY


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Contains Color Images

## TABLE OF CONTENTS

## EXHIBITS

## SHORT FORMS FOR FREQUENTLY CITED CASES

The following short form case citations are used herein:

| | |
|---|---|
| *AEPCO 2002* | *Arizona Electric Power Cooperative, Inc. v. Burlington Northern & Santa Fe Railroad Co. & Union Pacific Railroad Co.*, 6 S.T.B. 322 (2002). |
| *AEPCO 2011* | *Arizona Electric Power Cooperative, Inc. v. Burlington Northern & Santa Fe Railroad Co. & Union Pacific Railroad Co.*, STB Docket No. 42113, (served Nov. 16, 2011) |
| *AEP Texas* | *AEP Texas North Co. v. BNSF Railway Co.*, STB Docket No. 41191, (Sub-No. 1) (served Sept. 10, 2007) |
| *CP&L* | *Carolina Power & Light Co. v. Norfolk Southern Railway Co.*, 7 S.T.B. 235 (2003) |
| *Duke/CSXT* | *Duke Energy Corp. v. CSX Transportation, Inc.*, 7 S.T.B. 402 (2004) |
| *Duke/NS* | *Duke Energy Corp. v. Norfolk Southern Railway Co.*, 7 S.T.B. 89 (2003) |
| *FMC* | *FMC Wyoming Corp. v. Union Pacific Railroad Co.*, 4 S.T.B. 699 (2000) |
| *IPA* | *Intermountain Power Agency v. Union Pac. R.R. Co.*, STB Docket No. 42127 (served April 2, 2012). |
| *M&G* | *M&G Polymers USA, LLC v. CSX Transportation, Inc.*, STB Docket No. 42123 (served Sept. 27, 2012) |
| *Major Issues* | *Major Issues in Rail Rate Cases*, STB Ex Parte No. 657 (Sub-No. 1) (served Oct. 30, 2006), aff'd sub nom. BNSF v. STB, 526 F.3d 770 (D.C. Cir. 2008) |
| *McCarty Farms* | *McCarty Farms, Inc. v. Burlington Northern, Inc.*, 2 S.T.B. 460 (1997) |
| *Otter Tail* | *Otter Tail Power Co. v. BNSF Railway Co.*, STB Docket No. 42071 (served Jan. 27, 2006) |
| *PPL Montana* | *PPL Montana, LLC v. Burlington Northern & Santa Fe Ry. Co.*, 6 S.T.B. 286 (2002) |
| *Rate Regulation Reforms* | *Rate Regulation Reforms*, STB Ex Parte No. 715 (served July 25, 2012). |

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|---|---|
| *SAC Procedures* | *Procedures for Presenting Evidence in Stand-Alone Cost Rate Cases*, 5 S.T.B. 441 (2001) |
| *TMPA I* | *Texas Municipal Power Agency v. Burlington Northern & Santa Fe Railway Co.*, 6 S.T.B. 573 (2003) |
| *TPI Bifurcation* | *Total Petrochemicals & Refining USA, Inc. v. CSX Transportation, Inc.,* STB Docket No. 42121 (served April 5, 2011) |
| *TPI* | *Total Petrochemicals & Refining USA, Inc. v. CSX Transportation, Inc.*, STB Docket No. 42121 (served May 31, 2013) |
| *West Texas* | *West Texas Util. Co. v. Burlington Northern Railroad Co.*, 1 S.T.B. 638 (1996). |
| *WFA I* | *Western Fuels Ass'n & Basin Elec. Power Cooperative v. BNSF Railway Co.*, STB Docket No. 42088 (served Sept. 10, 2007) |
| *WFA II* | *Western Fuels Ass'n, Inc. v. BNSF Railway*, STB Docket No. 42088 (served Feb. 17, 2009) |
| *Xcel* | *Public Service Co. of Colorado d/b/a Xcel Energy v. Burlington Northern & Santa Fe Railway Co.*, 7 S.T.B. 589 (2004) |

DuPont has not carried its burden of proof with respect to the jurisdictional market dominance test in more than two-thirds of the challenged traffic lanes, and its Complaint should be dismissed on those grounds alone. In addition, DuPont has failed to present a *prima facie* stand-alone cost ("SAC") case because both on Opening and Rebuttal it submitted an operating plan that fails to provide complete service for all of its selected traffic, including DuPont's own "issue traffic," a failure that warrants dismissal of the Complaint on that ground as well. Moreover, even if the Board were to conduct a full SAC analysis, NS's evidence convincingly demonstrates that all of the challenged rates are reasonable. DuPont cannot claim to show otherwise without inappropriately contorting the SAC test to "make the math work." NS's evidence, developed in accordance with Board precedent and the economic principles underlying the SAC test, clearly shows that the math supports a reasoned finding that the challenged rates are reasonable.

Although this maximum reasonable rate case is larger and more complex than the typical SAC case—challenging the reasonableness of NS's common carrier rates for transportation of 26 commodities in 148 different traffic lanes, which move in merchandise trains over a complex network of more than 8,000 miles—it is governed by the same well-settled principles that apply to every SAC case. A complainant must develop and support "a detailed operating plan" for its proposed SARR that is tailored to serve the complainant's selected traffic group.[1] That operating plan "must provid[e] service that is equal to (or better than) the existing service" for the selected traffic.[2] "The parties must provide appropriate documentation to support their estimates."[3] And all assumptions used in the SAC analysis "must be realistic, *i.e.*, consistent with the underlying realities of real-world railroading."[4]

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[1] *See, e.g., AEPCO 2011* at 4; *Rate Regulation Reforms* at 5; *Otter Tail* at 6; *Xcel*, 7 S.T.B. at 598; *TMPA I*, 6 S.T.B. at 589.

[2] *See, e.g., TMPA I* at 589; *Duke/NS*, 7 S.T.B. at 99; *AEPCO 2011* at 28; *Xcel*, 7 S.T.B. at 610.

[3] *See, e.g.*, *Rate Regulation Reforms* at 6; *AEPCO 2011* at 4-5.

[4] *See, e.g.*, *WFA I* at 15; *AEPCO 2011* at 16; *Xcel Reconsideration* Docket No. 42057 (Jan. 19, 2005) at 8.

The Board's adherence to these bedrock principles is essential if the SAC test is to perform its designed function of "determin[ing] whether a complainant is bearing costs resulting from inefficiencies or costs associated with facilities or services from which it derives no benefit." *Rate Regulation Reforms* at 5. Allowing a SAC complainant to claim revenues for selected traffic without providing complete service for that traffic, or to inflate SARR revenues or depress SARR expenses based on unrealistic, infeasible or unsupported assumptions, would transform the SAC methodology from a rigorous economic test into an abstract mathematical game untethered from sound economic principles. *Id.*

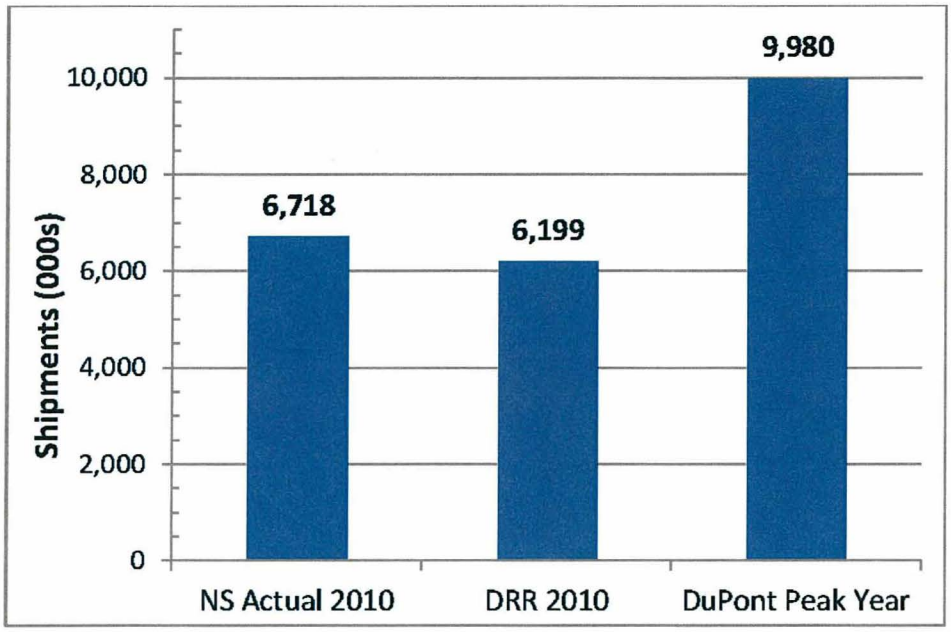
DuPont's evidence disregards these basic SAC principles. This is not because the principles are hard to understand or difficult to apply. It is rather because applying those principles to this case shows that the DRR's stand alone costs exceed its stand alone revenues, and thus that NS's rates are reasonable under the SAC constraint. So DuPont does its best to ignore the "underlying realities of real world railroading" in order to achieve its desired results. The product of DuPont's efforts is a stand alone presentation that has no proper operating plan, that fails to provide adequate service for its selected traffic group, that is supported by little documentation, and that depends upon a host of unrealistic assumptions.

For example, DuPont presents a so-called "operating plan" for the DRR that is predicated entirely on "adopting" historical NS trains as DRR trains. Even assuming that this approach were appropriate (which it is not, for reasons explained by NS), DuPont's Opening Evidence failed to "adopt" literally tens of thousands of trains that are needed to provide full service for 725,661 cars of selected traffic. *See infra* at 19-23. After NS pointed out this flaw on Reply—specifically tagging each missing train in DuPont's own database—on Rebuttal DuPont chose to add only a small fraction of the missing trains. As a result, DuPont's operating plan still does not include the trains necessary to serve hundreds of thousands of selected carloads—including *33% of its own issue traffic*. *See id.* This is not mere sloppiness on DuPont's part—on the contrary, by failing to provide full train service for hundreds of thousands of carloads of traffic, DuPont artificially depressed SARR operating expenses by assuming that the DRR would need far fewer

locomotives, crews, and train starts than a real-world DRR would need to "provid[e] service that is equal to (or better than) the existing service" for the selected traffic. *TMPA* I, 6 S.T.B. at 589. Indeed, DuPont's failure to provide for full origin-to-destination transportation for all the traffic it selected—and especially its own issue traffic—is such a fundamental shortfall as to constitute a failure to present a *prima facie* case, and DuPont's Complaint should be dismissed without further consideration on that ground alone.

Although DuPont purports to base its operating plan on NS's "real-world operations," a useful illustration of the utter incompatibility of its operating plan with the real world is to compare the total traffic volumes that DuPont says the DRR will handle in the Peak Year with the total freight volumes NS handles in the real world today. According to DuPont, the DRR would handle almost ten million Peak Year carloads—a volume that is 46% higher than NS's entire 2010 traffic base—while building no hump yards and substantially fewer yards and less infrastructure than NS uses to transport less than 7 million carloads of traffic today. Yet DuPont provides no plausible explanation for how the DRR would realize such remarkable efficiencies over the real world NS. *See infra* at 26-31.

**Figure 1**
**DRR Base Year and Peak Year Carloads Compared to NS Actual Carloads[5]**




The only way that DuPont can "make the math work" for the DRR to wind up with more SAC revenues than SAC expenses is for it to make a host of unreasonable and unsupported assumptions that are completely inconsistent with the real world. The "short-cuts" in its operating plan are just the beginning of its attempts to distort the SAC test. For example:

- DuPont assumes that the DRR could acquire property for its right-of-way at 2009 prices (in a deeply depressed real estate market), even though its own DRR construction schedule contemplates right-of-way acquisition in 2007 (in a robust real estate market). *See infra* at 102-04.[6]
- DuPont posits two diametrically opposed assumptions about fuel price increases—in calculating future DRR fuel surcharge *revenues*, DuPont used an index projecting a substantial increase in fuel prices, but for purposes of calculating future DRR fuel

[5] *Sources*: NS Reply Figure III-C-22 at III-C-159, DuPont Rebuttal WP "DRR Traffic Revenue Forecast - Rebuttal.xlsx." Peak year (June 1, 2018 – May 31, 2019) traffic volumes were derived by applying DuPont's 58% forecasted growth for all traffic to the 92% of total NS traffic that DuPont selected for the DRR; this results in total DRR peak year traffic that is 146% of NS's total 2010 levels.

[6] As discussed below, DuPont's claim that this error is corrected by its use of an index for real estate values in the DCF model is meritless, for the concocted "index" makes the ludicrous claim that the post-crash real estate values DuPont uses would have been even lower before the crash.

expenses it uses a different index that projects the same fuel price will be unchanged over the same period. *See infra* at 97-99.

- DuPont posits DRR general and administrative ("G&A") and maintenance of way ("MOW") spending levels wildly below those that would be consistent with past Board decisions—let alone the experience of real world railroads—and provides no evidence from which the Board could conclude that DuPont's proposals are realistic. *See infra* at 59-75.
- DuPont tosses aside the long-accepted R.S. Means ("Means") estimates for SARR earthwork costs in favor of poorly supported costs from a small, isolated, and atypical project on a shortline railroad, which it attempts to extrapolate to a 7,300 track mile SARR that traverses different terrain in 20 states. *See infra* at 110-119.
- It claims that the DRR could acquire land easements for the same dollar amounts that NS's predecessors paid over a century ago—with no indexing for inflation. *See infra* at 109-110.

These are just a few examples of DuPont's manipulations of the SAC test, many more of which are detailed below. All of them share a common theme: a fundamental inconsistency "with the underlying realities of real-world railroading." *WFA I* at 15.

DuPont has also manipulated SAC theory and practices in a manner that would distort the SAC test almost beyond recognition. In particular, DuPont applied the "cross-over traffic" device in such a manner and to such a degree as to make the "traffic group" of the DRR a mockery, divorced from both the economic theory behind SAC and the real world of efficient freight railroading that is supposed to be the hallmark of the SAC test. NS urges the Board to reject the "leap frog" technique of hypothesizing the appearance, disappearance and re-appearance of trains and cars on portions of the routes of movement of DRR traffic, a technique that constitutes a blatant attempt to undermine the SAC test by "removing" costly portions of those routes from the account of the stand-alone proponent. Failure to disallow this abuse of the SAC test now would ensure that future rate cases would feature SARRs with numerous "missing" lines, bridges, tunnels, yards and other facilities on the incumbent's rail system whose costs the Complainant wishes to avoid incurring in the SAC world, taking "gaming" to an entirely new level. Rather than a test for cross-subsidy comparing the properly attributable costs and revenues of the least cost, most efficient alternative to a Defendant railroad's service to a

shipper, the test would become one limited only by the imagination and aggressiveness of the shipper's consultants and counsel.

In short, DuPont pushes the envelope so far with its unreasonable assumptions and distortions that its SAC analysis purports to show that the maximum reasonable rates for DuPont's chemicals traffic—including TIH chlorine traffic—should be set at levels *below* those that would cover *their variable costs* (were it not for the statutory prohibition against prescribing rates below the jurisdictional threshold). Moreover, its "corrected" Rebuttal SAC evidence still generates an operating ratio for the DRR of 51.8%,[7] an incredible number that is far below the operating ratios of even the most efficient Class I railroads in North America. This fact alone shows that DuPont's SAC evidence is derived not from a least-cost, most efficient alternative to NS's service, but rather from an unrealistic and inadequate one. When DuPont's unreasonable assumptions are corrected and a proper and complete SAC analysis is conducted, the DRR's expenses easily exceed its revenues, and therefore the SAC test shows that the challenged rates are below a maximum reasonable level.

DuPont also engaged in the all-too-common strategy of submitting a bare-bones Opening and withholding significant portions of its evidence and case-in-chief for rebuttal—a tactic that has resulted in a Rebuttal that dwarfs DuPont's Opening.[8] "Board rules clearly direct that complainants put forth their best and most complete case on opening." *TPI* at 9.[9] DuPont's strategic decision to flout this rule repeatedly by presenting evidence on Rebuttal that could and should have been presented on Opening must not be condoned. Such sandbagging, if allowed,

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[7] Railway operating expenses, including depreciation, of $1,609,663 divided by total railway operating revenues of $3,109,690, equals 51.8%. *See* DuPont Rebuttal Ex. III-H-1 at 18. The DRR's annual depreciation expense was calculated from the service lives and investment amounts in DuPont Rebuttal Exhibit III-H-1.

[8] For example, the Stand Alone Cost Narrative of DuPont's Rebuttal weighs in at 511 pages—over three times the length of the 156-page Stand Alone Cost Narrative in DuPont's Opening.

[9] *See also id.* ("Principles of fairness and the orderly handling of cases require that 'parties submit their best evidence on opening, so that each party has a fair opportunity to reply to the other's evidence.'" (quoting *Xcel Energy*, S.T.B. Docket No. 42057, at 2 (served April 4, 2003)).

would cause NS substantial unfair prejudice and undermine the reliability of the Board's processes. Exhibit 1 to this Brief catalogs numerous instances where DuPont violated the Board's rules governing the proper scope of rebuttal evidence. NS respectfully requests that the Board show that it means what it has said about requiring Complainants to submit their full and best evidence on Opening and disregard all of DuPont's improper Rebuttal.

Even before the Board considers the parties' SAC evidence, however, it should dismiss the majority of the challenged lanes for lack of jurisdiction. DuPont has failed to prove that NS possesses market dominance over the issue movements in 99 of the challenged lanes. Because market dominance is a jurisdictional prerequisite to the Board's analysis of the challenged rates in the 148 traffic lanes included in the Complaint, the Board should dismiss the Complaint as to these 99 lanes. And having done so, it will be necessary to determine whether there are a sufficient number of movements and lanes remaining to justify proceeding with analysis of the SAC evidence. *Cf. TPI Bifurcation* at 7 (recognizing that Board's dismissal of lanes for lack of market dominance after submission of SAC evidence can led to "an evidentiary record inconsistent with the assumptions underlying the complainant's selection of a traffic group and the facilities necessary to serve that group").

If the Board does proceed to analysis of the SAC evidence, that evidence overwhelmingly supports a finding that the challenged rates are reasonable. NS's Reply Evidence conservatively assumes that the DRR would be significantly more efficient than NS or any other real-world railroad. Yet even with those conservative assumptions, the challenged rates easily pass the SAC test.

This Brief summarizes important differences in the parties' evidence and the most critical issues that are presented for the Board's decision in this case. Because NS has focused on the most important issues, this Brief does not reiterate many points discussed in its Reply Evidence.[10] Section I discusses the substantial evidence that the Board lacks jurisdiction over

[10] NS incorporates all the arguments set forth in its Reply Evidence. Where NS does not further discuss a particular point in this brief, NS's position remains the same as on Reply.

most of the lanes in DuPont's complaint because of effective intermodal competition. Section II details the fundamental, irremediable flaw in DuPont's case—its failure to present an operating plan that is specifically tailored to the needs of its selected traffic group. DuPont's operating plan—which does not move substantial numbers of cars from each specific origin, through the network, and to each specific destination—utterly fails this basic requirement. Section II also shows that DuPont's attempts to distract from its failures by criticizing NS's operating plan are meritless, and that NS's operating plan is a reasonable and well-supported model for how an optimally efficient DRR would operate. Section III discusses major disputes regarding operating expenses, including G&A expenses, maintenance of way, insurance, and ad valorem taxation. Section IV addresses the parties' disputes over traffic and revenue issues such as the proper application of the ATC methodology, fuel surcharge assumptions, and the treatment of "leapfrog" traffic. Section V discusses major disputes about road property investment. Section VI concludes with a discussion of the proper application of the discounted cash flow analysis and, if necessary, the Maximum Markup Methodology ("MMM") and cross-subsidy analysis.

## I. NS DOES NOT POSSESS MARKET DOMINANCE OVER 99 OF THE CHALLENGED MOVEMENTS.

NS's Reply presented compelling evidence that DuPont has effective transportation alternatives for at least 99 of the NS tariff rates that it has challenged and that DuPont therefore has failed to carry its burden to demonstrate that NS possesses market dominance over those rates. NS's evidence proved, among other things, that DuPont transports many thousands of truckloads of the issue commodities each year; that for many of the challenged lanes truck transportation is a logistically feasible alternative; and that for many of those lanes the cost of such transportation is competitive with the cost of rail transportation using the challenged rates. For many of these lanes, therefore, DuPont has a genuine choice between using rail service or trucks. While DuPont apparently hopes that it can obtain lower rates from a Board prescription than it could from the market, Congress unambiguously provided that shippers who have the

option of using competitive alternatives to rail service are not entitled to a regulatory review of their rates.[11]

DuPont does not seriously dispute NS's evidence that DuPont transports many of the issue commodities by truck, that truck transportation is a possible alternative for many of the issue movements,[12] and that truck transportation is cost-competitive for many of those issue movements. Rather, the disputes in this case are about the legal significance of this evidence. For example, DuPont claims that the existence of comparably-priced trucking alternatives only proves NS's market dominance, because NS supposedly raised its prices to match those of higher cost truck competitors. But NS's evidence shows that those rates were increased after expiration of a long-term contract {

} DuPont

further claims that whole-route trucking alternatives legally cannot be considered for challenges to the NS portion of joint line movements—no matter that such alternatives are plainly effective competition in the real world and have been considered in past ICC and STB decisions. And DuPont claims that truck competition cannot be considered "effective" if trucking rates are above a "limit price" derived from NS's variable costs, despite the multiple legal flaws in the proposed "limit price" test for market dominance.

Space does not permit NS to respond fully to DuPont's Rebuttal arguments on market dominance matters in this Brief, and NS therefore primarily relies on the detailed evidence and

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[11] *See, e.g.*, *Midtec Paper Corp. v. United States*, 857 F.2d 1487, 1506 (D.C. Cir. 1988) (market dominance test furthers congressional policy "to preclude the Commission from scrutinizing rates where 'effective competition' exists"); *Consolidated Papers, Inc. v. Chicago & N.W. Transp. Co.*, 7 I.C.C.2d 330, 336 (1991) ("Congress has decided that, to the greatest extent possible, railroad rates should be governed by competitive forces."); *Potomac Elec. Power Co. v. Consolidated Rail Corp.*, 367 I.C.C. 532, 536 (1983) (recognizing that Congress intended to "allow[] the forces of the marketplace to regulate railroad rates wherever possible").

[12] To be sure, DuPont claims that many individualized factors affect the feasibility and desirability of truck service vis-à-vis rail transportation for particular movements, and that NS could still be market dominant because of these individualized factors. In almost no case does DuPont say that trucking is a categorically infeasible option, however. Because it is not possible to address DuPont's lane-specific claims in this Brief, NS relies on its detailed Reply Evidence to respond to those claims.

arguments presented in its Reply. NS briefly discusses five of the most critical issues below.

First, DuPont incorrectly claims that NS adopted an "oversimplistic" method for market dominance that focused only on (1) whether alternative transportation has "ever been used to transport the issue commodity" and (2) whether the cost of alternative transportation is comparable to the cost of NS rail transportation. DuPont Rebuttal I-19. On the contrary, NS's feasibility analysis carefully considered the circumstances of each lane, and NS did not contest market dominance on lanes where trucking would be impractical.[13] That said, evidence that a feasible trucking option has a cost comparable to that of rail service is highly probative evidence of a lack of market dominance. Congress indicated that such evidence will ordinarily be deemed to demonstrate effective competition:

> If a shipper can rely on a transportation alternative, which could include another railroad, a barge, or a truck, at a transportation cost which is not substantially greater than the rail transportation cost, then competition is present. Competition will serve to hold down rates, and the railroad involved would not have market power.[14]

The Board should bear Congress's instructions in mind when considering DuPont's various attempts to demonstrate that acknowledged, cost-competitive truck alternatives are not "effective" competition. As the quote above demonstrates, the Congress that enacted Staggers likely would have been quite surprised to learn that there was any serious dispute about the "effectiveness" of competition from truck movements that are both physically feasible and cost-competitive with rail.

Second, the most important and compelling evidence of NS's lack of market dominance is the real-world evidence that DuPont treats trucks as a feasible and useful alternative. DuPont

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[13] For example, while DuPont transports {{ }} amounts of sulfur trioxide by truck, *see* NS Reply II-B-188, NS did not propose a truck option for the short-haul Lane B122 movement between Burnside, LA and Gracewood, GA because of DuPont's evidence {{ }} Nor did NS challenge its market dominance on long-haul cross-border movements of dimethyl formamide, even though DuPont's own evidence showed that the trucking rates for that traffic could be less than the cost of rail transportation. *See* DuPont Opening II-B-87.

[14] H. Rep. 96-1430, at 89 (1980).

has used trucks to transport the issue commodities over {{ }} of the lanes where market dominance is contested, and it has point-to-point trucking contracts for {{ }} of those lanes. *See* NS Reply II-B-3 & NS Reply WP "Point to Point Contract Rates.xls." These are not hypothetical alternatives, but rather real-world alternatives that DuPont has used and is using. DuPont argues that the Board should not rely on DuPont's truck shipment history because the "circumstances" of these shipments show that DuPont more often chooses rail transportation over truck transportation. But an alleged preference for rail transportation cannot create market dominance when an alternative is feasible. *M&G* at 26-28. And DuPont's argument that it would be impossible to shift the full volume of issue shipments to trucks is a red herring. A competitive alternative need not be able to accommodate 100% of the issue volume in order to constitute effective competition.[15] Moreover, NS's Reply Evidence accounted for the cumulative effects of shifting multiple lanes to trucking alternatives. *See, e.g.*, NS Reply II-B-144–145; II-B-158; II-B-167.

Third, DuPont claims that NS's evidence that truck rates are competitive with rail rates is only proof of NS's market dominance, because NS raised its rates after expiration of its legacy contract with DuPont. In the first place, the idea that there is something untoward about NS increasing rates to levels that are competitive with DuPont's contract truck rates demonstrates a deep misunderstanding of the market dominance test. The question is not whether the market rates for transporting DuPont's commodities are at a level that DuPont likes—the question is whether there is in fact a competitive market in which DuPont has transportation options.[16]

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[15] *See, e.g., E.I. DuPont de Nemours and Co. v. CSXT,* STB Docket No. 42100, at 4 (decided June 27, 2008) ("*DuPont (Chlorine)*"). DuPont attempts to dodge this well-settled principle by claiming that, since it was first announced in *Aluminum Association v. ACY Ry. Co*, 367 I.C.C. 475 (1983), NS must make "a similar factual showing" as was made in *Aluminum.* DuPont Rebuttal I-29. DuPont even goes on to claim that "[i]t would be absurd to apply the *Aluminum* holding to individual movements." *Id.* But of course the Board itself applied this principle to an individualized movement in *DuPont (Chlorine)*, and it required no "similar factual showing" to determine that DuPont had failed to prove market dominance in that case. *DuPont (Chlorine)* at 4.

[16] DuPont's claim that {{

Situations where railroads set prices at levels competitive with feasible alternatives are precisely the situations in which Congress deemed it inappropriate for the Board to regulate. *See* H. Rep. 96-1430, at 89 (1980); NS Reply II-B-2 & n.5.

As NS explained in its Reply Evidence, DuPont's theory that price-competitiveness with trucking indicates NS's market dominance elevates a narrow "horse-and-buggy" exception—that price-competitiveness is immaterial where there is evidence that a railroad has priced up to a clearly inferior alternative—into a rule that utterly distorts the intent of the market dominance test. *See* NS Reply II-B-94–98. For the low-volume movements at issue here, trucking is a real-world, commonly used alternative, and one cannot reasonably conclude that NS is pricing up to a "patently ridiculous transportation alternative." *TPI* at 3.

Moreover, DuPont seriously overstates the significance of NS's allegedly unjustified rate increases. As NS's Reply Evidence shows, {

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Fourth, the proposed "limit price approach" that the Board applied in *M&G* and *TPI* is flawed and unlawful, and should not be applied in this case. As NS explained in its Reply Evidence and in its filing in *M&G* (which is attached as Exhibit 2 and incorporated herein), the "limit price" approach's decision to use a R/VC-based rebuttable presumption conflicts with the Interstate Commerce Act; the Board's decision to substantially revise its market dominance standards without a notice-and-comment rulemaking violates the Administrative Procedure Act; and the limit price methodology is an economically meaningless tool for purposes of assessing the effectiveness of competition. *See* NS Reply II-B-40–56. NS relies on the extensive evidence that it presented on Reply and notes that many of the detailed economic criticisms set forth in NS's Reply (and in the comments submitted by interested parties in *M&G*) were not addressed by the Board's *TPI* decision.[17] Even if the Board were to apply this flawed approach to this case, many of the challenged lanes would have presumptions of no market dominance, and many more have limit price R/VCs close enough to NS's RSAM for NS's substantial evidence of DuPont's real-world reliance on trucks to overcome a presumption of market dominance.

Fifth, the parties' dispute over whether *DMIR* precludes the Board from considering whole-route transportation alternatives to NS Rule 11 rates has been effectively resolved by the *TPI* decision, in which the Board held that "*DMIR* does not implicate the Board's subject matter jurisdiction" and affirmed that it "may consider transportation alternatives involving modes over which the Board has no jurisdiction," including contract movements. *TPI* at 10-11. The Board's resolution of this issue accords with the statute, with Board and ICC precedent, and with the

[17] The Board's suggestion in *TPI* that the limit price methodology is supported because it is analogous to the Lerner Index is puzzling, for the very article the Board cites makes clear that "[t]he most important limitation of the Lerner Index" is its inability to account for "the need to cover fixed costs" in industries with "front-loaded" fixed costs. Kenneth G. Elzinga & David F. Mills, *The Lerner Index of Monopoly Power: Origins and Uses*, at 5, *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1884993. The Index is not designed to measure market dominance in high-fixed-cost industries like the rail industry, and the Board's reliance upon it to support the limit price test is therefore misplaced.

reality that whole-route alternatives regularly compete with joint-line rail rates. *See* NS Reply II-B-57–91.

## II. DUPONT FAILED TO PRESENT A FEASIBLE OPERATING PLAN FOR THE DRR.

DuPont's operating plan for the DRR is not feasible and must be rejected. Even with the cosmetic changes proffered by DuPont on Rebuttal, that operating plan fails to provide complete train service for hundreds of thousands of cars of DRR traffic—including 33% of DuPont's own "issue" traffic. DuPont likewise fails to account properly for the car classification and blocking functions performed by a "carload" railroad, and posits a carrier whose physical plant, locomotives and cars, and personnel are utterly inadequate to support the transportation of millions of carloads of merchandise traffic over an 8,000-mile network. In short, DuPont's operating evidence constitutes a failure to present a *prima facie* case, and warrants dismissal of the complaint.

By contrast, NS presented a comprehensive operating plan for the DRR that is tailored to the specific needs of the traffic group actually selected by DuPont. NS's operating plan accounts for all of the facilities, equipment, and personnel necessary to provide the road and local train services, intermediate classification and switching, and pick-ups and set-offs at shippers' facilities, intermodal terminals, automotive ramps, transload facilities, and interchange points required to serve the DRR's traffic in a manner that is consistent with customer requirements, applicable laws, and real world operating practices. Should the Board decide not to dismiss DuPont's complaint outright, it should adopt NS's operating plan as the basis for decision in this case.

A SAC complainant bears the burden of proving that its SARR operating plan is "feasible."[18] The minimum requirements for a feasible operating plan are well-established. The complainant must present "a detailed operating plan" that is "specifically tailored to serve an

[18] *See e.g., CP&L* at 259 (complainant carries the burden to provide a feasible operating plan).

identified traffic group."[19] An operating plan must be "capable of providing the service required by the SARR's customers."[20] The operating assumptions upon which the plan is based must be "consistent with the underlying realities of real-world railroading."[21] While a complainant may elect to have its SARR "step into the shoes" of the defendant railroad, it may not assume that the SARR could do so on more favorable terms or conditions than those available to the incumbent carrier.[22] Finally, the parties "must provide appropriate documentation to support their [operating plan and expense] estimates."[23]

The operating plan submitted by DuPont on Opening did not come close to satisfying those well-established requirements. The SARR posited by DuPont is a railroad whose traffic group consists predominantly of individual carload shipments moving to and from more than 6,000 unique customer locations along an 8,000-mile rail network. DuPont's burden was to demonstrate the DRR's ability to handle each of those shipments from its origin (or on-SARR junction) to its destination (or off-SARR junction). DuPont's operating plan failed to make such a showing, for many reasons.

The most critical flaw in DuPont's Opening operating plan was its failure to provide complete train service for more than 725,000 cars—including 76% of DuPont's own issue traffic. This fatal evidentiary deficiency was the direct result of a litigation choice made by DuPont to base the DRR's train service plan entirely on an automated train selection process, rather than developing a set of trains tailored to the requirements of the DRR's Peak Year traffic. As NS demonstrated in its Reply Evidence, DuPont's flawed train selection methodology did not capture tens of thousands of trains in which the selected traffic moved in the real-world. On

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[19] *AEPCO 2011* at 4 (emphasis added); *see also* Ex Parte No. 715 at 5; *Otter Tail* at 6; *Xcel*, 7 S.T.B. at 598, 610; *TMPA I*, 6 S.T.B. at 589.

[20] *Duke/NS*, 7 S.T.B. at 99; *see also AEPCO 2011* at 28; *Xcel*, 7 S.T.B. at 610.

[21] *WFA I* at 15; *see also AEPCO 2011* at 16; *Xcel Reconsideration*, Docket No. 42057 (Jan. 19, 2005) at 8.

[22] *See, e.g., AEPCO 2002*, 6 S.T.B. at 328.

[23] *See Rate Regulation Reforms* at 6; *AEPCO 2011* at 4-5.

Rebuttal, DuPont admits that its analysis omitted thousands of trains that are essential to serving the selected traffic. Yet, DuPont's Rebuttal operating plan failed to adopt tens of thousands of other trains that, NS showed, are also required to serve the DRR's traffic—including thousands of cars of "issue" traffic. The Board cannot accept, much less accord probative weight to, an operating plan that violates the fundamental requirement that a SARR be capable of serving its selected traffic group.

DuPont's failure to provide complete train service was by no means the only fatal deficiency in its Opening operating plan. DuPont's initial operating evidence:

- Contained no car classification or blocking plan whatsoever for the DRR's three million carloads of general freight traffic;
- Presented no "blocking plan" for DRR yards (even though the car event data furnished by NS identified the specific blocks in which each car traveled);
- Did not include a single hump yard anywhere on an 8,000-mile Class I railroad whose traffic group consists predominantly of individual carload shipments that move across the DRR network in multiple trains;
- Proposed no car classification facilities anywhere on its system including at yard locations like Enola, PA, a major classification yard in NS's "real world" system;
- Presented no evidence or analysis to support the sizing and configuration of the DRR's yards, which were simply presented in conclusory fashion in a "yard matrix" workpaper;
- Proffered no evidence or analysis to support DuPont's estimate of the DRR's yard locomotive and yard crew requirements;
- Failed to account for the special handling requirements for TIH traffic—including the federally-mandated 50 MPH speed limit for trains carrying TIH commodities;[24]
- Did not take properly into account the "reciprocal" nature of real world interline relationships;
- Presented an RTC simulation that suffered from numerous fundamental flaws, including incorrect grades, a vast understatement of delays due to random failures and maintenance requirements, a failure even to consider

[24] Nor did DuPont provide the personnel needed to assure compliance with the myriad safety rules that apply to TIH shipments.

> delays caused by foreign trains crossing the DRR's lines and the daily curfew affecting freight train movements on Amtrak's Northeast Corridor, and modeling of DRR train movements via the wrong routes through Chicago.

NS's Reply Evidence exposed these (and other) glaring deficiencies in DuPont's operating plan, and presented an alternative plan that provides the train services, yard operations, local pickups and setoffs, and other operating activities that are necessary to meet the needs of the DRR's customers. Most importantly, unlike DuPont's operating plan, the NS plan accounted for the complete movement of each selected shipment from its origin (or on-SARR junction) to its destination (or off-SARR junction). Rather than relying upon a computerized selection of data from NS's historical records, NS's experts built the DRR's operating plan "from the ground up" based on the nature and volume of the traffic actually selected by DuPont.

Realizing that it could not submit an entirely new operating plan without violating the Board's pronouncements regarding the permissible scope of rebuttal evidence, and that doing so would prevent it from showing that the SARR revenues exceed the SARR costs (*i.e.*, they could not get the math to work), DuPont's Rebuttal "doubled down" on the fundamentally-flawed operating plan that it submitted on Opening. DuPont's Rebuttal Evidence consists of little more than a misguided effort to persuade the Board that its demonstrably incurable plan has somehow been revived by modest cosmetic changes and to trumpet a continuing litany of excuses for why DuPont made so many (allegedly) "inadvertent" errors on Opening. Despite DuPont's protestations, at the end of the day, DuPont's Rebuttal operating plan remains fundamentally and irremediably flawed.

The glaring deficiencies in DuPont's operating plan constitute a manifest failure to present a *prima facie* case for which the appropriate remedy is dismissal of its Complaint. But in all events, it is impossible for the Board to accept DuPont's operating plan for the DRR [25].

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[25] *See, e.g.*, *FMC*, 4 S.T.B. at 737, n.88, 89 (warning future complainants about attempting to develop an operating plan mathematically rather than developing it from the ground up); *id.* at 37 (rejecting complainant's operating plan in part for understating the number of trains); *Xcel*, 7 S.T.B. at 610-14 (rejecting complainant's operating plan for failure to properly implement grades and for failure to build sufficient track to stage trains); *AEPCO 2011* at 28-30 (adopting

### A. DuPont's Rebuttal Operating Plan Fails the Basic SAC Requirement that the SARR Must Provide Complete Service for all Selected Traffic.

Rather than making a serious effort to cure the many deficiencies in its Opening Evidence, or accepting NS's operating plan as the basis for its SARR, DuPont made a strategic decision to "double down" on its fatally flawed operating plan.

DuPont defends the computerized methodologies it used to develop its operating plan on the grounds that parties have taken a similar approach in prior SAC cases. DuPont Rebuttal III-C-66. The methodologies employed by parties in prior SAC cases provide no support for DuPont's ill-conceived operating plan. Virtually every prior SAC case decided by the Board involved a SARR traffic group consisting primarily of unit trains of coal and/or grain, augmented with intermodal traffic likewise moving in trainload service from origin to destination.[26] Unit train operations bear little (if any) resemblance to the operations required to handle large volumes of carload traffic. In particular, cars moving in unit train service do not need to be classified or transferred between trains at one or more intermediate yards along their route of movement.

However, the facts presented in this case are markedly different than in any prior SAC case decided by the Board. DuPont posits a SARR that would handle millions of individual carload shipments over an 8,000-mile rail network. Unlike the traffic groups in prior SAC cases, the majority of the DRR's selected traffic travels in multiple road and local trains between origin (or on-SARR junction) and destination (or off-SARR junction). This means that individual cars must be classified, blocked, and transferred between trains at intermediate yards, and picked up

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defendant's operating plan and criticizing complainant's operating plan for failing to account properly for random outages); *AEP Texas* at 17 (critiquing complainant's list of random outages for failing to include appropriate outages including locomotive failures); *cf. WFA I,* at 1 (instructing the parties to file supplemental evidence and admonishing the complainant for failing to model appropriate random outages).

[26] *AEP Texas* at 9 (describing a SARR solely serving power plants from three PRB mines); *CP&L*, 7 S.T. B. at 248 (describing a traffic group consisting of 95% Central Appalachian coal and a small percentage of overhead grain traffic); *Duke/NS*, 7 S.T.B. at 102 (same); *Otter Tail* at 10 (contemplating a SARR serving power plants with PRB coal and limited non-coal freight traffic); *Xcel*, 7 S.T.B. at 600 (selected traffic group consists of PRB coal delivered to 37 power plants).

and/or set off at more than 6,000 unique customer facilities. NS Reply III-C-2. Therefore, unlike the complainants in prior cases, DuPont was required to present an operating plan that demonstrated its SARR's ability to handle each individual carload shipment from its specific origin (or on-SARR location) across the DRR network—including through the classification process—to its destination (or off-SARR location).[27]

### 1. DuPont's Rebuttal Operating Plan Fails the Basic SAC Requirement that the SARR Must Provide Complete Service to the Traffic Selected—Including 33% of the "Issue" Traffic.

DuPont correctly observes that whether "[an] operating plan is capable of providing the end-to-end service required by the DRR's customers . . . is an essential factor for Board approval of a SARR operating plan." DuPont Rebuttal III-C-2. Nevertheless, DuPont's Rebuttal operating plan for the DRR still fails to provide complete on-SARR service for the DRR's

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[27] DuPont cites two prior Board decisions (and a statement by a complainant in a third SAC case) in support of the proposition that its operating plan should be acceptable simply because it "does not attempt to stray too far from NS's own operations by developing train sizes and consists as those used by NS." DuPont Rebuttal III-C-6. DuPont's reliance upon those decisions is misplaced. The *FMC* decision actually supports NS's position; as the Board noted, the hypothetical railroad in that case provided "predominantly trainload and unit-train service." *FMC*, 4 S.T.B. at 736. Nowhere in its *FMC* decision did the Board suggest that a SARR must operate just like the incumbent. However, the Board did state that an operating plan depends on the traffic selected: "The number of trains that would be required to move *the traffic group* is a product of the number of cars on each train, any shipper requirements or limitations, and the number of carloads required to move *the traffic group*." *Id.* (emphasis added).

DuPont's reliance upon *Duke/CSXT* is likewise unavailing. The Board rejected the complainant's operating plan in that case because it improperly combined cars originating at different mines into unit trains, essentially commingling cars moving to different customers. Complainant also failed to provide any staging and gathering yards where the "cars from various mines could be assembled into a single train." *Duke/CSXT*, 7 S.T.B. at 427. The Board held that such changes in the movement of specific customers' traffic violated the principle that a proposed change in the level of service must be supported by a demonstration that the affected shippers, connecting carriers, and receivers would not object. *Id.* Again, the Board did not say—as DuPont suggests—that a SARR is limited to "mimicking" the incumbent's historical operations. In fact, that case stands for the proposition that the complainant's freedom to develop an operating plan is limited only by the requirement that it be "capable of providing the service required by the SARR's customers." *Duke/NS*, 7 S.T.B. at 89, 99.

Finally, DuPont's reliance on *AEPCO* is misplaced. As an initial matter, DuPont quotes from AEPCO's submission to the Board—not the Board's decision. DuPont Rebuttal III-C-6. And DuPont admits that the AEPCO operating plan was used in that case because "the defendants accepted it." DuPont Rebuttal III-C-66. NS does not know why the defendants accepted the AEPCO plan, but NS does not accept the DuPont plan for any reason or any purpose in a carload network like the DRR's.

customers—including 33% of DuPont's own "issue" traffic. NS's Brief Exhibit 3 details the trains that NS identified on Reply that carry issue traffic and that DuPont failed to include in its Rebuttal operating plan.

The foundation of DuPont's operating plan is an "automated" train selection process that sought to identify trains in NS's train event file that traveled over the DRR during the Base Year. NS Reply III-C-9-12. That train selection process failed to capture 61,610 NS trains that handled the selected traffic on the DRR network. NS Reply III-C-12, Figure III-C-1. Although DuPont did not explain the process that it followed in compiling the DRR's train list, NS's analysis of DuPont's workpapers revealed that the exclusion of those trains was intentional, based upon the programming instructions designed by DuPont. *See* NS Reply III-C-12–14.

Specifically, NS showed that DuPont failed to capture 35,699 Base Year trains—nearly 100 trains per day—that "both transported DuPont's selected traffic and moved between multiple points (or traveled entirely) on the DRR." NS Reply III-C-13–14. As NS demonstrated, those trains are needed to provide uninterrupted on-SARR service for 725,661 carloads of the DRR's selected traffic—including 76% of DuPont's issue traffic.[28] *Id.* III-C-14. DuPont's failure to include those trains in its computer-based operating plan rendered the DRR incapable of serving the selected traffic and resulted in a major understatement of the DRR's facility, locomotive, car, and crew expenses.[29]

On Rebuttal, DuPont continued to insist that its original operating plan did, in fact, account for all of the trains necessary to handle the DRR's traffic. DuPont Rebuttal III-C-7–22. Yet, DuPont contradicted that assertion by adding approximately 7,500 trains to the DRR's train list on Rebuttal. Those new trains fall into two categories. Citing an (unexplained) "coding

[28] In addition to those 35,699 trains, the 61,610 "missing" trains included 16,746 other trains carrying selected traffic for which the NS train event data showed only one on-SARR reporting location. Because those trains perform a portion of the on-SARR movement of the selected traffic, they should have been accounted for in DuPont's operating plan as well. NS Reply III-C-13.

[29] *See, e.g., FMC*, 7 S.T.B. at 739 (rejecting complainant's operating plan in part because FMC "understated the number of trains, and in turn the locomotive and crew requirements").

error," DuPont stated that it "inadvertently" failed to include 6,855 of the trains identified as missing in NS's Reply Evidence. DuPont Rebuttal III-C-26. In addition, citing a desire "[t]o be conservative in its cost determinations," DuPont added 622 local trains that originated issue shipments at Edgemoor, DE, and McIntosh, AL. DuPont Rebuttal III-C-25.[30] Those modest additions fall far short of addressing the massive "gaps" in train service reflected in DuPont's operating plan.

In fact, DuPont made no effort to account for all of the missing trains that were clearly identified in the workpaper that NS provided to both DuPont and the Board. *See* NS Reply WP "DRR_TRAIN_ANALYSIS.xlsx." The 622 trains DuPont added back correspond only to three examples of missing trains that NS discussed in its Reply narrative. Specifically, DuPont Rebuttal workpaper "Edgemoor and McIntosh Trains.xlsx" shows that all of the 622 trains added by DuPont were either "H5K" or "H5N" trains originating at DuPont's Edgemoor facility (discussed at NS Reply III-C-14–16 and Figure III-C-2) or "A33" trains originating issue shipments at McIntosh (discussed at NS Reply III-C-17–18 and Figure III-C-3).[31] Indeed, DuPont explicitly limited its computerized search of the data to those three specific train symbols, and made no effort to evaluate whether other trains identified by NS as missing were, in fact, needed to handle the DRR's selected traffic.[32]

As a result, DuPont's Rebuttal plan still fails to provide service to 33% of the issue traffic. As NS's Brief Exhibit 4 shows, DuPont's "train symbol-specific" analysis failed even to capture all of the local trains that originated "issue" traffic at Edgemoor and McIntosh—much less all of the road and local trains handling "issue" traffic that DuPont excluded from its

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[30] DuPont's Rebuttal narrative states that it added 699 missing trains serving Edgemoor and McIntosh, but its workpapers indicate that, in fact, DuPont added only 622 such trains. *See* DuPont Rebuttal WP "Edgemoor and McIntosh Trains.xlsx."

[31] It is not clear whether DuPont actually added these trains back to its operating plan analysis, because those trains do not appear in DuPont's Rebuttal workpaper "Rebuttal Added General Freight and Local RTC List 3-7.xlsx." However, it is clear that DuPont did not account for them in its Rebuttal RTC simulation. *See infra* at 32.

[32] *See* DuPont Rebuttal WP "Edgemoor and McIntosh Trains.xlsx," Tab "Sql." *See also* NS's Brief Exhibit 4.

operating plan. As a result, DuPont's operating plan still fails to provide complete on-SARR service for 2,082 (or 33%) of the 6,335 Base Year "issue" shipments, as well as for hundreds of thousands of other cars in the DRR's selected traffic group. This monumental failure alone dooms DuPont's operating plan.

DuPont's other quibbles about its missing trains are also easily rebutted:

- DuPont suggested that NS intentionally "overstate[d]" the number of missing trains by counting approximately 3,000 Amtrak trains, haulage trains, and other trains that the DRR would not need to operate. DuPont Rebuttal III-C-25. This misleading assertion ignores the fact that NS's Reply Evidence explicitly acknowledged that the original 61,610 missing trains identified by NS included 5,858 trains that handled only cars that DuPont did not select for its SARR, and 3,307 work trains, haulage trains or light engine movements. NS stated explicitly that it "does not challenge the exclusion of those 9,165 trains from the DRR's train list." NS Reply III-C-13.

- DuPont takes the position that the 16,746 trains for which the NS train data reported movement at only one operating station do not need to be included in the DRR's operating plan. DuPont is mistaken. A local train whose work assignment involves picking up or setting off cars at industries that are located within the boundaries of a single operating station would report only one station in the NS train event file. Notwithstanding DuPont's efforts to obfuscate the facts, the reality is that every one of the trains identified by NS as "missing" from DuPont's operating plan transported selected traffic over a portion of the DRR system during the Base Year.[33] Accordingly, such trains are (like the 35,699 trains that reported movement at two or more stations) necessary for a "complete" operating plan.

- DuPont continues to attempt to shift the blame for its monumental evidentiary failure on the quality of NS's data. For example, DuPont referred to a supposed discrepancy in the total number of trains shown in NS's train event and car event files. DuPont Rebuttal III-C-23–26. DuPont likewise complained that it was unable to locate some of the missing trains in NS's car event file. *Id.* III-C-26–27. Such claims constitute a transparent ploy intended to obfuscate the fact that every one of the missing trains appears in the "Car/Train Database" that DuPont itself compiled in developing its traffic and revenue evidence. NS Reply III-C-24–36. NS even provided DuPont (and the Board) a workpaper that flagged—in DuPont's Car/Train Database—all of those missing trains.[34]

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[33] As stated previously, NS excluded on Reply the 5,858 trains in the initial list of 61,610 trains that did not handle any selected traffic.

[34] *See* NS Reply WP "DRR_TRAIN_ANALYSIS.xlsx." DuPont's Rebuttal barely acknowledges the existence of its own database.

At the end of the day, DuPont failed to submit an operating plan for the DRR that provided for full service from each specific origin (or on-SARR point), through the network, and to each specific destination (or off-SARR point)—for all of its "issue" traffic—much less all the traffic in the selected traffic group. That critical evidentiary failure makes it impossible for the Board to accept DuPont's operating plan, and also warrants dismissal of this case.

### 2. DuPont's Rebuttal Car Classification Evidence is Untimely and Flawed.

On Rebuttal, DuPont for the first time submitted a flawed car classification analysis. That newly-minted car classification analysis constitutes a blatant case of improper rebuttal. *SAC Procedures*, 5 S.T.B. at 445–46; *IPA* at 3.[35] Here, DuPont candidly admits that it did not address classification switching on Opening. While DuPont characterizes this glaring omission as "unintentional" (DuPont Rebuttal III-C-121), it offers no explanation as to how witness McDonald—who DuPont touts as "an acknowledged railroad operating expert" (DuPont Rebuttal III-C-1)—could have overlooked the basic need for the DRR to classify carload traffic at intermediate yards. Nor did DuPont correct its supposed oversight by filing an errata to its Opening Evidence. Only after NS's Reply Evidence (III-C-24–36 and III-C-61–65) exposed that glaring deficiency in DuPont's operating plan, and demonstrated how DuPont could have used the NS car event data to develop a car classification plan, did DuPont proffer (on Rebuttal) an estimate of the number of cars that the DRR would be required to classify. The Board should not countenance such sandbagging tactics.

Even if DuPont's belated car classification counts were admissible, DuPont's new car counts are demonstrably inaccurate. As DuPont explains, it attempted to develop a count of DRR cars requiring classification in the Base Year by identifying from the NS car event data "all cars moving through yards that changed train symbols . . . unless the block name remained the

[35] *See also Xcel*, STB Docket No. 42057 (served April 4, 2003) at 2 ("We are increasingly troubled by the submission of incomplete or erroneous evidence on opening in a SAC case and a complainant's reliance upon an opportunity to address deficiencies through later evidentiary submissions, to which the defendant has no opportunity to respond.").

same." DuPont then increased the Base Year car counts by a "peaking factor" to develop Peak Year car classification counts for each yard. DuPont Rebuttal III-C-126. DuPont's analysis is set forth in Rebuttal workpaper "Plan Block Analysis V11.xlsx." *See* DuPont Rebuttal III-C-126, n.250.

The procedure described by DuPont for determining the DRR's car classification requirements is conceptually sound—indeed, it is the same process that, NS explained, DuPont could (and should) have used to develop a car classification plan on Opening. NS Reply III-C-61–65. However, the process that DuPont applied to extract car classification events from the NS data was fatally flawed. Specifically, while DuPont initially created a data field (designated "RowNum") that sequenced the car events for each shipment by date and time, it inexplicably did not apply that field in reviewing the car event records. Instead, DuPont based its review on a different field (designated as "ID") that did not incorporate properly sequenced records. As a result, DuPont's analysis failed to capture nearly half of the instances in which, according to the car event data, a car would require classification. If a single line in DuPont's computer code is modified to instruct the program to review the data in the proper sequence (by utilizing the "RowNum" field), the program correctly extracts all instances in which NS cars changed trains and/or blocks in the Base Year.[36]

Table 2 below compares the number of cars requiring classification posited by DuPont for the Base Year (Column 1) and the Peak Year (Column 2) with the number of Base Year classifications identified by a properly-executed review of the NS car event data utilizing DuPont's "RowNum" field (Column 3).

[36] In DuPont's query "Base Year" in Rebuttal WP "Plan Block Analysis V11.xlsx, line #23 should be changed from "ON V1.ID = V2.ID - 1" to "ON V1.ROWNUM = V2.ROWNUM - 1." NS invites the Board to apply this simple correction to DuPont's workpaper to replicate the correct car counts.

**Table 2**
**AVERAGE DAILY CAR CLASSIFICATIONS AT DRR YARDS**

| DRR Yard | DuPont Base Year | DuPont Peak Year | DuPont Base Year Corrected | Impact of Correction | NS Actual 1/ | NS Reply Base Year 2/ | NS Reply Peak Year 2/ |
|---|---|---|---|---|---|---|---|
| Elkhart | 937 | 1,601 | 1,780 | +90% | { } | 1,786 | 2,274 |
| Bellevue | 853 | 1,457 | 1,546 | +81% | { } | 1,382 | 1,760 |
| Chattanooga | 752 | 1,283 | 1,415 | +88% | { } | 1,181 | 1,472 |
| Birmingham | 630 | 1,075 | 1,319 | +109% | { } | 1,242 | 1,584 |
| Macon | 606 | 1,035 | 1,318 | +118% | { } | 1,081 | 1,386 |
| Conway | 709 | 1,212 | 1,212 | +71% | { } | 1,219 | 1,545 |
| Linwood | 490 | 837 | 991 | +102% | { } | 988 | 1,238 |
| Enola | 369 | 632 | 780 | +111% | { } | 736 | 942 |

1/ Source: NS Reply WP "Yards.xlsx" (copy provided to DuPont in discovery)
2/ Source: NS Reply WP "Reply NS Yards – Operations.xlsx;" *see also* NS Reply WP "Yard_Volumes_DRR.xlsx."

As Table 2 shows, DuPont's flawed computer programming resulted in a massive understatement of the daily car classification activity at every DRR yard. For example, DuPont posits that, at the DRR's largest yard at Elkhart, IN, it would be required to classify only 937 cars per day in the Base Year (Column 1) and 1,601 cars per day in the Peak Year (Column 2). However, if NS's car event data are reviewed in the proper sequence, the data indicate that the number of classifications required at Elkhart in the Base Year is 1,780 cars per day (Column 3). That Base Year figure is nearly double the 937 cars generated by DuPont's flawed analysis and nearly identical to the NS Reply Evidence of 1,786 cars in the Base Year.[37] Likewise, at Conway, NS's MultiRail analysis indicates a classification requirement of 1,219 cars per day, while the NS car event data upon which DuPont based its analysis shows a (corrected) count of 1,212 cars per day. At Linwood, the daily car classification counts generated by the NS and DuPont analyses are 988 and 991 cars per day, respectively.

[37] The car counts generated by NS's MultiRail analysis (Column 6) are somewhat lower than the "NS Actual" car counts (Column 5) because NS's Reply Evidence is based on the DRR's 2009-2010 Base Year, while the "actual" data in Column 5 are 2010 data.

The "corrected" car counts in Column 3 are validated by Column 5, which displays the number of cars that NS actually classified at its major yards during 2010.[38] Those columns show that the methodology devised by DuPont (when correctly applied) yields results that are fully consistent with NS's real world experience. This basic sanity check would have revealed to DuPont that the car counts generated by its flawed analysis were vastly understated.[39]

On the one hand, this error leads to further errors in DuPont's evidence. For example, DuPont's yard sizing and configuration (including the number of "classification" tracks at each facility), yard locomotive fleet, and yard crew assignments all are woefully inadequate because DuPont's car counts were and continue to be wrong, as discussed below. NS Reply III-C-36–52, III-C-59–65.

On the other hand, the results of applying (correctly) DuPont's methodology confirm NS's car classification and blocking plan and undermine DuPont's criticisms of it. DuPont Rebuttal III-C-122–123. Indeed, the accuracy of NS's car classification counts is supported by DuPont's own Rebuttal Evidence. At every location, the number of car classifications posited by NS is similar to—or lower than—the counts derived from the methodology that DuPont itself relied upon on Rebuttal (properly applied). Indeed, the only "outliers" on Table 2 are the understated car classification counts posited by DuPont's flawed review of the NS car event file.

The Board must accept NS's car classification evidence.

### 3. DuPont's Yard Sizes and Configuration are Demonstrably Inadequate.

The yard sizes and configuration posited by DuPont on Opening were unsupported and woefully inadequate to accommodate the DRR's traffic. *See* NS Reply III-C-36–44. DuPont did not explain what methodology (if any) it employed in determining the DRR's yard requirements, nor did it provide any calculations or other evidence to support the sizing of each yard. *Id.*

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[38] That information was provided to DuPont in discovery, in a document titled "Yards.xlsx," which NS also included with its Reply workpapers.

[39] A by-product of this miscalculation is that DuPont's yard assignments are similarly understated.

Moreover, as DuPont admitted on Rebuttal (III-C-121), its Opening yard evidence did not account for classification switching—the primary activity at railroad yards through which merchandise traffic moves. On Rebuttal, DuPont increased the number of classification tracks at certain DRR yards while stubbornly adhering to its unrealistic assumption that the DRR would not need a single hump yard anywhere on its 8,000 mile network. DuPont Rebuttal III-C-120–126. DuPont's Rebuttal estimate of the DRR's yard requirements should be rejected, for several reasons.

First, DuPont vaguely suggested that the car classification counts that it presented on Rebuttal "are the basis for determining the number of classification tracks required at each of the DRR yards." DuPont Rebuttal III-C-126. As described above, those car classification counts are facially incorrect. *See supra* at 23-25. DuPont's new yard sizes and configurations are "fruit of the poisonous tree" from that impermissible Rebuttal.[40] Moreover, because the car counts are vastly understated, any classifications track requirements derived from them are likewise understated.

Second, DuPont's Rebuttal yard sizing and configuration are, like its Opening submission, unsupported by any credible evidence or analysis. DuPont proffered no explanation of the methodology it applied in determining the number and length of the tracks assigned to each DRR yard, nor did DuPont submit any diagrams or charts showing how those yards would be configured. Indeed, DuPont provided no evidence to establish a nexus between its (incorrect) car counts and the number and length of the classification tracks at each DRR yard. Instead, as it

[40] For example, DuPont's Opening Evidence did not include any classification tracks at Enola, PA, but instead contemplated that Enola would serve exclusively as a crew change point. NS Reply III-C-41. On Rebuttal, DuPont belatedly determined a need for 16 classification tracks—totaling 6.06 miles—at Enola. DuPont Rebuttal WP "DRR Yard Matrix Rebuttal Grading.xlsx" tab "CLASS TRK LENGTH". Similarly, DuPont's Rebuttal—for the first time—called for six classification tracks at the DRR yards at Buffalo and Louisville, where it had not posited any classification tracks before. *Id.*

did on Opening, DuPont simply posited its conclusions in a revised version of its "yard matrix" workpaper.[41]

Third, DuPont's position that the DRR could handle three million carloads of merchandise traffic annually without the benefit of a single "hump" yard is simply not consistent with "the realities of real world railroading." As the Board has previously observed, a hump yard is far more efficient in performing classification and switching of large volumes of traffic than a "flat switching" yard.[42] NS Reply III-C-44. That is why every Class I railroad in America operates hump yards. Nevertheless, DuPont "doubled down" on that preposterous assumption in its Rebuttal Evidence. DuPont Rebuttal III-C-127. DuPont's stated reasons for foregoing the use of hump yards on the DRR are unpersuasive:

- DuPont contends that, based on its (understated) car classification counts, only one DRR yard (Elkhart) would be required to handle more than 900 cars per day in the Base Year.[43] DuPont Rebuttal III-C-127. But capacity must be based on the Peak Year.[44] Indeed, DuPont itself constructed the DRR's smaller yards based on Peak Year traffic volumes (though the Peak Year car counts it used in sizing those yards are likewise understated). DuPont Rebuttal WP "DRR Yard Matrix Rebuttal v.8.xlsx." In any event, even the understated Peak Year car classification counts proffered by DuPont on Rebuttal indicate that no fewer than seven DRR yards would exceed the 900-car threshold for a hump yard in the Peak Year.[45] When DuPont's Base Year car counts are corrected, those same seven yards exceed the 900-car threshold in the Base Year. *See supra* at 25, Table 2.

- DuPont also asserts that, rather than constructing a hump yard, a complainant "can elect to add yard crew assignments when classification car count exceeds the threshold [for a hump yard] rather than to expend the capital resources to construct a hump yard." DuPont Rebuttal III-C-127. In other words, DuPont takes the position that additional locomotives and crews are an adequate substitute for track facilities at a major railroad yard. DuPont is mistaken. A hump yard takes advantage of its design (a hump track connected to multiple classification tracks) and

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[41] *See* DuPont Rebuttal WP "DRR Yard Matrix Rebuttal v8.xlsx."

[42] *See Joint Line Cancellation on Soda Ash by Union Pac. R.R. Co.*, 365 I.C.C. 951 (1982) (accepting UP's evidence that showed "that high capacity hump yards have made routings through Chicago more efficient").

[43] Based on NS's actual experience, NS witness Rieppi testified that an efficient railroad would construct a hump yard at any location where the anticipated daily volume exceeds 900 cars. *See* NS Reply III-C-174.

[44] *See, e.g., Duke/CSXT*, 7 S.T.B. at 437; *Major Issues* at 63; *AEP Texas* at 15; *WFA II* at 14.

[45] Elkhart, Conway, Chattanooga, Bellevue, Calumet, Birmingham, and Macon.

> gravity to switch cars into blocks quickly and efficiently. A single locomotive and crew working the hump track can push groups of cars "over the hump," and allow the person operating the hump (and the forces of gravity) to direct each car onto the proper classification track. Absent a hump track, each individual car would have to be removed from an inbound train and flat-switched separately onto the correct classification track, a process that would require more people and locomotives and time. Furthermore, contrary to DuPont's illogical assumption, as volumes increase, introducing more locomotives and crews at a yard would exacerbate (rather than relieve) congestion.[46] More than a century of real world experience by NS and every other Class I carrier teaches that it is simply not realistic to assume that the DRR could efficiently handle millions of carloads of merchandise traffic without the benefit of hump yards.

Finally, DuPont attempts to buttress its yard sizing and configuration on the grounds that the yard facilities shown in NS's RTC Model are "identical" to DuPont's. DuPont Rebuttal III-C-117. As DuPont (and the Board) know, the RTC Model does not purport to simulate yard operations, let alone measure the capacity required for yard activities such as switching, handling, or classification.[47] Yard tracks appear in the RTC Model only to the extent that the Model uses the "long" staging or receiving tracks to simulate road trains stopping to pick up or set off cars or to change crews, or to hold trains in order to clear the main line. For that reason, the physical facilities incorporated into an RTC Model do not include "classification tracks" within a yard. Indeed, the "screenshots" of the Elkhart yard presented by DuPont in support of its (absurd) argument do not depict any classification tracks, but rather show only the staging tracks that have nothing to do with the yard's car classification capacity. DuPont Rebuttal III-C-118. DuPont's suggestion that the similarity between the staging tracks at Elkhart in the RTC Models presented by NS and DuPont somehow proves that DuPont's classification track estimates are valid is nonsense.

In stark contrast to DuPont, NS presented an analysis of the DRR's yard requirements that is both carefully detailed and well-documented. NS clearly identified the number of cars

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[46] As flat switching is done from a switch lead, only one yard crew at a time can safely switch on a lead from the same end. Adding crews would generate unproductive idle time, as congestion increased the waiting period to access leads and switching tracks.

[47] NS explained the capabilities of an RTC Model in its Reply Evidence at III-C-117 – 118.

that would need to be classified, switched, or handled in interchange at each individual yard location, as well as the inventory of cars that would occupy each yard at different times throughout the day.[48] Unlike DuPont's flawed evidence, NS's analysis of the DRR's yard operations is based entirely on the Peak Year.

Determining the proper way to calculate yard capacity during the Peak Year for a carload network that must conduct classification operations is an issue of first impression. DuPont offered no methodology and NS's methodology is eminently reasonable. The DRR yard capacity contemplated by NS's operating plan is based directly on the average inventory of cars that would be present at each yard location during the peak hour on each day during a typical week in the Peak Year. Based on that number of cars, NS witness Rieppi first determined the "static" capacity requirement at each yard—*i.e.*, the number of feet of track that would be required literally to "park" all of the cars end-to-end. In order to determine the "practical" capacity requirement at each location—*i.e.*, the number of track feet required to enable fluid operations—witness Rieppi increased the "static" capacity by a "fluidity factor" of 0.6 that has been endorsed by several independent parties, including the Department of the Army. Witness Rieppi then allocated the resulting "practical" track capacity among classification tracks to maximize operating efficiency, based on NS's real world experience. *See* NS Reply III-C-174–184. Where NS's car classification analysis indicated the need to classify 900 or more cars per day at a particular location, the DRR yard was designed as a "hump" yard. Yards with fewer daily classifications were designed as large (601-900 cars), medium (201-600 cars) or small (51-200 cars) "flat switching" yards.

Despite the fact that DuPont built no hump yards, DuPont acknowledges that NS's proposed layout for DRR hump yards is 'realistic and reasonable.'" DuPont Rebuttal III-C-126.

[48] *See, e.g.*, NS Reply III-C-170 – 184; NS Reply WP folder "DRR Yard Requirements."

That layout should be adopted by the Board as the only record evidence of hump yards for the DRR system.[49]

In short, NS's well-documented yard capacity analysis is clearly the best—indeed only—credible evidence of record, and should be adopted.

### 4. DuPont's Rebuttal RTC Simulation is Meaningless.

DuPont's Rebuttal RTC Model is as meaningless as its Opening RTC Model. As NS's Reply Evidence showed, the RTC simulation submitted by DuPont on Opening was riddled with errors and omissions, including:

- Failure to include tens of thousands of road and local trains that are required to provide complete on-SARR service;
- Inadequate main line and passing tracks;
- Incorrect grades;
- Modeling trains containing TIH cars at speeds in excess of the federally-mandated 50 MPH speed limit;
- A vast understatement of delays caused by random failures and maintenance windows;
- Failure to account for delays at locations where foreign railroad lines cross the DRR;
- Failure to take into account the curfew affecting freight train movements on Amtrak's Northeast Corridor; and
- Modeling DRR train movements through Chicago via the wrong routes.[50]

On Rebuttal, DuPont conceded that most of those criticisms of its RTC simulation were valid.[51] DuPont made a number of "corrections" to its RTC Model, and declared that its Rebuttal

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[49]NS inadvertently miscalculated the track feet necessary for its hump yards by failing to adjust one of the two formulas used to compute classification tracks when converting the calculations from flat yards to hump yards. The mistake was a mathematical miscalculation, and not an error in the yard sizing analysis. The financial impact of the miscalculation was approximately $200 million. To illustrate the miscalculation, NS invites the Board to correct the calculation by changing the formula in Cell C61 on each of the eight hump yard tabs in NS Reply workpaper "DRR Yard List Reply.xlsx" as follows: "=H20-(VLOOKUP(C52,$M$54:$O$56,IF(C56=15,2,3))*(H19-1)/**2***2)."

[50] *See* NS Reply III-C-117 – 153.

[51] Not surprisingly, DuPont blamed many of the shortcomings in its RTC simulation on NS. For example, DuPont claimed that the grade errors in its RTC Model "originated in the RTC simulations provided by NS to DuPont in discovery." DuPont Rebuttal III-C-54. That assertion is wrong. The errors in DuPont's RTC evidence resulted from DuPont's attempt to cobble

RTC simulation "demonstrates that the DRR would be able to serve all of its customers, deliver all of the selected traffic, and achieve cycle times comparable to NS (or better)." DuPont Rebuttal III-C-53. Contrary to this assertion, DuPont's Rebuttal RTC simulation remains flawed and essentially worthless.

Most importantly, DuPont's Rebuttal RTC simulation tests the DRR's capacity requirements based on DuPont's Rebuttal operating plan, which as discussed above fails to account for tens of thousands of trains that are necessary to provide complete service to the DRR's traffic. Even worse, DuPont did not even test its actual Rebuttal operating plan in its Rebuttal RTC model because DuPont did not add to its Rebuttal RTC Model the 622 trains carrying "issue" traffic that it added to the DRR's train list.[52]

DuPont's Rebuttal also failed to remedy other deficiencies in its RTC Model. For example, while DuPont's Rebuttal RTC simulation restricted the movement of trains carrying TIH commodities to 50 MPH (as required by federal law), DuPont did not limit the speed of other "Key Trains." As NS explained (NS Reply III-C-96), "Key Trains" include not only trains that carry TIH shipments, but also those that include at least 20 cars of other hazardous commodities. The railroad industry has long followed a safety practice of limited all "Key Trains" to 50 MPH.[53] Contrary to industry practice, DuPont's RTC simulation operates those "Key Trains" at speeds in excess of 50 MPH. This omission affected fully one-third of the

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together a DRR network from multiple NS simulations, without checking to assure that the transitions in grade at the "endpoints" it joined together were correct. Moreover, NS provided ample information in discovery regarding the physical characteristics of the NS network to enable DuPont to discern the correct grades. *See* NS Reply III-C-129, n. 205 (identifying discovery documents that provided accurate grade information: "Track Chart Documents and Data.doc" and "grd_ns.txt"). As was the case with its erroneous analysis of NS's train event data in creating the DRR's train list, DuPont's effort to fault alleged deficiencies in NS data for the deficiencies in its RTC simulation is transparently designed to divert attention from its own analytical and evidentiary failures.

[52] These trains are the McIntosh and Edgemoor trains that NS identified as examples of missing trains in its Reply Evidence and that DuPont claimed on Rebuttal it added back to its operating plan. However, those trains do not appear in DuPont's Rebuttal workpaper "Rebuttal Added General Freight and Local RTC List 3-7.xlsx."

[53] NS Reply III-C-96; *see also* NS Reply WP "AAR Circular OT-55-L.pdf."

nearly 19,000 "Key Trains" that operate on the DRR network in the Base Year (and an even greater number of Peak Year trains).[54]

Nor does DuPont's Rebuttal RTC simulation properly account for the impact of foreign train movements on the DRR's operations (and capacity requirements). DuPont asserts that "[it] does not agree that foreign trains should be randomly input into the model and [DuPont] has not included randomly generated foreign trains crossing at grade." DuPont Rebuttal III-C-58. Instead, DuPont suggests that the "random outages" in its RTC Model adequately account for the effects of foreign train movements. However, as NS pointed out in its Reply (III-C-142), DuPont's RTC Model does not incorporate any foreign railroad crossings or otherwise take into account the inevitable conflicts between DRR and foreign trains at the 68 locations at which their lines cross. NS's RTC Model addressed this issue by incorporating several miles of "foreign" track at those 68 crossing points, adding foreign trains to the Model, and allowing the Model to resolve conflicts between DRR and foreign trains (just as it resolves such conflicts between DRR trains). *Id.* The effect of DuPont doubling-down on this omission on Rebuttal is that DuPont continues to assume—contrary to the realities of real world railroading—that DRR trains would in every instance be able to proceed through those crossing points without delay.

In short, DuPont's Rebuttal RTC Model continues to be incomplete, and the outputs of its simulation are unreliable. The Board should reject DuPont's RTC analysis and adopt NS's Reply RTC Model as the best evidence of the DRR's capacity requirements.

Given all these flaws in DuPont's operating plan, it is plainly wrong for DuPont to assert that it was "unnecessary" for NS to present "an entirely new operating plan" for the DRR, rather than correcting the errors in the plan presented by DuPont on Opening. DuPont Rebuttal III-C-2. *See also* DuPont Rebuttal III-C-65.[55] NS's choices were to rely on the Board agreeing that

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[54] *See* NS Reply WP "Key Trains Analysis.xlsx;" "NS Reply WP "Key_Train_Summary.docx."

[55] As Part II(A)(1) above demonstrates, DuPont's DRR operating plan is so fundamentally deficient that it cannot be salvaged by making the type of cosmetic changes proffered by DuPont on Rebuttal.

DuPont has failed to provide a *prima facie* case (which is what the Board should do, and NS has not conceded otherwise by providing a workable operating plan for the DRR) or to build a proper operating plan for the hypothetical railroad and the traffic DuPont selected for it.

### 5. DuPont's Claim that its Failure to Present a Feasible Operating Plan is Attributable to Flaws in NS's Data is Demonstrably False.

DuPont's Opening and Rebuttal submissions are replete with complaints regarding supposed infirmities in the train and car event data that NS produced to it in discovery. On Opening, DuPont asserted that NS's data was "flawed" and that DuPont was required to devise various "fixes" in order to utilize that data. DuPont Opening III-C-1. DuPont intensified its rhetoric on Rebuttal, accusing NS of "fail[ing] to meet its responsibility" to provide reliable data to DuPont,[56] knowingly producing "extensively flawed data," and "run[ning] away and hid[ing] from its own deeply flawed data" in developing its own operating plan. DuPont Rebuttal III-C-14–15.[57] Based on these unsupported allegations, DuPont declares that "[a]ny limitations on DuPont's operating plan are a result of NS's failure to provide accurate data." DuPont Rebuttal III-C-14.

DuPont's repeated attempts to blame its failure to present a *prima facie* case on the quality of the NS data are meritless. As NS's Reply Evidence showed, the train and car event information produced in discovery were more than sufficient to enable DuPont to trace the

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[56] NS takes exception to DuPont's assertion that NS "failed to meet its responsibility" to the Board or to DuPont in producing data requested by DuPont in the form in which NS maintains it in the ordinary course of business. *See Entergy Ark. Inc. v. Union Pac. R.R. Co.*, S.T.B. Docket No. 42104, at 6 (May 19, 2008) (holding that a party "does not have to conduct studies or attempt to recreate information that was not kept in the ordinary course of business" when responding to discovery requests).

[57] DuPont's suggestion that NS was "running away from" its own data in utilizing the MultiRail tool to develop its operating plan (DuPont Rebuttal III-C-14) is both incorrect and misleading. As DuPont well knows by now, NS did not use "historical" train and car movement data in preparing its operating evidence because that is not a proper methodology for developing a carload operating plan, and NS's 2009-2010 train movements do not accurately reflect the level of activity required to handle the DRR's much larger Peak Year traffic group. *See* NS Reply III-C-7 – 8.

movement of every car in its selected traffic group.[58] Moreover, DuPont's assertions are fatally undermined by the evidence that DuPont's itself submitted on Rebuttal.

As discussed above (at 23-26), DuPont presented on Rebuttal an analysis of the number of cars that the DRR would be required to classify at each yard. DuPont developed those classification car counts "from the car event data provided by NS in discovery." DuPont Rebuttal III-C-126. Specifically, DuPont reviewed the NS Base Year car event data to identify "all cars moving through yards that changed train symbols . . . unless the block name remained the same." *Id.*, n.250. While the process that DuPont described was conceptually sound, and would have yielded accurate car classification counts if DuPont had reviewed the car event records in the proper sequence, DuPont failed to review the data in the proper order (based on a field designated "RowNum"), in conducting its review of the data. As a result, DuPont failed to count nearly half of the classification events shown in the NS car event file. As NS demonstrated above (at 24) utilizing the "RowNum" field developed by DuPont produces an accurate count of the cars that the DRR would need to classify at each yard location.

DuPont's Rebuttal car classification analysis, while flawed in its execution, effectively impeaches DuPont's claims regarding the reliability and utility of NS's event data, in two ways. First, the very fact that DuPont successfully developed a process for extracting car classification events from NS's car event file thoroughly undermines its assertion that the data were confusing or unusable. Indeed, but for DuPont's ill-considered and unexplained decision not to utilize the "RowNum" field in reviewing the data, that process would have produced an accurate count of the cars requiring classification at each DRR yard. *See supra* at 24. Second, as Table 2 on page 25 above shows, the "corrected" car counts resulting from a review of the NS car event file based on the properly-sequenced "RowNum" field are, in every case, consistent with the actual 2010 car classification volumes produced separately by NS in discovery. This proves that the NS car

[58] *See* NS Reply III-C-24 – 36; NS Reply Ex. III-C-7.

event file is neither "incomplete" nor "extremely flawed," as DuPont alleges (DuPont Rebuttal II-C-14–15), but rather contains car movement information that is both accurate and reliable.

In short, DuPont's claim that NS is somehow responsible for the glaring deficiencies in its operating evidence is specious. The truth is that the train and car event databases produced by NS are robust sources of information about the movement of merchandise cars along the NS network. Those databases were more than adequate to enable DuPont to identify all of the trains that moved over the lines replicated by the DRR in the Base Year, the cars that moved in each train, the location(s) at which particular cars were classified and switched between trains, and the blocks to which each car was assigned during its journey across the NS network. DuPont had all of the tools it needed to manipulate the data in a manner that would have enabled it to design an operating plan capable of serving the DRR's selected traffic.[59] Notwithstanding the many excuses proffered by DuPont, the record demonstrates that the fatal flaws in its train selection and car classification analyses are attributable solely to errors that DuPont itself made in designing and executing its computer-based methodologies, and not to any inherent deficiency in the NS event data.

### B. DuPont's Criticisms of NS's Operating Plan are Meritless.

Rather than making a serious effort to cure the many deficiencies in its Opening Evidence, or accepting NS's operating plan as the basis for its SARR, DuPont made a strategic decision to "double down" on its fatally-flawed operating plan. At the same time, DuPont apparently decided that "the best defense is a good offense," and its Rebuttal attempts (in vain) to discredit NS's realistic and well-supported operating plan. DuPont's strategy is distraction and misdirection, which does not and cannot resuscitate DuPont's unworkable operating plan. Moreover, DuPont's criticisms of NS's operating evidence are easily refuted.

[59] *Cf. AEPCO 2011*, at 24-25.

### 1. DuPont's Claim that its Operating Plan Better Reflects Real World Railroading than NS's Operating Plan is Incorrect.

DuPont launched a vigorous attack on NS's Reply operating plan, asserting (among other things) that it is "completely divorced from NS's own operations" and is "made for litigation." DuPont Rebuttal III-C-7, III-C-126. DuPont defiantly insists that the Board should adopt its fatally deficient operating plan simply because the DRR (allegedly) "operate[s] the same trains as NS operates in its real world operations in the same basic fashion." DuPont Rebuttal III-C-3–4 (emphasis in original).[60] Conversely, DuPont argues that NS's Reply operating plan is "utterly divorced from NS's own real-world operations" because NS developed that plan "from the ground up" rather than picking trains from NS's historical train event file (as DuPont did). DuPont Rebuttal III-C-65. DuPont's contention that its operating plan should be "good enough" simply because it (supposedly) is based on NS's historical operations is incorrect.

DuPont's criticism of NS's operating plan on the grounds that it is "made for litigation" (DuPont Rebuttal III-C-68) is, of course, absurd because all evidence related to a hypothetical SARR is, by definition, developed—or made—for SAC litigation. The key is that an operating plan must account for the real-world operations necessary for a SARR to serve the traffic selected by the complainant. In any event, DuPont's arguments on this issue fail because its operating plan does not, in fact, replicate NS's real world operations. To the contrary, as shown above, DuPont's operating plan failed to account for the train services, car classification and switching, and yard operations that NS performs in the real world.

Moreover, NS's 2009-2010 train operations and car blocking plan, which DuPont purports to "adopt" (DuPont Rebuttal III-C-4–7, 10), do not accurately represent the train movements, classification switching, car blocking, and local service that the DRR would need to

[60] DuPont contradicts itself by acknowledging that its operating plan does not, in fact, include all of the trains in which NS actually handled the selected traffic, does not incorporate the same pickups and setoffs at customer facilities as NS performed, and does not adopt the same dwell times as NS experienced in its actual operations. DuPont Rebuttal III-C-7 – 14.

perform to handle its Peak Year merchandise traffic in a least cost, most efficient manner, for several reasons:

First, while DuPont selected 92% of the traffic that NS handled during the 2009-2010 Base Year period over the lines replicated by the DRR (NS Reply III-D-1), it did not select all of that traffic. Accordingly, NS's 2009-2010 train service and car blocking plans were designed to accommodate traffic that is not part of the DRR's traffic group (and is therefore irrelevant to this case). Conversely, DuPont posits that the DRR's general freight traffic volumes would grow by 53% between the Base Year and the Peak Year (which extends to May 2019).[61] *See supra* at 4, Figure 1.

NS's historical train and blocking plans were not conceived with such massive new traffic volumes in mind. The DRR's Peak Year traffic would, by definition, generate larger "blocks" of cars moving to and from customer facilities. Those increased block sizes would unquestionably require a least cost, most efficient railroad to make adjustments to its operations, including changes in the trains to which blocks were assigned, adding more trains and (perhaps) even changing the yards at which certain blocks were built in order to mitigate congestion at the busiest yards. Local train assignments would also be modified to eliminate service to those historical NS customers that DuPont did not select, and to accommodate the greater volume of cars moving to DRR customers in the Peak Year. By basing its evidence solely on NS's "historical" train and car movement data, DuPont posits an operating plan that is not "specifically tailored to serve [the DRR's much larger Peak Year] traffic group."[62] NS's operating plan is so tailored.

Second, the physical plant posited by DuPont for the DRR is different in important respects from that which NS operated in 2009-2010. In particular, DuPont takes the (unrealistic)

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[61] DuPont projects a 53% traffic growth for General Freight (non-Coal, non-Intermodal) traffic. DuPont Rebuttal WP "DRR Traffic Volume Forecast – Rebuttal.xlsx."

[62] *AEPCO 2011* at 4 (emphasis added); *see also* Ex Parte No. 715 at 5; *Otter Tail* at 6; *Xcel*, 7 S.T.B. at 598, 610; *TMPA I*, 6 S.T.B. at 589.

position that the DRR would not operate hump yards at any of the locations at which NS does today. Moreover, DuPont chose not to replicate the entire NS routes over which the selected traffic moved in 2009-2010, instead converting the vast majority of those shipments into "crossover" traffic. The major differences in infrastructure and lengths of haul between NS's 2009-2010 network and the DRR system posited by DuPont would clearly necessitate corresponding adjustments in the DRR's car classification and train service plans.

Third, as the Board knows, a Class I railroad's operating plan is not carved in stone—real world railroads make frequent adjustments to their train services and yard operations in response to changes in (and seasonality of) traffic volumes, surges in demand at particular locations, weather conditions, and a variety of other factors. Indeed, NS's 2009 operating plan is a particularly inappropriate model for the DRR's "Peak Year" operations because 2009 was a recession year in which NS, like other railroads, scaled back its operations to account for reduced traffic volumes.

In short, DuPont's operating plan—and the RTC Model, operating statistics, and operating expenses generated from that plan—are based on the fallacy that a least-cost, most efficient railroad doing business in 2018-2019 with a different (and much larger) traffic base than NS had in 2009-2010, and with fewer physical facilities and shorter lengths of haul than NS, would nevertheless operate its trains in exactly the same manner as NS did in 2009-2010. Such an assumption is simply not consistent with reality or with SAC theory.

In any event, DuPont's argument that the DRR's operating plan must essentially mimic NS's "real world" operations cannot save its operating evidence because DuPont's operating plan does not in fact replicate NS's operations. For example:

- DuPont's operating plan does not include tens of thousands of road and local trains in which NS moved the DRR's selected traffic during 2009-2010.[63]

[63] NS Reply III-C-8 – 36.

- DuPont acknowledges that it "[made] some adjustments to certain [NS] train operations where NS's operations where [sic] [supposedly] less efficient than the DRR's operations." DuPont Rebuttal III-C-4, n.2.
- Nor does DuPont's operating plan account for the extensive classification and yard switching that NS performed to transfer the DRR's merchandise traffic between trains. *Id.* III-C-59–65.
- Unlike NS, the DRR does not operate a single hump yard, which, as the Board knows, is the most efficient method of classifying large volumes of carload traffic.[64] NS Reply III-C-44; DuPont Rebuttal III-C-126–127.
- DuPont's operating plan does not incorporate the time and expense that NS incurred in serving the DRR's 6,000+ customer facilities. NS Reply III-C-65–67.

In short, DuPont's assertion that "[its] operating plan is based on NS's own operations" (DuPont Rebuttal III-C-4) is simply not true.

### 2. DuPont's Criticisms of NS's MultiRail Analysis are not Valid.

The centerpiece of DuPont's attack on NS's operating plan is its criticism of NS's decision to use the "MultiRail" software developed by Oliver Wyman in preparing that plan. DuPont characterizes MultiRail as an "untested" computer program that produces a "made for litigation modeling exercise." DuPont Rebuttal I-79, I-101, III-C-99. According to DuPont, the MultiRail outputs utilized by NS in developing its operating plan are untethered to NS's real world traffic and operations, and are therefore unreliable. DuPont Rebuttal III-C-65–108. DuPont's criticisms of NS's operating plan, and the MultiRail analyses that NS performed in developing that plan, are meritless.

Unlike DuPont's ill-conceived operating plan, NS's operating plan is <u>not</u> the product of "automated" analyses conducted by computer programmers.[65] Rather, NS's plan was developed by a team of operating experts that included NS witnesses Johnson, Cheng, Schaub, Smith, and

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[64] *Joint Line Cancellation on Soda Ash by Union Pacific R.R. Co.*, Investigation and Suspension Docket No. 9256, 365 I.C.C. 951(August 6, 1982) (finding persuasive evidence that "high capacity hump yards have made routings through Chicago more efficient").

[65] While DuPont insists that "[its] operating plan was developed exclusively by Mr. McDonald and not by witnesses Burris, Fapp and Humphrey" (DuPont III-C-13), the record—including DuPont's own evidence—demonstrates otherwise. Indeed, DuPont explicitly acknowledges that the list of trains that forms the basis for DuPont's train service plan was developed by witness Fapp, not witness McDonald. DuPont Opening Ex. III-C-5 at 14; DuPont Rebuttal III-C-6. DuPont's untimely car classification evidence is likewise the product of a flawed computer-based analysis rather than the application of operating knowledge.

Rieppi. Those individuals, who collectively possess decades of "real world" railroad experience,[66] are the same persons who are (or were) responsible for designing and adjusting the operating plan that NS uses in its day-to-day operations. Their experience with the NS rail network—and, in particular, the lines and routes replicated by the DRR—underlies every decision regarding the train service plan, yard classification and blocking plans, and specification of physical facilities, equipment and personnel posited by NS. Moreover, the starting point for NS's operating plan was the traffic group and Peak Year volumes posited by DuPont, rather than a database of NS's 2009-2010 historical trains and cars. Based upon the Peak Year traffic actually at issue in this proceeding, NS's operating experts designed a detailed, well-documented operating plan, using MultiRail to assist them in organizing the millions of carloads of traffic that the DRR would be required to handle. The operating plan that NS's experts developed meets the needs of all DRR customers in the least-cost, most efficient manner. *See* NS Reply III-C-156–241.

Contrary to DuPont's assertions, MultiRail is neither "untested" nor "made for litigation."[67] MultiRail is a proprietary but publicly available modeling tool that is relied upon by railroads throughout the world in performing operational analyses and planning day-to-day operations. *See* NS Reply III-C-157–158. As NS's Brief Exhibit 5 demonstrates, the MultiRail software has been used by U.S. Class I railroads, including NS, to create their real world operating plans. Indeed, Oliver Wyman reports that "MultiRail's users include all of the North American Class I freight railroads," as well as Wisconsin Central, TFM and various other foreign carriers.[68] NS itself utilized MultiRail in developing its first Thoroughbred Operating Plan. The

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[66] *See* NS Reply, Part IV (witness qualifications).

[67] DuPont's criticism of NS's MultiRail analyses as "made for litigation" is not only incorrect, but disingenuous, given DuPont's extensive reliance upon computer programs and processes designed by Peabody & Associates exclusively for use in STB rate cases.

[68] *See* NS's Ex. 5 at 31, Oliver Wyman, *MultiRail, MultiModal Freight Edition Infosheet. See also* NS's Ex. 5 at 2, Michael S. Murray, *Ultimate Technology: Railroads Met the Wizard Software That Made The Uncontrollable Controllable*, *TRAINS* MAGAZINE, (2010) ("MultiRail revamped the operating plans of every Class I railroad but Kansas City Southern.")

widespread use of MultiRail for non-litigation purposes attests to its reliability and acceptance throughout the rail industry. The MultiRail software has also been used to develop evidence that was presented to (and accepted by) the Board in several past proceedings. *See, e.g.,* STB Docket No. 42110, *Seminole Electric Cooperative, Inc. v. CSX Transportation, Inc.* (Reply Evidence of CSXT); *Canadian Nat'l Ry. Co., Grand Trunk Corp. and Grand Trunk Western R.R. Inc.—Control—Illinois Central Corp., Illinois Central R.R. Co., Chicago, Central and Pac. R.R. Co. and Cedar River R.R. Co.,* STB Fin. Docket No. 33556 (served May 25, 1999).[69] Thus, DuPont's suggestion that NS's decision to use MultiRail in preparing its operating plan in this case is "unprecedented" is simply incorrect.[70]

Nor is MultiRail a "black box" that generates a computerized operating plan that is divorced from real world operations. Rather, MultiRail performs a function similar to that of a mechanical coin-sorter. A coin sorter enables a person to organize and count large quantities of coins more quickly (and with far less risk of human error) than by sorting them manually. Likewise, MultiRail enabled NS's operating experts to organize the millions of Peak Year carload shipments posited by DuPont into blocks for movement in DRR trains, and to assign those blocks to the appropriate trains to move them across the DRR network in the most efficient manner.

However, MultiRail did not determine which blocks the DRR would build or what trains the DRR would operate. Rather, the blocks used by MultiRail to sort the DRR's selected traffic were specified by witnesses Johnson, Smith, and Cheng. As NS explained clearly in its Reply Evidence, NS's experts started with a list of the blocks that NS actually builds in its real world operations, and eliminated those blocks that were not needed to handle the selected traffic.[71] The

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[69] *See also* NS Brief Exhibit 5 at 31, ("MultiRail has been used to examine most of the largest railroad restructuring efforts of the decade. For example, the Union Pacific/Southern Pacific, Norfolk Southern/CSX/Conrail, and Canadian National/Illinois Central merger efforts all used the system for the development of the merged railroad operating plan that was submitted to the U.S. regulatory authority (Surface Transportation Board) for approval.")

[70] *See* DuPont Rebuttal III-C-65.

[71] *See* NS Reply III-C-160 – 161.

MultiRail software then sorted the DRR cars into the blocks specified by NS's experts, and identified any cars that were "unassigned" (*i.e.*, cars for which NS's experts did not initially create a block). This process was repeated until all cars were assigned by NS's operating experts to blocks for movement. Likewise, NS's operating witnesses developed (and input to MultiRail) a list of trains based on NS's real world train schedules (which were provided to DuPont in discovery).[72] The MultiRail software then assigned blocks of cars to the appropriate trains.

DuPont's claim (Rebuttal I-3) that NS's operating plan is "untethered to the SARR's traffic" is specious. The traffic considered by NS's experts in developing NS's operating plan (and input to MultiRail) consisted of the Peak Year cars actually selected by DuPont for the DRR—nothing more and nothing less.[73] *See* NS Reply III-C-158–159. Furthermore, DuPont's assertion that NS's MultiRail analysis is "untethered" to NS's real world operations is contradicted by its own Rebuttal filing:

> The rail network NS used as its input network was the entire NS rail network, not simply the DRR network. In addition, the blocking plan NS entered as an input to the [MultiRail] model is the NS system-wide blocking plan NS uses in the real world, and the train list NS entered as an input to the model is based on the train schedules NS uses in the real world.[74]

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[72] *See* NS Reply III-C-161 – 163.

[73] Indeed, it is DuPont's operating plan (not NS's) that lacks a direct nexus to the DRR's actual traffic group. DuPont's selected traffic does not include all of the cars that moved in the "historical" NS trains which DuPont's operating plan purportedly "adopted." Moreover, DuPont posited that the DRR's general freight traffic volumes would grow by 53% between the Base Year and the Peak Year. *See* DuPont Rebuttal WP "DRR Traffic Volume Forecast – Rebuttal.xlsx." Accordingly, by basing its evidence solely on NS's "historical" train and car data, DuPont posits and operating plan that is not "specifically tailored to serve [the DRR's Peak Year] traffic group." *AEPCO 2011* at 4 (emphasis added); *see also Rate Regulation Reforms* at 5; *Otter Tail* at 6; *Xcel*, 7 S.T.B. at 598, 610; *TMPA I*, 6 S.T.B. at 589.

[74] DuPont Rebuttal III-C-68 – 69 (emphasis added; citations omitted). The quoted language also impeaches DuPont's nonsensical assertion that MultiRail "draws a wall around the SARR, without accounting for the effect on the residual NS and other connecting railroads." DuPont Rebuttal III-C-2. In reality, NS's operating plan includes not only blocks of cars that would move internally over the DRR network, but also "external" blocks that the DRR would receive from, and deliver to, NS and other connecting railroads. NS Reply III-C-160.

In light of this admission, DuPont's portrayal of NS's operating plan as being "divorced from NS's real world operations" or in any way "untethered" from the SARR's traffic is absurd. DuPont Rebuttal III-C-65

DuPont's suggestion that the Board should not credit NS's operating plan because NS did not submit a full "read and write" version of MultiRail with its Reply Evidence, and provide it to DuPont free of charge, is likewise meritless. As an initial matter, DuPont's position is ironic in light of the fact that DuPont did not provide either the Board or NS with the proprietary code that witnesses Fapp and Humphrey used to select trains from NS's historical train file. Unlike MultiRail, which is available for purchase from Oliver Wyman, the Fapp/Humphrey code is not otherwise accessible. In any event, the Board effectively rendered DuPont's complaint "moot" in its March 25, 2013 Decision declining to decide whether NS was required to provide a full read-and-write version of MultiRail for DuPont's use. In that decision, the Board made clear that the record contains more than enough documentation to evaluate NS's operating plan.[75]

Moreover, DuPont's Rebuttal recites a litany of supposed errors that NS made in conducting its MultiRail analysis (DuPont Rebuttal III-C-65–108), effectively contradicting DuPont's assertion that it was denied the ability to analyze NS's evidence.

DuPont's specific other criticisms of NS's MultiRail-based analyses are similarly without merit:

- DuPont wrongly asserts that, because NS did not input the DRR's unit train traffic into MultiRail, "NS did not account for the requirements of that traffic in developing its routing and operating plans for the carload traffic." DuPont Rebuttal III-C-87. Unit trains move intact between the same origin/destination pairs. Cars moving in unit train service do not need to be classified or transferred between trains during their journey. Accordingly, it was not necessary to develop "blocks" for that traffic, or to assign individual cars or blocks to trains.[76] However, NS's RTC simulation did include both the carload and intermodal trains that flowed

[75] STB Docket No. 42125 (March 25, 2013) ("The fact that the Board does not have a particular software program does not mean we would be unable to evaluate that evidence.").

[76] Indeed, if NS had included unit train shipments in its MultiRail analysis, those cars would have been assigned to a common "block" at origin and moved in a single train across the DRR network—a meaningless exercise.

through MultiRail and the DRR's unit trains in evaluating the DRR's overall capacity requirements.[77]

- DuPont's further assertion that including unit train traffic in the MultiRail analysis "could be useful for such things as balancing traffic flows with crew change points" (*id.*) is nonsensical—the traffic flows and crew assignments associated with unit train operations are, by definition, balanced and there would be no practical benefit in combining unit train and carload traffic for that purpose.

- DuPont chides NS for "manually overrid[ing]" the default train schedules and dwell times generated by the MultiRail software. DuPont Rebuttal III-C-95–96. As discussed above, NS's experts intentionally based their analysis on NS's actual train schedules in order to produce a plan that is consistent with "real world" operating conditions. Moreover, adjustments to dwell times were, in most instances, made to adopt dwell time assumptions (such as a 15 minute allowance for crew changes) posited by DuPont itself on Opening. Those adjustments underscore the fact that NS's operating plan is the product of the NS witnesses' real world expertise, rather than slavish adherence to "default" parameters suggested by the MultiRail software.

- DuPont's allegation that MultiRail generated "inefficient and incorrect routing[s]" for the DRR's traffic (DuPont Rebuttal III-C-101) is, at best, highly misleading. For example, DuPont states that MultiRail "routes traffic" moving from Clymers, IN, to Atlanta, GA, via "a long and circuitous route." DuPont Rebuttal III-C-100. What DuPont does not tell the Board is that this "example" of inefficient routing involves one carload during the entire Peak Year.[78] A movement from Chicago to Ayer, MA, that DuPont touts as "[y]et another example of inefficient and incorrect routing" by MultiRail likewise involves a single car for the entire Peak Year.[79] These two movements are classic "real world" examples of cars that were inadvertently misrouted by a carrier. For example, the Chicago-Ayer car was mistakenly delivered by UP to NS at Landers Yard in Chicago (rather than at its usual point of interchange at 47th Street Yard), and was moved by NS to Ayer via a route (and trains) other than those in which the shipment would customarily travel. In preparing the DRR operating plan, NS's experts were aware of these "aberrational" movements, but chose not to define an additional "dedicated" block in MultiRail to accommodate a single car. A third example cited by DuPont, a movement from Mapleton, PA, to Geneva, NY, did involve 1,500 cars, but DuPont's claim that MultiRail improperly routed the cars in a manner

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[77] As NS's Reply Evidence explained (III-C-168 – 169), while most of the DRR's intermodal traffic moves intact in a single train, there were some instances in which blocks of intermodal units needed to be transferred between trains while en route. For that reason, NS did incorporate the DRR's intermodal traffic in its MultiRail analysis.

[78] DuPont's own workpapers indicate that the total Peak Year volume for this movement is "0.0." *See* DuPont Rebuttal WP "ClymersIN to AtlantaGA Data Analysis.xslx" Tab "NS MultiRail Data."

[79] *See* DuPont Rebuttal WP "ChicagoIL to AyerMA Data Analysis.xlsx," Tab "NS MultiRail Data."

inconsistent with their "real world" route of movement is incorrect. While NS's historical event data indicate that the traffic was routed via a connecting short-line carrier in 2009-2010, NS shifted the traffic to an "NS direct" route in 2011. While the mileage of the "NS direct" route is somewhat greater than the old routing, eliminating an interchange with the short-line carrier reduced the overall transit time for those shipments. In developing NS's operating plan for the DRR, NS's experts applied the more efficient current routing for this traffic. In short, the "examples" cited by DuPont do not support its claim that NS's MultiRail analysis generated inefficient routings.

- DuPont attempts to defend its creation of "leapfrog" traffic on the grounds that NS's operating plan and its real world operations both include such movements. DuPont Rebuttal III-A-5; III-C-73–84. NS strongly believes that DuPont's creation of "leapfrog" segments on the DRR is contrary to SAC principles and should not be allowed. However, in developing its operating plan, NS did not modify those segments, given the uncertainty as to the Board's ruling on the validity of "leapfrog" traffic. DuPont's reliance on the supposed existence of "leapfrog-like" movements in NS's real world operations (DuPont Rebuttal III-A-5) is similarly misplaced. The issue in this proceeding is not whether such movements occur in the real world, but rather whether DuPont's decision to convert large volumes of service sensitive traffic that actually moves in single line service over the lines replicated by the DRR into "leapfrog" movements exceeded the scope of permissible cross-over traffic. NS Reply III-C-107–115. Finally, DuPont's complaint that NS's operating plan created improper "external" reroutes fails to acknowledge that DuPont's choices regarding the NS lines replicated by the DRR, and its traffic selection decisions, created "new" interchange points along the DRR system that do not exist in the real world (thereby necessitating certain departures from NS's current routings). NS Reply III-C-108–109, 186.

- DuPont seizes upon certain reports that can be generated by MultiRail in a vain attempt to demonstrate that NS's operating plan did not account for all of the selected traffic. For example, DuPont alleges that MultiRail failed to assign all of the blocks generated by the software to trains. DuPont Rebuttal III-C-88–92. As an initial matter, several of the reports upon which DuPont relies in making that argument were generated from NS's 2010 (Base Year) MultiRail run. That run was not used in developing NS's operating plan, which was based entirely on the 2018 (Peak Year) MultiRail analysis.[80] Moreover, DuPont's reference to "stranded" blocks (DuPont Rebuttal III-C-90) is disingenuous—as DuPont's workpapers show, 23 of the 29 blocks in NS's 2010 MultiRail run upon which DuPont relies had no cars assigned to them.[81] Blocks with no traffic clearly do not need to be assigned for movement by a train.

- DuPont's claim that "1.7 percent of the total 4.5 million carloads NS handled in MultiRail" "did not reach their final destination" (DuPont

[80] *See* NS Reply III-C-166 –167. Certain information derived from the Base Year MultiRail analysis was utilized by witness Benton Fisher in developing the DRR's operating expenses.

[81] *See* DuPont Rebuttal WP "mmtrnblkval_2010.xlsx."

Rebuttal III-C-91) is incorrect. The 81 blocks and 43,094 cars that DuPont alleges were "stranded" in NS's 2018 MultiRail run amount to less than one percent of the approximately 4.5 million cars modeled in MultiRail. Moreover, the "Stranded or Partially Routed" block report upon which DuPont bases this assertion identifies any traffic that stalls at some point during the MultiRail simulation. Many of those shipments or blocks can move from origin to destination via multiple combinations of routes and trains. In most cases, traffic flagged in the "Stranded or Partially Routed" report was, in fact, subsequently flowed by MultiRail via an alternative train-route combination. Indeed, NS's review of DuPont's Rebuttal indicated that fully 90% of the blocks cited by DuPont did, in fact, flow through to their destination—only three Base Year (2010) blocks and four Peak Year (2018) blocks did not have identified alternative routings

- DuPont proffers a litany of other claims regarding NS's MultiRail analysis that are equally incorrect, trivial and/or misleading. For example, DuPont references the "Block Bypass Report" and claims that nearly one-third of the DRR's traffic was inefficiently routed. *See* DuPont Rebuttal at III-C-102–103. DuPont failed to properly interpret this report. The Block Bypass Report identifies potential alternative routings that could be used, including options that could result in fewer handlings for particular blocks or lanes of traffic. While this report is a helpful tool which was consulted by the NS operating team to develop an overall efficient operating plan, sole reliance on this report ignores other efficiencies that are at play in the development of a system-wide operating plan. Whether blocks can be consolidated (or can bypass an intermediate handling) depends on the block volumes and yard capacities. While it is theoretically possible to build blocks to every possible destination and bypass all intermediate handlings, such an operating strategy would be impractical and unrealistic and prohibitively expensive. In particular, it would require each yard to have enormous blocking capacity, and create additional complexity for the train plan—leading to delay and congestion in yards and on main lines. For these reason, adding larger numbers of (smaller) blocks is often not prudent. Thus while the Block Bypass Report provides additional insights that are used to develop an overall plan, the fact that blocks remain on the bypass report does not lead to the conclusion that the operating plan is inefficient.

- Similarly, DuPont criticizes NS's "substitution logic," by which DuPont claims "NS altered the 2010 NS waybill data for two-fifths of the merchandise carloads." DuPont Rebuttal at III-C-98. These refinements were undertaken to reflect the rules prescribed in NS's Interline Service Agreements which dictate particular practices at interchanges with other Class I and short line railroads. It is industry practice to incorporate such "substitutions" when developing an operating plan, in order to ensure that the plan implements the terms of those inter-carrier agreements. Moreover, the vast majority of shipments for which waybill data were "altered" represent improved identification of specific locations within a

terminal.[82] NS explained this substitution process at length in its Reply Evidence, including identifying and describing a series of rules. *See* NS Reply WP "Modeling Operating Plan in MultiRail for the DuPont Rate Case.docx" at pp. 15-16.

In short, DuPont's lengthy attack on MultiRail, and the analyses that NS performed with that software, is devoid of merit. The 42 pages of narrative that DuPont devotes to that (futile) task amount to nothing more than smoke and mirrors designed to divert attention from the fatal deficiencies in its own operating plan.

### 3. DuPont's Other Criticisms of NS's Operating Plan are Unpersuasive.

In addition to its frivolous assault on the MultiRail software, DuPont's Rebuttal makes a half-hearted attempt to discredit other elements of NS's operating plan. DuPont's criticisms of NS's operating evidence are unavailing.

DuPont contends that the daily car classification requirements posited by NS are "unsupported," "unrealistic," and "artificially inflated." DuPont Rebuttal III-C-122–123. That assertion is demonstrably incorrect. Indeed, as NS demonstrated above, the accuracy of NS's car classification counts is supported by DuPont's own Rebuttal Evidence. The number of car classifications posited by NS at every yard location is similar to, or lower than, the car counts generated by a proper application of the methodology (based on NS's car event data) that DuPont itself sponsored on Rebuttal. *See supra* at 25, Table 2. NS's car classification calculations are further supported by "real world" evidence regarding the number of cars that NS actually classified at its major yards during 2010. *Id.*

DuPont also asserts that NS's car classification evidence is "unsupported" based on a reference to an NS Reply workpaper (NS Reply workpaper "Reply Yards – Operations.xlsx") that (according to DuPont) contains only "hard coded numbers without a link to any analysis." *Id.* However, as DuPont knows, the average daily car counts shown on that workpaper were taken directly from NS's MultiRail analysis. Indeed, the NS Reply WP

[82] Refining the "Chicago," "Kansas City," or "St. Louis" areas for example, to identify the physical location where traffic is interchanged with specific railroads (*e.g.*, Ashland Avenue, Cicero).

"Yard_Volumes_DRR.xlsx" also cited by DuPont (DuPont Rebuttal II-C-123, n.240) establishes the clear link between the MultiRail outputs and the car counts shown in NS Reply workpaper "Reply Yards - Operations.xlsx." The latter workpaper simply summarizes various statistics relating to NS's Reply yard configuration.

DuPont also attempts to cast doubt on the accuracy of NS's car classification counts by pointing to an alleged discrepancy between the daily volumes for a single yard (Decatur, IL) shown on NS Reply workpaper "Reply Yards – Operations.xlsx" (625 cars per day) and in NS Reply WP "Yard_Volumes_DRR.xlsx" (659 cars per day). As an initial matter, the alleged "discrepancy" appears in data for the Base Year (2010), which were not used in preparing NS's operating plan. Moreover, the discrepancy posited by DuPont is illusory.[83] The refreshed pivot table total of 653 cars for Decatur consists of 625 general merchandise cars and 28 Multi-Level cars. *See* NS Reply WP "Yard_Volumes_DRR.xlsx", Sheet 4, ln. 14. The 625 general merchandise cars is the very same total shown in NS's workpaper "Reply Yards – Operations.xlsx." Multi-Level cars are not "classified" over a hump track, and were therefore properly excluded by NS from the car classification count at Decatur.

DuPont also claims that, when it attempted to recreate the car classification count for Decatur in NS's 2010 MultiRail analysis, it got an even higher car count (895 cars per day). DuPont Rebuttal III-C-123. The reason for that discrepancy is easily explained—DuPont ran a MultiRail report that included all Originating, Intermediate, and Terminating handlings at Decatur. *See* DuPont Rebuttal WP "Yard Volume 2010.pdf." By contrast, in developing its car classification counts, NS excluded Terminating handlings, based on the assumption that DRR local train crews (rather than yard crews) would perform the last handling of terminating cars and build the local train to deliver those cars to destination. *See* NS Reply III-C-174 (explaining that car counts were determined based on volume of cars in outbound blocks).

[83] The 34-car discrepancy posited by DuPont is actually a 28-car difference, once the pivot table is refreshed. *See* DuPont Rebuttal III-C-123, n. 240 (acknowledging that the pivot table refreshes to illustrate a 653 per day car count at Decatur).

In short, the record evidence overwhelmingly demonstrates that the car classification counts posited by NS are reliable, while those (improperly) proffered by DuPont on Rebuttal are vastly understated.

DuPont makes a similarly unpersuasive attack on the DRR yard configurations posited by NS on Reply. Unlike DuPont, NS supported its yard sizes and configurations with a carefully detailed and well-documented analysis of the DRR's hour-by-hour yard operations. NS Reply III-C- 170–184. The DRR yards posited by NS are based directly on the inventory of cars that would be present at each yard location during the peak hour on a typical day in the Peak Year.

DuPont's criticisms of NS's yard sizing and configuration evidence are both ironic—given that DuPont articulated no methodology whatsoever for determining yard capacity requirements on Opening or on Rebuttal—and unpersuasive.

First, DuPont contends that NS's yards are based on inflated car counts. As the discussion above clearly shows, that argument has no merit.[84] *See supra* at 23-26.

Second, DuPont contends that NS's yard sizing methodology "built a church for Easter Sunday" by considering "the peak *hour* of each day in the peak week." DuPont Rebuttal III-C-123–124 (emphasis in original). DuPont is both factually and conceptually wrong. As a factual matter, the car counts utilized in NS's yard analysis are derived from NS's 2018 MultiRail run, which evaluated an average week (rather than the peak week) during the DRR's Peak Year. Accordingly, the "peak hour" car counts developed by NS Witness Rieppi represent the number of cars that would, on average, be present in a given yard during the busiest ("peak") hour during

[84] In attacking NS's yard capacity analysis, DuPont again points to alleged discrepancies between the car count figures used in the yard analysis and the Base Year car counts generated by MultiRail. DuPont Rebuttal III-C-124. However, NS's yard analysis was based—as it should be—on the DRR's Peak Year car volumes. *See, e.g., Duke/CSXT*, 7 S.T.B. at 437 (noting that "[t]he [SARR] is designed to handle a (peak-year) volume of over 100 million tons"); *Major Issues* at 63 ("complainants have constructed SARRs with sufficient capacity to handle the peak weak of the peak year of a 20-year analysis period") (emphasis in original); *WFA II* at 16 (noting that a SARR must have sufficient capacity to handle the peak forecast demand).

a typical week during the Peak Year. NS's use of an average week rather than the peak week makes its car counts conservative.

Moreover, DuPont is conceptually wrong in suggesting that yard capacity should be based on the daily average car volume, rather than the number of cars present during the "peak hour." Failing to account for the inventory of cars present in a yard at the busiest time of day would virtually ensure that a railroad would experience congestion at that yard every day. NS's analysis, which bases capacity on peak hour car inventory during an average week, "right sizes" the DRR's yards—indeed it produces conservative results.

Third, DuPont takes issue with the application of a "fluidity factor" to the "static" capacity in determining a yard's overall capacity requirement. DuPont Rebuttal III-C-124. Again, DuPont is both factually and conceptually wrong. DuPont's assertion that NS witness Rieppi applied "an effective 167 percent fluidity factor" (*id.*) is nonsense. As NS's Reply clearly explained, the fluidity factor applied by Witness Rieppi was 0.6. NS Reply III-C-177. Moreover, DuPont's challenge to the use of a "fluidity factor" in sizing a railroad yard flies in the face of logic—if a yard's track capacity were limited to its "static" capacity, a railroad would barely be able to park its inventory of cars in the yard, and would have no additional track whatsoever on which to perform switching operations. The 0.6 fluidity factor applied by NS witness Rieppi has been endorsed by independent analyses (including a study conducted by the Department of the Army[85]) as an appropriate adjustment to "static" capacity to ensure that cars can be moved about the yard. The application of a fluidity factor in sizing a yard reflects the reality that a railroad yard is not a "parking lot," but rather is a working facility at which cars and locomotives are constantly moved between tracks, as trains are built and dis-assembled.

In summary, unlike DuPont's ill-conceived operating plan, NS's plan is tailored to the traffic group selected by DuPont, and provides all of the train services, intermediate

[85] *See* NS Reply WP "Army Rail Operations.doc." The 0.6 fluidity factor has likewise been endorsed by the State of Washington Department of Transportation. *See* NS Reply III-C-177.

classification and switching, and service to customer facilities that the DRR would have to perform in order to meet the needs of its customers. If the Board does not dismiss DuPont's complaint outright (as it should), it should adopt NS's operating plan in its entirety.

## III. NS'S OPERATING EXPENSE EVIDENCE SHOULD BE ACCEPTED.

### A. Because DuPont's Operating Plan is Fatally Deficient, all of its Operating and Personnel Expenses must be Rejected.

As explained above, DuPont's operating plan is infeasible and must be rejected. DuPont's Rebuttal Evidence failed to correct the fatal flaws in its analysis—most particularly it still does not provide for complete service for all of the DRR's traffic, including 33% of the "issue" traffic because DuPont's plan is still missing tens of thousands of necessary trains. *See supra* at 19-23. Accordingly, DuPont's personnel counts and operating expenses, which DuPont admits are derived from its operating plan and RTC outputs (*see, e.g.*, DuPont Rebuttal III-C-132, III-D-23-24) are demonstrably unreliable and should be rejected. To the extent the Board does not reject DuPont's counts in their entirety, below NS identifies some of the most blatant failings in DuPont's operating expense evidence.

#### 1. DuPont's Operating Personnel Counts Remain Insufficient.

On Reply, NS identified many areas in which DuPont vastly understated the operating personnel costs that the DRR would incur. NS Reply Ex. III-D-1. DuPont failed to correct many of these errors on Rebuttal and its operating personnel counts remain utterly unrealistic.

In general, DuPont's reaction to NS's criticisms of its train and yard crew personnel headcounts was to accept the descriptions of the duties and responsibilities that NS attributed to various personnel, and simply to impose those duties upon the limited workforce that DuPont proposed on Opening, without reference to the preexisting duties that those personnel were already assigned on Opening. If DuPont were to identify all of the duties and responsibilities that its Opening and Rebuttal Evidence impose on respective functional areas, it would become obvious that a larger headcount is required.

For example, DuPont continues to maintain that the DRR would need only 11 Managers of Locomotive Operations ("MLO"), whereas NS proposes 24 positions to support a railroad the size of the DRR.[86] On Rebuttal, DuPont accepted the premise that the MLOs would "be responsible for investigating accidents" and that they would also qualify engineers on unfamiliar territory. DuPont Rebuttal III-D-36 – 37. But DuPont made no allowance for the time or additional personnel necessary to perform those functions. This is a clear example of DuPont simply imposing additional duties identified by NS in its Reply on the (already inadequate) personnel proposed by DuPont on Opening. This tactic was not limited to locomotive operations; most of DuPont's headcounts remain far too low to meet the needs of the DRR.

One of the most significant headcount differences arises in the area of Car Inspectors. On Reply, NS assigned 464 car inspectors at 29 locations. NS Reply Ex. III-D-1 at 14. DuPont maintains that the DRR could be operated with only 377 foremen and inspectors. DuPont Rebuttal III-D-42. Yet DuPont posits that the DRR would configure and operate the same train service that NS operated in the real world during 2009-2010 (albeit with even more trains to accommodate the DRR's Peak Year volumes). DuPont has not explained how such operations would be adequately supported by fewer inspectors than NS currently uses. In order to maintain the same level of service as NS, the DRR would require at least as many inspectors in the same locations as NS. Under DuPont's assumption of fewer inspectors, trains would be held for longer periods, and yard congestion and dwell times would increase. *See* NS Reply Ex. III-D-1 at 13. DuPont cannot simply assume that the workload would be absorbed by already over-worked DRR train crews. Also, because DuPont missed tens of thousands of trains in its analysis, it continues to avoid the activities such as classification, blocking, set offs and pick ups at customer locations performed by these trains (the majority of which are local trains), all of

[86] NS's Reply specifically referenced the recent *AEPCO 2011* decision as guidance for the ratio it utilized. *See* NS Reply Ex. III-D-1 at 11.

which would require more car inspection and Terminal Operations staff. NS's evidence presents the most accurate reflection of the number of car inspectors the DRR would require.

### 2. DuPont's Operating Expenses Fall Far Short of the Actual Expenses the DRR would be Required to Incur.

As with operating personnel, in the area of operating expenses DuPont failed to justify its flawed Opening positions on Rebuttal. On Reply, NS pointed out many areas where DuPont's Opening Evidence was insufficient, including crew payroll, locomotive expenses, railcar expenses, and crew repositioning. *See* NS Reply III-D-1–47. DuPont has failed to respond adequately to those critiques.

**Crew payroll.** One of the most transparent and objectionable of DuPont's arguments arises in the area of crew payroll. DuPont assumes that DRR crews would work 270 shifts per year—considerably more shifts than the average NS crewperson. *See* NS Reply III-D-41. At the same time, DuPont assumes that those harder working crewmembers would be paid a lower salary than the average lowest-paid person on NS's roster—for more working days. This is a patently inequitable position that the STB has rejected in the past. *See WFA I* at 47, *AEP Texas* at 58, *Xcel* at 68, *Otter Tail* at C-11.

DuPont's attempt to justify its low crew salary on Rebuttal is transparently ridiculous. In reviewing 2009 NS average salaries, DuPont simply arrays the salaries from low to high, and observes that those that are paid more generally average more years of service. DuPont Rebuttal III-D-26. DuPont then asserts that, because its workforce will be "new," it can get away with paying them less for more work. DuPont's claim amounts to an assertion that, in hiring only from the miniscule pool of people who work 270+ shifts, the DRR would somehow be able to hire only the lowest-paid, most inexperienced subset of this group. The Board rejected a similar argument from Complainants in the *AEP Texas* case.[87] DuPont's analysis should be rejected as unfair, unreasonable, and clearly contrary to Board precedent. The Board should adopt NS's

[87] *AEP Texas* at 77 ("Although a SARR is presumed to be a low-cost, most-efficient carrier, that does not permit the complainant to selectively choose data that supports its position, while ignoring other relevant data.").

approach which is consistent with Board precedent and is representative of the wage expenses that the DRR would incur. *See* NS Reply III-D-41 – 42.

**Crew Deadheading.** On Rebuttal, DuPont modified its Opening position that no crew deadheading would be required, and employed a new analysis to determine that the DRR's deadheading obligations would be one percent. DuPont Rebuttal III-D-20–23; WP "DRR Operating Statistics_Rebuttal.xls." DuPont's revised position constitutes impermissible rebuttal evidence, and in any event remains insufficient and unsupported.

First, like many of DuPont's analyses, DuPont's deadheading analysis constitutes improper rebuttal that could have and should have been undertaken on Opening. NS provided no new evidence or information on Reply that DuPont would not have had access to on Opening, nor are deadheading costs a "new" or unknown cost item. Indeed, deadheading costs are commonly recognized and included in a SAC analysis, which surely DuPont's expert operating witnesses know. *See, e.g., AEPCO 2011* at 46; *FMC*, 4 S.T.B. at 770. Nevertheless, DuPont impermissibly engaged in a new analysis using its own new approach to identifying crew imbalances on Rebuttal, which should be rejected. *See* DuPont Rebuttal III-D-23.

Second, even if DuPont's analysis is not rejected out of hand, the analysis is inaccurate and unsupported. DuPont's review oversimplifies the train flows, resulting in an understatement of the costs that would actually be incurred to achieve the geographical groupings that DuPont assumes. For example, DuPont's evaluation of train flows between Chicago, IL, and Sandusky, OH, assumed that imbalances to/from Toledo, OH, could be offset by other imbalances at both Elkhart, IN (130 miles away) and at Sandusky, OH (45 miles away, and in the opposite direction from Elkhart).[88] Further, DuPont included no costs for taxiing crews between any of the locations that it grouped together, despite its assumption that DRR crews would work to/from different on- and off-duty points.

[88] *See* DuPont Rebuttal WP "DRR Crew Rebalancing - North Region.pdf."

Finally, DuPont's conclusion that a one percent adjustment is a satisfactory solution for the DRR's myriad flows is nonsensical. Even if DuPont has accurately identified instances where NS train crews could be ferried between locations in a larger terminal or metropolitan area, it did not demonstrate that those crews could maintain the very high level of utilization that DuPont assumes, or that there would always be DRR trains available to work at times that also ensured that the crews would comply with their Hours of Service and rest-period requirements.

NS's analysis of crew deadheading costs is well-founded on its MultiRail analysis and presents the best evidence on record.

**Locomotive Shops.** On Rebuttal, DuPont adheres to its Opening position that four locomotive shops would be sufficient for the DRR. *See* DuPont Rebuttal III-D-11. Not only does DuPont fail to defend the basis for its Opening assumption that the DRR could support its locomotive fleet with four shops, it actually increased the size of its DRR locomotive fleet by nearly 40% on Rebuttal (DuPont Rebuttal Table III-C-3, III-C-132) without making any corresponding adjustment to the number of maintenance facilities.

In a misguided attempt to refute NS's evidence, DuPont presents on Rebuttal an invalid comparison of the number of NS's DRR locomotive repair facilities to the number of locomotive shops that NS operates in the real world. DuPont claims that NS's assignment of ten shops for the DRR must be wrong because that total is higher than the total on NS's entire network. *See* DuPont Rebuttal III-D-11. DuPont is wrong. DuPont cites to a list of NS's "system" shops, of which there are eight. However, DuPont's statement ignores the fact that NS also maintains 19 smaller "division" shops on its system. When the comparison is corrected, it is clear that NS's plan provides fewer than one-half of the shops that NS operates in the real-world. By contrast, DuPont proposes to handle more than 90% of NS's traffic in the Base Year, and generate two-thirds of the unit-miles on NS's entire system, yet it replicates only 15% of NS's locomotive shops (4 out of 27). DuPont's proposal is unsupported and utterly unrealistic. In comparison, NS's locomotive shop requirements are reasonable and reflect the best evidence of record.

**Locomotive Fleet Size.** On Rebuttal DuPont continues to posit a locomotive fleet that is undersized and assumes significantly higher utilization than that achieved by any Class I railroad. DuPont's approach does not reflect realistically the operations of a merchandise network: the locomotives on DRR general freight trains achieve higher utilization than locomotives on DRR unit trains. DuPont Rebuttal WP "DRR Operating Statistics_Rebuttal.xls." This fact alone demonstrates the absurdity of DuPont's evidence, as the STB has long recognized that unit train service is more efficient. *See, e.g., PPL Montana* at 2, n.4; *Major Issues* at 55.

NS's analysis of the DRR's locomotive requirements is superior in numerous ways. First, NS's locomotive dwell time analysis appropriately analyzed inbound and outbound train movements by location to identify areas where locomotives would need to be repositioned. In modeling dwell time, NS incorporated an assumption that capped locomotive dwell time at 24 hours, which renders NS's fleet size conservatively low, as NS effectively does not "charge" the DRR for locomotives that dwell for longer than 24 hours. Rather than employ any of the realities of sizing a locomotive fleet, DuPont simply assumed on Rebuttal that every general freight and non-premium intermodal train would experience exactly three hours of locomotive dwell time, citing only witness McDonald's "extensive railroad operating experience"—without providing any evidentiary support for that assumption.

Second, NS's "repositioning speed" of 20 MPH is not unreasonable. Indeed, it is supported by DuPont's own operating expense calculations, which indicate that DRR general freight trains would average 21.6 MPH. *See* DuPont Rebuttal WP "DRR Operating Statistics_Rebuttal.xls."

Third, DuPont criticizes NS for analyzing 29 days of train movements, but using a divisor of 24, to determine the locomotive requirements. DuPont incorrectly asserts that this resulted in an overstatement of 18%. DuPont Rebuttal III-C-134. NS's analysis of locomotive requirements employed both a two-day warm-up period and a two-day cool-down period, in the same manner that both parties incorporated such periods in their respective RTC simulations.

NS realizes this means that it should have used a divisor of 25 days, not 24.[89] In order to correct this slight overstatement, the ES44 road locomotive counts that NS calculated in its Reply Evidence should be reduced by four percent, *i.e.*, multiplied by 0.96, or 24/25.

Finally, DuPont's claim that NS "fail[ed] to support its evidence" is belied by the extensive workpapers that NS provided.[90] The workpapers contained all of the information needed to run the fleet sizing model, including the MultiRail and RTC input data. It also included the Matlab script for running the simulation, which produced the so-called "hard-coded" numbers used in the final set of calculations. DuPont's claim that a discrepancy exists between the RTC period and the simulation period is also incorrect. In order to develop a more robust analysis than provided by the single week modeled in RTC, NS followed the common modeling practice of replicating the train movements to cover a longer period. NS's locomotive fleet sizing calculations are based on the same DRR trains—operating with the same frequency and routings—that NS determined would be necessary to handle the mix of DRR traffic and routes.

**Peaking factor**. On Reply, NS showed that DuPont's peaking factor would result in the DRR having an insufficient number of locomotives in the Base Year. NS Reply III-D-14–15. DuPont does not contest NS's claim, yet it continues to use the same peaking factor to calculate the DRR's locomotive needs in the Base Year. DuPont's claim that NS's peaking factor would result in the DRR having too many locomotives in the Peak Year (Rebuttal III-C-137) does not address the fact that DuPont failed to demonstrate that its proposed locomotive fleet would be adequate to power DRR trains in the Base Year. As a result, DuPont has not presented a feasible operating plan for the Base Year.

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[89] The trains and locomotives that were actually used in the calculation were those movements that occurred from October 8 through November 1, not October 6 through November 3, as DuPont claimed.

[90] *See* NS Reply WP folder "III-D\III-D-1\Local Trains and Locomotive Fleet Sizing."

**Switch locomotives**. As discussed above, the switch locomotive count presented by DuPont on Rebuttal is based on an untimely, flawed analysis that relies upon DuPont's vastly understated car classification counts. *See supra* at 23-26. When DuPont's car classification analysis is corrected, the number of cars to be classified at many DRR yard locations are approximately double the number that DuPont posited (*see* Table 2), and would require considerably more yard locomotives.

**Triple Crown Car Costs.** The single-largest difference between the parties' car cost evidence relates to equipment for the DRR's Triple Crown service. On Rebuttal, DuPont accepted NS's criticism that it was incorrect for DuPont to assume that all of the DRR's intermodal shipments would move on railroad-provided equipment. DuPont Rebuttal III-D-17. In correcting that error, however, DuPont for the first time on Rebuttal bases the costs for certain shipments on a lease between Triple Crown and TCS Leasing, another subsidiary of NS Corporation. *See* DuPont Rebuttal WP "DRR Car Costs_Rebuttal.xlsx." There are two significant problems with DuPont's new analysis. First, it is impermissible for DuPont to introduce a new source for the cost of intermodal equipment on Rebuttal, after having relied on other NS equipment leases on Opening. Second, DuPont's new position represents an effort for the DRR to "have it both ways" vis-à-vis Triple Crown. For revenues, DuPont seeks to augment the NS Railway revenues received from Triple Crown, claiming that DRR is entitled to more revenue than NS Rail receives for the rail transportation service it provides to Triple Crown. When it comes to accounting for the costs of providing that service, however, DuPont takes the opposite position. There, it seeks to use an intracorporate agreement as a proxy for all of DRR's costs, when such costs do not reflect the market rates that an unaffiliated lessor would pay in an arms-length transaction.[91] DuPont's significant understatement is revealed by the fact that its Rebuttal costs for Triple Crown equipment are less than one percent of what DuPont submitted

[91] Notwithstanding the fact that DuPont has staked out an inconsistent position, it claims that NS is being "self-serving" with respect to Triple Crown. DuPont Rebuttal III-A-60.

on Opening. Despite including nearly all of NS's Triple Crown shipments on the DRR, DuPont claims the SARR would incur less than $50,000 in equipment expense, less than 20 cents per shipment: DuPont's new, cherry-picked selection should not be accepted.

**B. NS's Evidence of DRR G&A Expenses Is the Best Evidence Of Record.**

DuPont's utter failure to develop a SARR capable of serving the needs of its selected traffic is exemplified by its approach to G&A evidence. Despite the fact that DuPont chose to select (and claim revenues from) a diverse SARR traffic group more typical of real-world Class I railroads than the simplified SARR operations of past cases, DuPont has proposed G&A staffing and spending levels between one-sixth and one-third the size of prior SARRs (when adjusted for revenue). *See* NS Reply III-D-56–57 & Tables III-D-13 & III-D-14. Therefore, it should have come as no surprise to DuPont that NS has proposed to triple the G&A staffing of the DRR, as doing so placed those staffing levels within the conservative range of Board precedent in this area. Such an increase would not have been necessary had DuPont proposed a G&A staff on Opening capable of serving the needs of its diverse traffic group.

Indeed, had DuPont bothered to look for real-world benchmarks on Opening, as directed by the Board in *AEPCO 2011*, DuPont would have realized that its proposed G&A spending is only one-eighth the amount spent by the average Class I railroad, with only one-sixth of the G&A staffing, when adjusting for revenue. *See id.* III-D-194 & NS Reply Ex. III-D-2. In area after area of its Reply Evidence, NS showed that DuPont's proposed staffing and spending could not possibly meet the needs of the DRR's traffic group and that the assumptions on which DuPont relied in its G&A evidence were not "consistent with the underlying realities of real-world railroading." *WFA I* at 15. By contrast, NS has proposed G&A staffing and spending commensurate with the DRR's needs, while still representing only about half of the revenue-adjusted G&A staffing and spending of the average real-world Class I. *See* NS Reply III-D-194–195 & NS Reply Ex. III-D-2. In sum, only NS's G&A evidence is consistent with staffing levels of real-world railroads and past SARRs, while simultaneously representing the least-cost, most efficient manner to meet the G&A needs of the DRR.

It is impossible in this brief to summarize the scores of disputes between the parties about DRR G&A expenses. NS relies on the detailed evidence and arguments it submitted on Reply, and in this brief discusses only three of the most important G&A issues raised by DuPont's Rebuttal: (1) DuPont's impermissible and unreliable Rebuttal "benchmarks" for G&A staffing; (2) DuPont's new Rebuttal theories for why the DRR would need less G&A spending than real-world railroads; (3) and DuPont's continued reliance on unreasonable assumptions to justify its extraordinarily low G&A staffing.

**1. DuPont's Alleged Benchmarks are Incomplete and Unreliable.**

DuPont responds to NS's detailed, real-world G&A benchmarks by producing for the first time its own alleged staffing "benchmarks" on Rebuttal. DuPont's tactic of including no G&A benchmarks on Opening and then producing them after NS had filed Reply Evidence is blatantly impermissible rebuttal, and these newly asserted benchmarks should be disregarded. *See SAC Procedures* at 445-46; *Xcel*, STB Docket No. 42057 (served April 4, 2003) at 2. Without this impermissible Rebuttal Evidence, DuPont's staffing levels are unsupported and must be rejected.

Regardless, DuPont's benchmarks do not come close to justifying its paltry staffing. In fact, some of these benchmarks plainly support NS's staffing proposal—for example, DuPont's assertion that KCS "employed close to 50 IT personnel" would suggest that a railroad like the DRR with five times the revenues and over three times the employees of KCS would need an IT staff in the hundreds.[92] DuPont Rebuttal Ex. III-D-1 at 51. NS conservatively proposed just 78. *See* NS Reply III-D-162.

Moreover, the primary "benchmarks" DuPont relied on—railroad contact lists from decades-old editions of the Official Railway Guide—plainly do not represent the full G&A staffing of real-world railroads. Railway Guide contact lists have never purported to represent a

[92] *Compare* AAR, RAILROAD FACTS (2011) at 73 (KCS had $1.016 billion in revenues and 2702 employees) *with* NS Reply Ex. III-A-1 & NS Reply III-D-152 (DRR has approximately $5.6 billion in revenues and 8,808 employees).

railroad's full G&A staff, and DuPont presented no evidence that they do. DuPont's approach is the equivalent of counting individuals listed on the staff directory on the Board's website and concluding that the Board must have only 54 employees, when it actually has almost three times that number.[93] A few of the most egregious flaws in DuPont's Railway Guide "benchmarks"—other than the fact that they are impermissible on Rebuttal—are listed below:

- **DuPont's Benchmarks Are Incomplete.** The contact lists DuPont uses as benchmarks plainly do not include full IT[94] or police staffs,[95] and in many departments appear to only include management-level personnel.[96] Indeed, DuPont admits at one point that the Railway Guide does not include clerks and assistants—ignoring the fact that on the immediately prior page of its evidence DuPont implied that Railway Guide counts represented full G&A staffing.[97]

- **DuPont's Alleged Benchmarks Are Irreconcilable With Reported Data.** DuPont unwisely includes in its workpapers a 1994 Wage Form A for the Chicago & North Western Company ("C&NW") that shows that DuPont's claimed Official Railway Guide "benchmark" of C&NW personnel is one-eighth the number of Group 100 and 200 employees the railroad reported.[98]

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[93] *Compare* http://www.stb.dot.gov/stb/docs/Contacts/Key Contacts PP 9-12.pdf (staff directory listing 54 STB employees) *with* STB 2011 Annual Report, at 70, *available at* http://www.stb.dot.gov/stb/docs/AnnualReports/STB_FY2011_Annual_Report.pdf (reporting 140 full-time-equivalent employees).

[94] For example, the Norfolk & Western Railway ("N&W") contact list includes no IT personnel at all save three "Management Information" employees. *See* DuPont Rebuttal WP "G&A Staffing – small Class I carriers.pdf" at 6. C&NW's IT listing for 1993 includes only six IT employees, all of whom are Assistant Vice Presidents, and thus plainly have employees working for them. *See* DuPont Rebuttal WP "C&NW G&A 1993.pdf" at 2.

[95] Not one of the Guide contact lists includes a complete police force. Only the Southern Railway directory includes any police or security force beyond the top administrative personnel and even this includes no personnel below the rank of captain. *See* DuPont Rebuttal WP "G&A Staffing – small Class I carriers.pdf" at 13.

[96] For example, the 1993 C&NW directory does not include any personnel but Vice Presidents and Assistant Vice Presidents for Human Resources, Government Affairs, Safety & Casualty Prevention, Real Estate & Office Services, and Information Technology. *See* DuPont Rebuttal WP "C&NW G&A 1993.pdf" at 2.

[97] *Compare* DuPont Rebuttal Ex. III-D-1 at 6, Table 3 ("The Guide does not show administrative assistants and clerks.") *with id.* at 5, Table 2 (using Guide counts for "comparison of DRR G&A staffing with similar size Class I railroads").

[98] *Compare* DuPont Rebuttal WP "C&NW 1994 Wage Form A&B.pdf." (showing 543 employees in the "Executives, Officials & Staff Asst." (Group 100) category and another 811 employees in the "Professional and Administrative" (Group 200) category) *with* DuPont Rebuttal Ex. III-D-1 at 6, Table 3 (showing 165 employees in G&A C&NW in 1993). While some of the Group 100 and 200 employees listed on C&NW's 1994 Wage Forms may have been executives

- **DuPont Manipulated Its Benchmarks With Obvious Undercounts.** DuPont transparently manipulates its "benchmark" numbers by refusing to count scores of marketing employees listed in the Railway Guide.[99]

- **DuPont's Own Expert Contradicts Its Benchmarks.** Finally, DuPont's own expert contradicts DuPont's reliance on the Railway Guide by testifying about his recollections of C&NW G&A employees who are not in the Railway Guide.[100]

In short, DuPont's late-filed, deeply flawed "benchmarks" are worthless for purposes of determining appropriate staffing for the DRR.

**2. DuPont's Attempted Justifications for its Proposed Staffing Levels Lack Merit.**

DuPont continues to be unable to explain why its G&A workforce could be a small fraction of the G&A workforces of real-world railroads and prior SARRs. NS's Reply Evidence thoroughly rebutted the theories DuPont advanced on Opening that the SARR could somehow achieve enormous efficiencies through "technology" (which is no better than NS's), by having a non-union workforce (which has little effect on G&A requirements), by shifting G&A costs to other carriers (which is expressly forbidden by Board precedent), and because it would be privately held (which does not eliminate the need for the DRR to maintain robust financial and regulatory reporting functions). *See* NS Reply III-D-60–73. DuPont's Rebuttal has no answer for NS's arguments and instead trots out two new theories that supposedly allow reduced G&A staffing for the DRR. DuPont first claims that the DRR could have lower staffing because it would be a "startup." *See, e.g.*, DuPont Rebuttal Ex. III-D-1 at 1, 27, 37. But the DRR begins its existence as a full-scale operation; it cannot plan to "start small" and then scale itself up over

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and assistants from the operating department rather than G&A employees, neither that fact nor the one-year time lag between the 1993 Guide and 1994 Wage Form can account for the gigantic disparity between DuPont's claimed "benchmark" of non-operating employees and the actual number of Group 100 and 200 employees that C&NW reported.

[99] *See, e.g.*, DuPont Rebuttal WP "G&A Staffing – small Class I carriers.pdf" at 10 (omitting approximately 50 Illinois Central Gulf Railroad ("ICG") Sales and Customer Services Officers); *id.* at 4 (excluding 75 C&NW sales and services employees).

[100] *See, e.g.*, DuPont Rebuttal Ex. III-D-1 at 43 (McDonald claims that C&NW had one claim agent for each of its eight divisions—none of whom appear in the Official Railway Guide).

time. From day one it will be a multi-billion dollar Class I railroad moving traffic and serving customers in 20 states.

DuPont's other new theory is that it will be more efficient than NS because NS has "extra personnel from mergers and consolidations that were carried on for years." *Id.* at 14. This theory is both wrong and irrelevant. The modern NS—formed from the combination of the Southern and the N&W—is over thirty years old, and NS's last significant consolidation transaction (Conrail) was nearly fifteen years ago. The notion that decades-old consolidations continue to cause staffing inefficiencies is not credible, and DuPont offers no specific example of this supposed merger-related inefficiency. But DuPont's argument is also beside the point. In every area where NS used its own staffing to benchmark DRR staffing, NS's evidence conservatively assumed that the DRR would be significantly more efficient than NS,[101] and NS's proposed G&A staffing for the DRR represents only half of NS's real-world G&A staffing levels, even after adjusting for revenue. In short, DuPont does not have any persuasive explanation for how the DRR could serve its diverse, complex traffic group with a G&A staff that is a small fraction of the G&A staffs of real-world railroads.

### 3. DuPont's G&A Evidence is Based on Unrealistic Assumptions.

Most of the parties' specific G&A disputes can be resolved in light of the basic principle that "the assumptions used in the SAC analysis . . . must be realistic, *i.e.*, consistent with the underlying realities of real-world railroading." *WFA I* at 15. DuPont's absurdly low levels of G&A staffing in the areas where some of the greatest differences between the parties remain are achieved primarily through ignoring this principle in favor of unrealistic and unreasonable assumptions. NS describes below some of the most significant unreasonable assumptions made by DuPont and how they affect several departments of the DRR and issues in dispute.

[101] *See, e.g.*, NS Reply III-D-136 (scaling the workload of a typical claims agent to NS but reducing the total claims agents necessary to be conservative); NS Reply III-D-141 (scaling police to the real-world NS but reducing the total to be conservative).

**Executive.** DuPont completely ignores NS's well-documented evidence of the work of a Class I railroad's Executive Department—which included a discussion of the dozens of employees at NS performing functions like public relations, corporate relations, and state and government relations—in favor of the plainly false allegation that "all the daily and long term corporate functions of the railroad" are handled solely by NS's CEO. DuPont Rebuttal Ex. III-D-1 at 18; *see also* NS Reply III-D-77–84; DuPont Rebuttal Ex. III-D-1 at 17. As NS documented on Reply, the executive functions of a Class I railroad could not possibly be performed by the DRR CEO with the assistance of only two employees. Rather, the Board should accept NS's proposed Executive staffing, which is half the size of the real-world NS.

**Marketing and Customer Service.** One of the widest gaps between the parties is in marketing and customer service, because DuPont has relied on a series of misguided assumptions to reduce its proposed DRR staff in these areas to patently inadequate levels.[102] First, DuPont assumes that basic marketing tasks for DRR traffic will be performed by other railroads. *See* DuPont Rebuttal Ex. III-D-1 at 20-21 ("DRR's high share of overhead traffic [*i.e.*, crossover traffic] greatly reduces the burden on the DRR's Marketing & Customer Service department relative to that borne by real-world railroads."). As NS explained in Opening, the idea that the DRR could reduce expenses by relying on the residual NS and third-party carriers to perform marketing and customer service in its place is inconsistent with SAC theory and was directly rejected by the Board in *AEPCO 2011*. *See* NS Reply III-D-70–71 & III-D-87. Second, DuPont assumes it will have "fewer customers, rates and contracts to deal with" than the real-world NS. *See* DuPont Rebuttal Ex. III-D-1 at 21. But the DRR is adopting NS's real-world traffic, and thus it will have the same amount of customers, rates, and contracts as NS has for that traffic. Third, DuPont vaguely asserts that "Class I railroads have simplified the entire rate making

[102] DuPont wrongly claims that NS has proposed a "range" of Marketing and Customer Service Department Staff of 202 to 206. *See* DuPont Rebuttal Ex. III-D-1 at 20. NS proposed 206 employees. The difference in numbers is that one figure excludes the Vice President and Administrative Assistants assigned to the Department.

process" in an automated manner that reduces the need for marketing employees. *Id.* But that cannot explain why the DRR would have a vastly smaller marketing department than NS and the other Class I railroads that already have implemented such automations.[103]

**Finance and Accounting.** The parties' dispute over DRR accounting staff is primarily driven by differences about revenue accounting staff. NS's Reply showed that DuPont cannot rely on RMI software to replace human operators, in part because RMI cannot automatically rate every waybill. DuPont quibbles that the approximately 10% of waybills that cannot be automatically rated by RMI might not qualify as "errors." But it does not matter whether these waybills are "errors" or not, what matters is that when a waybill cannot be automatically rated by the RMI software, human staff would be required to manually intervene. *See* NS Reply III-D-113; DuPont Rebuttal Ex. III-D-1 at 29-30. DuPont's claim that a skeleton revenue accounting staff could manage this function for a railroad with revenues approaching $6 billion is ridiculous.

**Law and Administration.** Much of the staffing difference in this area stems from police. DuPont's claim that the DRR could rely on local police or its untrained operating work force to handle security situations implicitly admits that DuPont's proposed DRR police force is insufficient to provide security itself. *See* DuPont Rebuttal Ex. III-D-1 at 45 to 46. But the DRR will have responsibility for transporting high-value freight and much highly hazardous cargo. Given the potential for loss and the safety and security risks involved in handling that selected traffic, it is not reasonable to think that the DRR would simply "coordinate with the local police should an incident occur." DuPont misapprehends the most valuable role of railroad police—to

[103] DuPont incorrectly asserts that NS does not have an Intermodal Planning and Yield Management function. *See* DuPont Rebuttal Ex. III-D-1 at 26. But NS's workpapers plainly show that it has staff to perform this real-world, critical function. *See* NS Reply WP "NS Organizational Chart.pdf" at 144. As NS explained in its Reply Evidence, the Planning and Yield Management Group is responsible for planning functions related to revenue and asset management, including equipment for Intermodal and Automotive traffic. *See* NS Reply III-D-93–94.

provide security to prevent incidents from occurring in the first place.[104] No real world railroad operates as DuPont proposes.

DuPont makes equally unreasonable staffing assumptions in the Administration area by attempting to shift responsibilities to unidentified "contractors" (whose compensation DuPont neglects to account for). For example, DuPont says that it can "outsource" claims investigations to a "third party" on an "'as needed' basis," that "outside assistance would be more economical" than in-house staff for environmental work, and that it can use an "outside recruiter" for executive-level positions. DuPont Rebuttal Ex. III-D-1 at 43, 48–49. But nowhere does it provide for the costs of this "outside assistance."

**Outside Counsel Spending.** DuPont's Rebuttal formula for outside counsel spending deflates the cost of such spending on the theory that all "internal and outside counsel for the DRR likely will reside in Roanoke, VA." DuPont Rebuttal Ex. III-D-1 at 40. Even setting aside the fact that DuPont improperly introduced this "Roanoke discount" on Rebuttal after failing to provide any support for its outsourcing figures on Opening, applying such a geography-specific discount makes little sense for a SARR that will need legal representation in all of the 20 states it traverses.

**Executive Compensation.** NS demonstrated in its Reply Evidence that stock awards to executives are now included as expenses by railroads, and thus that such stock compensation should be included when considering what the DRR would have to pay to offer competitive executive compensation. *See* NS Reply III-D-163–170. DuPont essentially concedes the point on Rebuttal, but nevertheless claims that it can offer below-market compensation because the DRR would be a "startup" offering the prospect of greater pay in the future. DuPont Rebuttal Ex. III-D-1 at 56. But it deeply distorts the SAC test for DuPont to assume that the DRR would

[104] Furthermore, DuPont claims that the DRR would realize the benefits of NS's police force by using NS's loss and damage ratio to estimate those costs for the SARR. It would distort the SAC test to allow the DRR to slash security spending while still basing loss and damage expenses on a railroad that reduces those losses by funding an adequate police force.

pay below-market compensation for the SAC analysis period and then increase executive compensation at some point in the distant future.[105] Similarly, DuPont's unsupported assertion that its proposed outside director salary "will suffice" cannot stand against evidence that comparable director salaries at real-world railroads are more than four times higher than DuPont's proposal. DuPont Rebuttal Ex. III-D-1 at 56; *see* NS Reply III-D-171–172.

**Attrition.** DuPont ignores NS's calculation of a real-world attrition rate in favor of an absurdly low and unreasonable attrition rate of 1.8%—which logically requires that only one out of every 55 DRR employees would leave their job each year (and thus an absurdly unrealistic average tenure of 55 years). *See* DuPont Rebuttal Ex. III-D-1 at 66. As NS explained in its Reply Evidence, the number DuPont relied upon is actually the quit rate of a particular union and not a realistic indicator of overall attrition. *See* NS Reply III-D-153.

**RMI Implementation.** DuPont proposes an unsupported RMI implementation expense of $750,000. In its Reply Evidence, {{

}}. *See* NS Reply III-D-173–174. Despite NS's evidence, DuPont on Rebuttal proposed $4.5 million, ignoring {{ }} and providing no support for its invented amount. *See* DuPont Rebuttal Ex. III-D-1 at 59.

In short, NS has presented thorough, detailed, and well supported G&A evidence and demonstrated why DuPont's proposals are flawed and unsupported. DuPont's attempt on Rebuttal to use new benchmarks and make other, unsupported claims, assumptions, and arguments should be rejected by the Board.

### C. NS's Maintenance of Way Evidence Should Be Accepted.

DuPont's maintenance of way ("MOW") evidence proposes MOW staffing and spending levels dramatically below those of real-world railroads and far below the levels approved by the

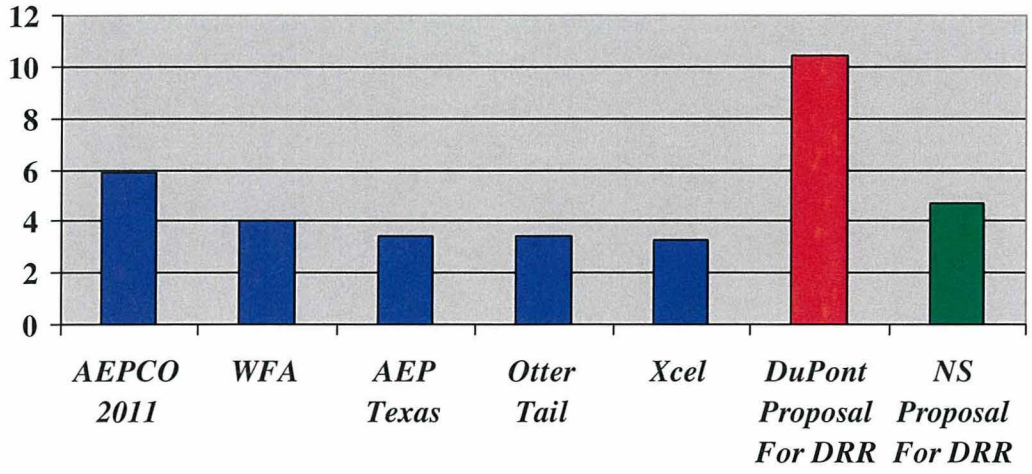
[105] And DuPont's assertion that a "startup" would not need to offer stock awards and other incentives (or their comparable value) is completely contradicted by real-world startups, where stock options are a major component in competitive compensation packages necessary to draw experienced executives to new companies.

Board in prior SAC cases. But DuPont has presented no evidence from which the Board could conclude that the DuPont MOW plan would be sufficient to maintain the DRR or that the Board's prior SAC decisions on MOW staffing were wrong. In contrast, NS's MOW evidence is reasonable, well-supported, and consistent with Board precedent. The Board should accept it as the best evidence of record.

### 1. DuPont has not Justified MOW Staffing and Expenses that are Dramatically Lower than the Levels Accepted in Prior SAC Cases.

While DuPont substantially altered its attempted justification for its MOW evidence between its Opening and Rebuttal, that alteration cannot rescue its evidence. On Opening, DuPont asserted that its MOW plan for the DRR should be accepted because it was "consistent with" the Board's approach in past SAC cases. *See, e.g.*, DuPont Opening I-70, III-D-22. NS's Reply proved that assertion simply is not true. DuPont actually proposed MOW staffing vastly lower on a track-mile basis than the Board has ever accepted. *See, e.g.*, NS Reply III-D-199 & Table III-D-50.

**Figure 3**
**Comparison of DuPont and NS MOW Staffing Proposals to Recent SAC Cases**
**Track Miles Per MOW Employee**[106]




[106] Source: NS Reply III-D-199 & Table III-D-50.

To take a few examples, on a track mile-to-MOW-employee basis DuPont's proposed MOW staffing is 57% the size of the MOW staff in *AEPCO 2011*, only 38% the size of the MOW staff in *WFA*, and just 33% the size of the MOW staffs in *AEP Texas* and *Otter Tail*. *Id.*

Faced with this evidence, DuPont's Rebuttal abandoned its false claim of consistency with past cases and instead claimed that the DRR's MOW workforce could be vastly more efficient than those of past SARRs because the DRR is larger than previous SARRs. DuPont Rebuttal Ex. III-D-2 at 10. But the only support DuPont provided for this conclusion is two anecdotes of the supposed staffing efficiencies it realized from designing a larger SARR, each of which falls apart on examination. DuPont first claimed that the DRR's size allowed it to have bigger-than-typical smoothing districts, but in fact DuPont's proposed smoothing districts are not any larger than the districts from recent SARRs.[107] And DuPont's other claim that the DRR's larger size allowed it to have more efficient divisional management is nonsense, for DuPont provided no staffing at the divisional management level. Indeed, no recent SAC case has included MOW divisional management, because the DRR is the first SARR large enough to require divisions.

Unable to advance any persuasive explanation for its massive cuts to MOW expenses, DuPont spent much of its Rebuttal accusing NS of presenting unreasonably high MOW expenses. First, DuPont accused NS of failing to account for the lower maintenance needs of newly built infrastructure. The glaring problem with this theory is that NS's evidence is consistent with—and in many ways more conservative than—staffing levels adopted by the Board in previous SAC cases. *See* NS Reply III-D-199 & Table III-D-50. The MOW staffs for those SARRs were designed for newly built railroads, too. The Board was not "gold-plating"

[107] *Compare* DuPont Rebuttal Ex. III-D-2 at 10 (claiming that DRR achieved efficiency by proposing 400-mile smoothing crew districts as opposed to smaller districts of "250 or 300 miles" necessary in earlier cases "due to the odd length of the system"); *with AEPCO 2011* at 70–71 (smoothing districts averaged 475 miles); *WFA I* at 59 (accepting a total of four surfacing crew members for a 391-mile SARR).

MOW staffing in these past cases—rather, it was simply recognizing that even a newly constructed SARR must provide sufficient staffing for its basic maintenance needs from Day 1.

Moreover, as NS explained on Reply and as the Board has repeatedly recognized, newly built track does not obviate the need for maintenance. Even brand-new railroads need significant maintenance from the outset because of the wear and tear of current operation. For example, in *Otter Tail* the Board rejected the argument that a SARR "could get by with a smaller MOW force because it would be a newer system and would therefore experience fewer maintenance problems," holding that the complainant had failed "to quantify the impact" of new construction on MOW needs. *Otter Tail* at C-20-21.[108] Here, too, DuPont has done nothing to quantify the supposed savings that the DRR would realize from being a newly-built railroad.[109]

Second, DuPont's claim that MOW expenses should be reduced because the SARR "has a 10 year life" betrays a basic misunderstanding of SAC theory. DuPont Rebuttal Ex III-D-2 at 7. The SARR is operated as a going concern, and it would defeat the purpose of the SAC test if DuPont could posit that the DRR would perform minimal maintenance for the first ten years and defer other maintenance to the future. This "going concern" principle is built into the Board's DCF analysis, which assumes that the SARR will exist in perpetuity. *See, e.g.*, *AEPCO 2011* at 134.[110] Indeed, DuPont's theory that the DRR can skimp on maintenance for ten years and then presumably "catch up" in the future is an impermissible cross-subsidy, for it assumes that future DRR shippers would bear the cost of the maintenance deferred during the SAC analysis period.

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[108] *See, e.g.*, *AEPCO 2011* at 66 (recognizing that "substantial welding work would be required from the outset" of a newly-built SARR); *AEP Texas* at 71 ("We cannot simply assume . . . that only minimal repairs would be required throughout the entire SAC analysis period").

[109] If anything, the fact that the DRR will be a newly built startup would likely cause more maintenance expense as the track structure settles and as the newly hired workforce acclimates itself to the DRR's territories. Although each of these factors would result in the DRR incurring more than the normalized expenditure levels in the early years of its operation, the SARR is not penalized for these real-world added startup costs.

[110] Because the DCF assumes that the SARR will exist in perpetuity, both the annual capital recovery pattern and the development of related operating expenses are normalized over the expected life of the SARR's assets.

Third, DuPont's claims that NS's MOW plan was designed to replicate NS's own staffing—or even that NS's MOW plan exceeded current NS staffing in favor of replicating "the staffing levels of the Southern Railway of the 1970s"—are demonstrably false. DuPont Rebuttal Ex. III-D-2 at 1–2. The NS MOW experts did not base their MOW plan for the DRR on NS's staffing. On the contrary, they conservatively assumed that the DRR's MOW workforce would be far more efficient than NS's own MOW workforce. While NS currently employs approximately one MOW employee for every 3.27 track-miles it maintains, the NS MOW experts assumed that the DRR could maintain its lines with approximately one employee for every five track miles. Put differently, the NS MOW experts assumed that DRR MOW personnel would be 33% more efficient than equivalent NS MOW personnel.

**Table 4**
**Comparison of Reply MOW Workforce for DRR and NS Actual Workforce**

| | NS Reply Proposal for DRR | NS Actuals |
|---|---|---|
| Track Miles[111] | 10,639 | 20,750 |
| MOW Staffing[112] | 2,133 | 6,341 |
| Track Miles Per MOW Employee | 4.99 | 3.27 |

In short, DuPont has failed to justify its extraordinarily low level of MOW expenditures, and its accusations that NS overstaffed the SARR are conclusively disproven by the fact that NS's MOW plan is consistent with past Board precedent and assumes significant efficiencies over the real-world NS.[113]

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[111] Track mile counts in Table 4 exclude yard tracks, as the Board did in *WFA I*. The source for the DRR mileage figures is NS Reply III-B-10; the source for the NS figures is NS's Annual R-1 Report for 2012 at 85.

[112] See NS Reply III-D-199 for DRR staffing count. The NS MOW staff count is the number of Group 300 (Maintenance of Way & Structures) employees listed in the 2012 NS Wage Form A. Table 4 understates NS's actual MOW workforce, because the Group 300 count does not include NS's MOW executives, managers, and officers; under STB rules those are Group 100 employees. *See* 49 C.F.R. § 1245.5. As a result, the gap between NS's actual MOW staffing and the DRR MOW staffing proposed in NS's Reply is even larger than shown by Table 4.

[113] One of the areas in which DuPont alleges inefficient NS staffing is bridge tenders, whom DuPont claims are unnecessary because the DRR "would provide for remote control of such bridges." DuPont Rebuttal Ex. III-D-2 at 33. But DuPont provided no costs for constructing or maintaining the remote control capability of movable bridges, and its assertion that it provided

### 2. DuPont's MOW Evidence Ignored Both Board Precedent and NS's Reply Evidence.

While space does not permit a full discussion of the many disputed MOW issues in this case, below NS briefly addresses two areas that drive much of the difference between the parties' positions: (1) DuPont's repeated departures from Board precedent; and (2) DuPont's refusal or inability to acknowledge or respond to detailed NS Reply Evidence.

**DuPont Repeatedly Ignored Board Precedent.** One of the reasons that DuPont's evidence is so inconsistent with overall MOW staffing and spending levels approved by the Board is that DuPont disregarded Board precedent in multiple MOW areas in an effort to make the math work. Litigants are free to propose different MOW staffing levels than those the Board has accepted in previous SAC cases, or to posit previously unrecognized reasons for improved SARR efficiencies. But litigants have to do so with actual, documented evidence—not mere assertions that the Board's previous decisions were wrong.[114] Here, DuPont advocated for sharp departures from prior Board decisions without either acknowledging those departures or providing evidence to support them.

For example, DuPont claimed that the DRR's Roadmaster districts could be vastly larger than anything the Board has previously accepted as reasonable, but did not explain how its SARR could be more efficient than past SARRs. In *AEPCO 2011* the Board rejected a complainant's claim that Roadmaster districts of 166.5 track miles were "wasteful" and accepted the railroad's evidence that districts of that size were reasonable. *See AEPCO 2011* at 66-67. DuPont's response to that decision was to propose districts even larger than the complainant proposed in *AEPCO 2011*, including obviously infeasible districts of 582 and 348 track miles.[115]

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for remote control on Opening is a fiction. Because DuPont has not accounted for the costs of operating movable bridges by remote control, bridge tenders are necessary. *See McCarty Farms*, 2 S.T.B., at 498 (including 48 bridge tenders in MOW staffing for SARR with 11 movable bridges).

[114] *See SAC Procedures*, 5 S.T.B. at 446 ("[T]he parties to SAC cases are cautioned not to attempt to relitigate issues that have been resolved in prior cases. Unless new evidence or different arguments are presented, we will adhere to precedent established in prior cases.").

[115] *See* NS Reply WP "Text Analysis of DuPont Track Workforce" at ¶ 8 (DuPont Roadmaster Territory 11 contains 581.75 main track miles, one main yard, and three other yards); *id.* at ¶ 9

But like the complainant in *AEPCO 2011*, DuPont has provided "no evidentiary support for larger Roadmaster districts," and as such its evidence must be rejected. *Id.*[116]

In many other areas, DuPont proposed MOW staffing and spending completely at odds with past Board decisions, without any effort to distinguish or even acknowledge that contrary precedent. For example, the Board has recognized in past cases that signal technicians are necessary complements to signal maintainers,[117] that SARRs need to have engineering and construction personnel,[118] and that increasing the number of Roadmasters requires increasing the number of other employees of Roadmaster teams[119]—all conclusions directly contrary to DuPont's assertions that the DRR would need no signals technicians or engineering personnel and that it was inappropriate for NS to size Roadmaster crews in a way consistent with the number of Roadmasters. DuPont similarly ignored Board precedents when calculating contracting costs, whether those precedents relate to the appropriate way to capitalize costs,[120] the prohibition against complainants assuming that maintenance could be deferred until after the

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(DuPont Roadmaster Territory 18 contains 348.55 miles of main track, one major yard, and four other yards). DuPont's Rebuttal did not alter the size of any of its Roadmaster territories.

[116] DuPont's only attempt to fill this evidentiary gap is an anecdote it offers on Rebuttal about an NS track crew that supposedly maintains a district consistent with the districts DuPont proposes for the DRR. But this anecdote is both improper Rebuttal and blatantly untrue. Specifically, DuPont claimed on Rebuttal that its MOW expert "is familiar with an NS track crew based at Savannah, GA [that operates as a] four-man crew cover[ing] approximately 125 mainline track miles." DuPont Rebuttal Ex. III-D-2 at 19. But in fact NS's Savannah track maintenance is supported by a 7 man track roster that maintains a territory of just 68.2 main line miles. (While DuPont's decision to wait until Rebuttal to raise its false claim prevented NS from including documentation of these facts in its Reply Evidence, NS will provide such documentation if the Board requests.)

[117] *See AEPCO 2011* at 73.

[118] *See CSXT/Duke*, 7 S.T.B. at 469; *NS/Duke*, 7 S.T.B. at 66; *McCarty Farms*, 2 S.T.B. at 496.

[119] The Board has long accepted the logical point that larger numbers of Roadmasters require correspondingly larger numbers of Roadmaster team members like roadway machine operators and roadway equipment mechanics. *See, e.g.*, *AEPCO 2011* at 70.

[120] For example, DuPont's position that rail grinding costs should be capitalized is contrary to both Board precedent and NS practices. *See AEPCO 2011* at 77; *WFA I* at 71; NS Reply III-D-250 n.463. And DuPont's claims about "NS's accounting position" on rail grinding capitalization completely ignore the evidence NS submitted on Reply about its actual accounting treatment of rail grinding. *See* NS Reply WP "Rail Grinding SEC Letter.pdf."

SAC analysis period,[121] or the basic rule that a complainant is not permitted to change positions on rebuttal.[122]

**DuPont Ignored NS's Detailed Evidence.** NS's MOW experts supported their opinions with several detailed studies of MOW expenses, including special studies on welding requirements[123] and on the average number of AAR units that could be maintained by a signal maintainer.[124] Rather than attempt to dispute these studies, DuPont pretended they did not exist—inexplicably claiming that NS's welding evidence was "unsupported opinion" and refusing to acknowledge NS's AAR signal unit study. *See* DuPont Rebuttal Ex. III-D-2 at 24, 28–29. DuPont's evidence on MOW contracting costs is plagued by similar flaws. It offers no meaningful response to NS's evidence that DuPont's evidence of MOW contracting costs misread NS discovery documents[125] and otherwise relied on incomplete or erroneous data.[126]

In the same vein, DuPont includes a lengthy single-spaced "appendix" primarily dedicated to repeating the mantra that each MOW position proposed by the NS MOW experts "was not justified by NS, nor substantiated with supporting evidence." DuPont Rebuttal Ex. III-D-2, Appendix A at 3. But DuPont cannot wish away the detailed support for NS's MOW evidence by pretending that it does not exist.[127] Indeed, as the party proposing a dramatic

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[121] *See, e.g.,* DuPont Rebuttal Ex. III-D-2 at 45 (claiming that DRR could defer shoulder ballast cleaning until after SAC analysis period).

[122] For example, DuPont's suggestion on Rebuttal that the DRR might not need to clean its yards annually cannot be squared with its proposal for annual yard cleaning on Opening. *See* DuPont Rebuttal Ex. III-D-2 at 40.

[123] *See* NS Reply III-D-217–218.

[124] *See id.* at III-D-227–228 & NS Reply WP "Signal Maintainer Productivity.xlsx."

[125] *See* NS Reply III-D-248 (showing that DuPont calculations of rail grinding contractor costs were based on out-of-pocket NS equipment expenses and did not include any labor costs).

[126] For example, DuPont's vegetation control expenses underestimated NS's expenses by including miles that NS does not maintain in the calculations; its yard cleaning expenses were disproven by a more detailed estimate from the very company DuPont cites for its own expense calculations; and its derailment expenses were predicated on use of a demonstrably incomplete data set. *See* NS Reply III-D-251–253; *id.* at III-D-260–262.

[127] The "justification" and "substantiation" that DuPont falsely claims was not provided by NS in fact was set forth in great detail in NS's Reply Evidence III-D-202–244 and in NS Reply workpaper "MOW Position Descriptions.pdf."

departure for Board precedent, it is DuPont's burden to show why its extraordinarily thin MOW staffing is superior evidence to a well-documented NS plan that is consistent with prior Board precedent. DuPont has not even begun to meet that burden, and as a result the Board should accept NS's Reply Evidence on MOW expenses as the best evidence of record.

**D. NS's Fringe Benefits Evidence Should Be Accepted.**

While both NS and DuPont agree that it is appropriate to estimate DRR fringe benefit expenses by using an average ratio of fringe benefits to total wages paid "to all railroad operating personnel *in the states* in which the DRR operates,"[128] only NS actually followed this approach. Rather than relying on the fringe benefits ratio of carriers in the geographic region of the DRR, DuPont instead relied upon a "national average" of the fringe benefit ratios of all the Class I railroads for the year 2009. Nevertheless, as NS demonstrated on Reply, DuPont's proposed fringe benefit ratio of 37.5% is lower than the fringe benefits ratios of all but one of the Class I railroads for that year and is irreconcilable with other data reported by the AAR. *See* NS Reply III-D-42–44 & Tables III-D-9 & 10. In addition to being factually inaccurate, DuPont's proposed fringe benefit ratio inappropriately cherry-picks a single year of data from the low point of the recession. NS's Reply Evidence corrects these errors by applying the average fringe benefit ratios of NS and CSXT—the two Class I railroads in the geographic area of the DRR—for the years 2009 through 2011, which results in a fringe benefit ratio of 49.2%. *See id.* at III-D-46.

DuPont's Rebuttal offers no defense of the flawed number it presented on Opening and no explanation for the glaring mathematical error described in NS's Reply. Instead, DuPont chooses to attack NS's proposed number with two meritless arguments. First, DuPont objects to NS's inclusion of CSXT in its average. But a NS/CSXT average ensures a DRR ratio based on railroads with similar geography to the DRR—an approach that is consistent both with Board precedent and with DuPont's purported desire to develop a fringe benefit ratio based on "the

[128] DuPont Opening III-D-11 (emphasis added).

states in which the DRR operates.[129] Indeed, a geographically-based approach is reasonable because both the cost of benefits and employee expectations about benefit packages can vary by region. Benefits for New Yorkers and benefits for Montanans do not cost the same.

Second, DuPont claims that NS should have only used 2009 fringe benefit data as opposed to a multi-year average. But "use of multi-year average is superior to using just a single year of data,"[130] particularly when the single year DuPont proposes to use is the extraordinary recession year of 2009. Among other things, the economic turmoil of 2009 likely affected employee 401(k) contribution rates, which in turn would affect railroad 401(k) matching expenses. Averaging the unusual 2009 year with more typical years smooths out any irregularities and provides a better guide as to what the DRR would actually have to spend on fringe benefits over the 10-year SAC analysis period. And DuPont's claim that NS's approach represents "a double-count of expenses" is nonsense, for NS is not averaging the total costs of benefits; it is averaging the relative percentages of benefits to wages. Using a more accurate view of average fringe benefit expenses does not "double-count" anything; it simply precludes DuPont from using an unusually low fringe benefit ratio to depress DRR operating expenses for the entire SAC analysis period.

Even if DuPont were correct, however, that a single-year snapshot is preferable to a multi-year average and that NS alone should be used in the calculations, NS's fringe benefit ratio for 2009 of 43.7% is well above DuPont's proposed ratio for the DRR. Thus, the fact remains that DuPont's proposed fringe benefit ratio is not supported by any data. And DuPont's last-ditch effort to justify its number by cherry-picking single-year BNSF and KCS fringe benefit ratios must be rejected. DuPont has presented no evidence that these western railroads are better proxies for DRR fringe benefit expenses than the eastern railroads. Indeed, having argued on

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[129] DuPont Opening III-D-11; *see also WFA I* at 66 (basing SARR fringe benefit ratio on ratio for all railroad employees in the state in which the SARR was located).

[130] *WFA I* at 55; *see also West Texas,* 1 S.T.B. at 713 ("Using data for a single year increases the risk that the single period is aberrational.").

Opening for using a fringe benefit ratio based on the states in which the DRR operates, DuPont cannot switch tactics on Rebuttal and justify its calculations by pointing to railroads that operate in entirely different parts of the country. *See SAC Procedures*, 5 S.T.B. at 446. In sum, NS's fringe benefit ratio of 49.2% is the only proposal that follows the approach agreed on by the parties and is the best evidence of record in this case.

### E. NS's Evidence on Leased Facility Payments Should Be Accepted.

NS's Reply made multiple corrections to DuPont's calculations of what it would cost the DRR to operate on segments it does not wholly own. *See* NS Reply III-C-143–147; III-D-268–275; NS Reply Exhibit III-C-6. While DuPont adopted nearly all of NS's changes on Rebuttal, it continues to calculate inappropriately the cost of DRR operations in Conrail Shared Asset Areas ("SAAs"). NS's Reply showed that the trackage rights agreement that DuPont used on Opening to estimate the costs of DRR operations in SAAs was not even a Conrail agreement, and NS proposed a different approach based on allocating the DRR 24% of NS's real-world payments to Conrail—a percentage that matched the percentage of NS SAA carloads that DuPont selected. *See* NS Reply Exhibit III-C-6 at 13; NS Reply III-D-271–272. In its Rebuttal DuPont adopts NS's approach of using real-world NS payments to Conrail, but claims that the DRR portion should be allocated on the basis of route miles, not carloads. NS's carload approach is superior to DuPont's route-mile approach {{

}} NS's approach also better accounts for the fact that the DRR would use some of the highest density segments in the SAAs. The Board should accept NS's evidence on this and all other remaining disputes relating to payments for leased facilities.

### F. NS's Multi-Year Insurance Average is a Better Guide to Realistic DRR Insurance Costs than DuPont's Cherry-Picked Single Year Number.

The parties' dispute as to insurance, and as to other issues like bad debt and travel expenses, centers on whether multi-year or single-year 2009 averages are better for modeling the DRR's expenses. NS consistently used multi-year averages to calculate expenses instead of a

single year's numbers, an approach that is especially appropriate in this case because 2009 was the low point of the recent economic recession. *See, e.g.*, NS Reply III-D-278 (using a multi-year average of insurance costs to avoid overstating any variables affecting a particular year).[131] NS did so because of the Board's preference for this approach. *See WFA I* at 55; *AEP Texas* at 107.

In comparison, DuPont's approach is entirely result-oriented. DuPont feigns outrage when NS proposes the use of multi-year averages, but DuPont itself uses multi-year averages when it likes the results. For example, DuPont embraced multi-year averages when calculating bad debt and external audit expenses because such averages produced lower expenses than 2009-only numbers. DuPont Rebuttal Ex. III-D-1 at 64-65, 69-70. Such a transparently outcome-driven approach should be rejected, and the Board should adopt NS's consistent approach of using multi-year averages as the best evidence for estimating DRR insurance costs, as well as other expenses such as fringe benefits, bad debt, and travel expenses.

### G. NS's Ad Valorem Tax Approach Properly Accounts for the Income Value of a Highly Efficient SARR.

NS's Reply Evidence showed that DuPont's approach of assigning the DRR a portion of NS's ad valorem taxes on a strict route-mile basis significantly understates the ad valorem taxes that would be actually assessed upon an optimally efficient SARR with a high income value. *See* NS Reply III-D-279–287. NS demonstrated both that most of the DRR states assess ad valorem taxes through a "unit value" approach and that a railroad's income value is the primary factor considered by these "unit value" states. *See id.* III-D-279–285. And NS set forth a simple, conservative approach by which the Board could estimate the ad valorem taxes the DRR would pay in "unit value" states. *See id.* III-D-286–287.

In its Rebuttal, DuPont did not dispute NS's evidence that most states would assess ad valorem taxes on the DRR based on its income value, and DuPont offered no substantive

[131] *See also* NS Reply III-D-45 (averaging fringe benefit ratios to avoid single year irregularities); NS Reply III-D-187 (applying a multi-year average of a third-party travel cost benchmark to avoid skewed results due to the recessionary year of 2009).

defense of its ad valorem approach except that it had been used by the Board before. Instead, DuPont primarily claims that NS's approach is "[i]ntuitively . . . suspect" because NS's evidence that the DRR would have a higher income valuation than NS is supposedly at odds with NS's evidence that the DRR's revenues would not exceed its operating expenses and capital requirements in the SAC analysis. DuPont Rebuttal III-D-66. But DuPont's "intuition" ignores the fact that a unit value analysis and a SAC analysis are measuring different things. While unit value states typically assess ad valorem taxes based on a railroad's net operating income alone, a SAC analysis measures not just gross profits, but also whether the railroad is earning a reasonable return. Thus there is nothing at all "suspect" about a railroad with operating income that makes it profitable for taxation purposes but that does not provide an adequate return to investors.[132]

Indeed, "intuition" provides strong evidence that DuPont's approach is wrong. DuPont claims that the DRR would be an extraordinarily profitable railroad—one that would claim 74% of NS's revenues with only a small fraction of NS's operating expenses—but that it would pay just 61% of the ad valorem taxes that NS paid in 2009.[133] In contrast, NS assumed that the DRR would operate at optimal (but realistic) efficiency, giving it a relatively higher income value than NS, but that the DRR would still pay less in ad valorem taxes than NS paid in the DRR States. NS's approach is a better approximation for the taxes that a least-cost, most-efficient DRR would pay in the real world in states that use railroad income value to assess property taxes, and the Board should adopt NS's ad valorem taxation evidence.[134]

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[132] NS paid substantial ad valorem taxes in 2009 despite being found to be revenue inadequate for that year. *See Railroad Revenue Adequacy, 2009 Determination*, STB Ex Parte No. 552 (Sub-No. 14) (Nov. 10, 2010).

[133] While NS paid {{ }} in ad valorem taxes in the 20 DRR states in 2009, DuPont claims that the DRR would pay just $56,874,229. *See* DuPont Rebuttal WP "DRR Ad Valorem Tax_Rebuttal.xlsx."

[134] DuPont also raises two technical complaints about NS's unit value calculations, neither of which has merit. First, DuPont quibbles that NS's unit value methodology is flawed because it uses an NROI number for NS that reflects the impact of taxes and deferred income tax but does not use an NROI for the DRR that accounts for those potential impacts. *See* DuPont Rebuttal III-D-67. But DuPont's alleged mismatch would have little effect, for the DRR would have no

## IV. NS'S EVIDENCE ON DRR REVENUES AND VOLUMES SHOULD BE ACCEPTED.

Although on Rebuttal DuPont reduced its claimed DRR revenues by $796 million, it continues to overstate those revenues by approximately $1 billion. NS's revenue evidence should be adopted because it is more accurate, more consistent with Board precedent, and better supported.

### A. The Board's Original ATC Formula is the Best and Most Appropriate Method for Allocating Cross-Over Revenues and Should be Applied in this Case.

#### 1. The ATC Rule Adopted in *Major Issues* Achieves the Board's Goals and Allocates Cross-Over Revenues in a Manner that is More Consistent with SAC Principles than the Modified Approach Advocated by DuPont.

The Board should apply the Average Total Cost ("ATC") rule it adopted in the *Major Issues* rulemaking to allocate cross-over traffic revenues in this case and should reject DuPont's effort to apply an amended revenue allocation approach that the Board experimented with in the *Western Fuels* case (the so-called "Modified ATC" approach). As a matter of law, original ATC is the only valid cross-over traffic revenue allocation methodology, adopted in a notice-and-comment rulemaking and judicially affirmed. *See* NS Reply III-A-85–86. In fact, original ATC has been the only valid method of allocating cross-over traffic revenue at all times relevant to DuPont's development of its case. *See* NS Reply III-A-86–90. The Modified ATC approach the Board applied in *Western Fuels* was an unsound *ad hoc* rule amendment and change in policy that was rejected by the D.C. Circuit. *See BNSF Ry. Co. v. Surface Transp. Bd.*, 604 F.3d 602 (D.C. Cir. 2010) NS was not a party to that case, had no opportunity to comment on the Board's

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income tax liability for the first three years of its operations. *See* NS Reply Ex. III-H-1 at 12. And even if the Board chose to use an NROI for NS that did not incorporate the effect of taxes, it could do so using the income valuation spreadsheet model provided in NS's workpapers. Second, DuPont complains about NS's supposed "use of the STB's cost of capital" in its calculations. *See* DuPont Rebuttal III-D-67. This is a pure red herring, for the STB's cost of capital is not a factor in NS's unit value modifier. While NS's workpaper included references to the cost of capital to help illustrate the valuation concept, those cells do not affect the unit value calculations. *See* NS Reply WP "DRR Ad Valorem Tax_Reply.xlsx," Tab "Modifer_Reply," Cells C17 and C24.

proposed modification to the ATC methodology, and is not bound in this case by case-specific adjustments made on an *ad hoc* basis in the *Western Fuels* case.[135]

As a matter of sound policy and economics, original ATC is logical, fair, and more consistent with SAC principles, including the Board's express intent in adopting a cross-over revenue allocation. *See* NS Reply III-A-116–122. As the Board has explained, "the goal in allocating revenue from cross-over traffic should be to ensure that a truncated SAC analysis using cross-over traffic will approximate the outcome of a full SAC analysis, which provides origin-to-destination service for the entire traffic group." *Major Issues* at 24. In order to accomplish that goal, the Board adopted a revenue allocation method—ATC—whose stated purpose was to allocate cross-over revenues "in proportion to the average total cost of the movement on– and off-SARR" *Major Issues* at 26; *see id* at 31 (ATC "meets the Board's stated goals of reflecting, to the extent practicable, the carrier's relative average costs of providing service over the two segments."). Allocating more cross-over revenues to the high density segment than its proportion of the average total cost of the full movement would defeat the goal of cross-over traffic revenue allocation and introduce bias to the SAC analysis.

The concern that led the Board to apply a revised version of ATC in the *Western Fuels* case—that in some circumstances ATC may allocate to the SARR revenues that do not cover the incumbent's variable costs on certain segments—is not consistent with the principles and policies animating its cross-over traffic revenue allocation rules. *See generally id.* at 24–26, 31–36; NS Reply III-A-106–108. A SAC complainant possesses full control over the design of its SARR, and sole discretion to select whatever traffic it desires. A complainant that, like DuPont, selects cross-over traffic pairing a high density on-SARR segment with a low-density off-SARR segment does so with its eyes open. *See* NS Reply III-A-116–117. Indeed, the reason a

[135] Moreover, because "Modified ATC" sought to amend in an individual adjudication a legislative rule adopted in notice-and-comment rulemaking, the attempted amendment violates the Administrative Procedure Act ("APA") and therefore is invalid and unenforceable. *See* NS Reply III-A-90–115. The Board's failure to conduct the notice-and-comment rulemaking required to amend its ATC rule renders "Modified ATC" invalid.

complainant selects cross-over traffic (like any other selected traffic) is its judgment that the selected traffic generates more net revenue for the SARR—after allocating revenues between the SARR and the residual incumbent—than the SARR would generate without that traffic.[136] Tellingly, DuPont does not claim that ATC renders any DRR cross-over traffic unprofitable, only that it is not as profitable as DuPont wishes. There is nothing unfair or illogical about applying a revenue allocation method that apportions revenues in accordance with the Board's stated goals, was adopted pursuant to notice-and-comment rulemaking, and was affirmed on appeal. To the contrary, it would be unfair, illogical, and unlawful to do otherwise.

DuPont used Modified ATC—which was not the law when DuPont filed its evidence and is not the lawfully established rule today—to allocate cross-over revenues in its Opening Evidence. On Rebuttal, DuPont mounted a collateral attack on *Major Issues*, claiming that original ATC and Alternate ATC are "biased and demonstrably inferior" to Modified ATC applied in *WFA*. *See* DuPont Rebuttal III-A-46.[137] Unlike the *ad hoc* approach applied in *WFA*,

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[136] The fact that a SARR's revenue division for an individual cross-over movement may not cover the incumbent carrier's system average URCS variable costs does *not* mean that traffic makes no contribution to SARR fixed costs. Because the SARR is designed to be least cost and optimally efficient, its variable costs for a given segment are substantially lower than the incumbent's system average URCS variable costs. Proof of this is the fact that the through revenues for fully fourteen percent of the SARR traffic that DuPont selected would not cover NS's URCS variable costs. *See* NS Reply III-A-120. Thus, if DRR revenues for that cross-over traffic were allocated in the same manner and proportion they would be if DuPont had modeled the entire movement as part of its SAC presentation, the revenue generated by those movements would be insufficient to cover the URCS variable costs of that movement. *See Major Issues* at 25 ("[T]he goal in allocating revenue from cross-over traffic should be to ensure that a truncated SAC analysis using cross-over traffic will approximate the outcome of a full SAC analysis which provides origin-to-destination service for the entire traffic group."); *id.* at 35 ("A successful allocation of cross-over revenues would produce the same revenue-to-cost relationship as would be produced if the complainant modeled the entire movement."). Plainly, neither DuPont nor any other complainant would select as SARR traffic movements that make no contribution to SARR fixed costs.

[137] The Board has proposed, in a pending rulemaking, to amend the ATC rule and revise its revenue allocation methodology. *See Rate Regulation Reforms,* Ex Parte 715, at 17-18. NS believes that "original" ATC is more consistent with SAC principles, Board precedents, and the Board's stated goals in adopting the ATC rule in *Major Issues.* Therefore, the ATC method is superior to the revised method the Board has proposed in *Rate Regulation Reforms.* However, the revised method proposed in Ex Parte 715 is superior to the "modified ATC" approach applied in *Western Fuels*, because the proposed revision would be considerably more consistent with SAC principles and precedents than the Modified ATC approach applied in that individual

however, ATC was adopted after full notice-and-comment rulemaking and affirmed on appeal. DuPont and its representatives had ample opportunity to address ATC in that process, and its belated criticisms on Rebuttal are an impermissible collateral attack on the ATC rule that should not be considered in this case. *See E.I. DuPont de Nemours and Co. v. CSX Transp. Inc.*, STB Docket No. 42099, at 1 (decided June 27, 2008) ("CSXT seeks to relitigate various methodological issues related to the application of the Three-Benchmark approach … those arguments were presented and rejected in *Simplified Standards.* CSXT may not collaterally attack *Simplified Standards* in this proceeding.").[138]

### 2. DuPont's Arguments and Examples Fail to Show that Modified ATC Is Superior to Original ATC.

Even if the Board were to consider DuPont's arguments in support of Modified ATC, those arguments would be unavailing. DuPont's core complaint is that, on a per-car basis, ATC allocates proportionally more revenue to lighter-density lines. But this is not an unintended side effect of ATC; it is a central purpose of the ATC methodology as adopted. The Board clearly stated that the purpose of its ATC rule was to allocate cross-over revenues "in proportion to the average total cost of the movement on– and off-SARR" *Major Issues* at 26; *see id.* at 31. No amount of misdirection and obfuscation by DuPont should divert the Board from two crucial, dispositive points. First, the Board's aim and intention in adopting the ATC rule—based on a thorough rulemaking and record—was to allocate cross-over traffic revenues in accordance with the relative *total* costs of the on-SARR and off-SARR segments. *See id.* at 31 (adopting ATC based on finding that ATC methodology meets Board's goal of "reflecting . . . the carrier's

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adjudication. DuPont's Rebuttal refers to the amended version of ATC proposed in the *Rate Regulation Reforms* rulemaking as "Alternate ATC." To reduce confusion, NS will use the same term to refer to the amended cross-over revenue rule proposed in *Rate Regulation Reforms*. If the Board were to apply a method other than ATC to allocate cross-over revenues in this case, Alternate ATC would be far superior to Modified ATC.

[138] Developments during the course of this case further undermined the Modified ATC approach applied in *Western Fuels. See* NS Reply III-A-122–124. In *Rate Regulation Reforms*, the Board acknowledged that the Modified ATC is inferior, and proposed Alternate ATC, which more closely conforms to original ATC than Modified ATC. Ex Parte 715 at 16-17; *see Western Fuels* at 13-14.

relative average costs of providing service over the two segments."). Second, the Board directly considered—and flatly rejected—the premise of DuPont's argument: that ATC allocates proportionally more revenues to lower density segments. *Id.* at 27, 35-36.

DuPont's Rebuttal included some hypothetical examples that attempt to support its claim that Modified ATC better allocates cross-over revenue than original ATC. But review of DuPont's examples and arguments reveals the fallacy of its objections and demonstrates that Modified ATC would be inconsistent with *Major Issues* and the Board's objectives in allowing cross-over traffic and allocating revenues generated by that traffic.

First, the "per-unit" measure of profits that DuPont uses to compare ATC and Modified ATC allocations is both irrelevant and misleading. DuPont's comparison of profits per ton considers each individual movement (or car) in isolation, ignoring the effects of greater traffic volume (*i.e.* greater density) on the overall profits generated by a segment. A profit-maximizing entity such as a SARR does not focus on the relative contribution of any single unit, but rather on the overall profit generated by the provision of a good or service, *i.e.,* the sum of all revenues less total costs for that activity.[139] Thus, contrary to DuPont's assertion, it is entirely "logical" for a SARR to move any traffic that generates a positive contribution—comparison of the per-unit profit generated by any given unit on another carrier (here the residual incumbent) is irrelevant.

To the extent profit has any relevance to a review of a cost-based allocation of cross-over revenue, the appropriate comparison would be of the total profit generated by all traffic on each of the on-SARR and off-SARR segments. It is indisputable that the higher density segment traversed by cross-over traffic generates more total profit than the lower density segment of the same movement under original ATC as well as Alternate ATC. The fact that a lower density

[139] The profit-maximizing SARR would move any and all available traffic that generates sufficient revenue to contribute to fixed costs, regardless of the marginal amount of any given movement, car, or ton, because every marginal unit increases overall profit (or contributes to fixed costs).

segment of a cross-over movement must cover its attributable costs just like the higher density segment is the reason the Board allocates cross-over revenues in accordance with average total costs. Allocation of revenues in a manner that would result in higher per-unit profit for high-density segments, as DuPont advocates, would prevent the low-density segment from sharing equally in the recovery of the movement's total costs. That, in turn, would systematically defeat the purpose of allowing cross-over traffic—to allow a simplified truncated analysis that replicates the result of full SAC modeling of a movement *without introducing bias*. *See, e.g., Major Issues* at 24. The approach DuPont urges would systematically bias the SAC analysis in favor of complainants using cross-over traffic by allocating more revenue (and profit) to the on-SARR segment than the segment would generate had the complainant modeled the full movement in its SAC presentation.

Second, DuPont erroneously asserts that a revenue division method that allocates more revenue to a lower density segment is "absurd" and "illogical." As demonstrated, allocation of relatively greater revenues to lower density segments is not only logical, it is the *purpose* of ATC and the inevitable result of allocating revenues in accordance with relative average total costs. Because lower density lines have higher relative total costs, a formula that allocates revenues in accordance with relative total costs necessarily allocates proportionally more revenue to lower density segments. But DuPont's Rebuttal examples and arguments make clear that its position is that the goal of revenue allocation for cross-over traffic should be something else: to "maximize profit" on the higher density segments that are replicated by the SARR. As DuPont summarizes its position,

> [o]riginal and Alternate ATC transfer the profitability associated with traffic moving on high-density lines to traffic moving on low-density lines, in effect robbing the high-density lines of the very scale economies that incented the railroads to invest in capacity enhancements on those high-density lines in the first place.[140]

[140] DuPont Rebuttal III-A-50. As demonstrated, DuPont's examples and arguments consistently use an erroneous and misleading measure of profits per unit rather than overall profits when comparing the profits attributed to high-density and low-density lines. *See supra* at 84-85.

DuPont thus seeks to discard the Board's goal in allocating cross-over revenues—to apportion revenues in accordance with the incumbent carrier's relative average costs of providing service over the two segments. *See Major Issues* at 24-35. Moreover, it is *DuPont* that seeks to effect a "transfer" of revenues—from the lower density segment to the higher density segment—that would not be possible if it modeled the movements from origin to destination. *Cf. id.* at 35 (cross-over revenue allocation should "produce the same revenue-to-cost relationship as would be produced if the complainant modeled the entire movement.). The Board has repeatedly made clear it will not allow crossover traffic to be used to distort the SAC analysis and results. *See, e.g., Major Issues* at 24; *Rate Regulation Reforms* at 16-17 (proposing to limit permissible cross-over traffic in order to eliminate distortion of SAC analysis resulting from allocation of "more revenue to the facilities replicated by the SARR than is warranted").

Moreover, the Board directly addressed in *Major Issues* the very objection that DuPont seeks to relitigate in this case—that ATC would allocate lower revenue to higher-density lines. During the rulemaking, commenters objected to the Board's ATC proposal because in their view it would "allocate disproportionate shares of SARR revenues to lower density" lines. *Major Issues* at 27. The Board expressly and unequivocally rejected this objection, stating:

> the goal of allowing cross-over traffic is to simplify the analysis without introducing bias. A successful allocation of cross-over revenues would produce the same revenue-to-cost relationship as would be produced if the complainant modeled the entire movement. Rather than arbitrarily allocating revenue to low-density lines, the ATC method more accurately is keyed to the defendant carrier's relative costs of providing service over the two segments.[141]

As the Board further noted, it was ironic that the same shippers who raised this objection had also complained that it was difficult for shippers located on light density lines to make a successful SAC presentation. As the Board noted, one reason for this difficulty was that prior revenue allocation methods did not adequately reflect the higher average total cost to construct and operate some of those lines. It is indisputable that the Board considered and rejected

[141] *See id.* at 35.

DuPont's core objection in *Major Issues*. DuPont's self-serving arguments and examples provide no reason for the Board to revisit the same argument in this adjudication, let alone to abandon the sound ATC rule adopted in the *Major Issues* rulemaking.

Third, DuPont's hypothetical examples err by comparing absolute dollar profits, rather than profit margins (percentages), for the high-density and low-density segments of a cross-over movement. Calculation of the profit margins shows that both ATC and Alternative ATC do not "transfer" profitability to a low-density segment as DuPont claims, but rather maintain equal profit margins for the two segments. The per-ton "profit" measured in absolute dollars per ton is higher for the low-density segment (under either original ATC or Alternate ATC) because the *costs* per ton are higher on that segment. This is entirely consistent with the Board's stated goal of dividing revenue in a manner that reflects the relative costs of providing service on each segment. Table 5 below shows the profit margins for the segments in DuPont's example in Rebuttal Table III-A-12. For that movement, original ATC and Alternate ATC would assign revenues in a manner that properly reflects the relative costs, resulting in the same profit margin for the low-density and high-density segments. By contrast, the higher profit margins that Modified ATC would allocate to the high-density segment demonstrate that approach would produce disproportionately higher revenues, and profits, for the high-density segment.

**Table 5**
**Comparison of Revenue Division Methodologies,**
**DuPont Rebuttal Table III-A-12**

| | Original and Alternate ATC | | Modified ATC | |
|---|---|---|---|---|
| | High-Density Segment | Low-Density Segment | High-Density Segment | Low-Density Segment |
| Total Costs per Ton | $6.25 | $7.50 | $6.25 | $7.50 |
| Revenue Division per Ton | $10.00 | $12.00 | $10.45 | $11.55 |
| Profit per Ton | $3.75 | $4.50 | $4.20 | $4.05 |
| Profit Margin | **37.5%** | **37.5%** | **40.2%** | **35.1%** |

DuPont also constructed other hypothetical examples purporting to illustrate "substantial problems" with original and Alternate ATC by comparing R/VC ratios for movements across segments of different densities. These examples are irrelevant because they rely entirely on revenue-to-*variable* cost ratios, a measure that the Board has flatly rejected as "fail[ing] to take into account the defining characteristic of the railroad industry–economies of scale, scope, and density." *Major Issues* at 25. Accordingly, *Major Issues* held that cross-over revenues are to be allocated based on *total* costs, *not* variable costs. Thus, DuPont's comparison of R/VC ratios, even if it were otherwise accurate for the hypothetical set of costs and revenues posited by DuPont, is irrelevant. ATC was never intended to generate equal R/VC ratios for segments of different densities. DuPont's R/VC comparison is a red herring, designed to divert attention from the fact that original ATC does precisely what the Board correctly intended, namely allocating cross-over revenue in accordance with each segment's relative average total cost.

### B. DuPont Failed to Account for TCS/TDIS Costs while Taking the Revenues for Associated Intermodal Traffic.

DuPont's approach to revenues earned by Triple Crown Service ("TCS") and Thoroughbred Direct Intermodal Services ("TDIS") would violate fundamental SAC principles, Board precedent, and basic economic principles. DuPont overstated SARR revenues in its Opening Evidence by $168 million by impermissibly including revenues earned by TCS and TDIS without constructing the necessary infrastructure or providing for the operations and corresponding expenses. On Rebuttal, DuPont continued to ignore entirely the construction of necessary facilities and operations and merely subtracted some TCS and TDIS operations costs from DRR revenues. Accordingly, the TCS and TDIS revenues DuPont included in its SAC presentation should be excluded from the analysis. *See* NS Reply III-A-63. In addition, by attributing to the DRR revenues that do not share facilities with the issue traffic, DuPont's approach creates an impermissible cross-subsidy. *See* NS Reply III-A-64–65.

Moreover, DuPont's Rebuttal approach is flawed for several other reasons. First, DuPont failed to subtract all of the operating costs associated with providing Triple Crown service. TCS

and TDIS revenues were $375.5 million in 2010. The accounts payable for both of these businesses totaled $362.4 million. *See* DuPont Rebuttal WP "TCS TDIS AP Summary Reb.xlsx." That leaves a $13.1 million contribution, far lower than the $82.3 million that DuPont's Rebuttal calculations assume. The reason for the difference is that DuPont deducted only a portion of the TCS and TDIS payables from the DRR's revenues. Second, even if DuPont had subtracted all of the relevant costs, its approach erroneously allocated all of the TCS/TDIS contribution to the DRR and none to NS. The compound result of those two errors alone would be a substantial overstatement of DRR net revenues. Third, DuPont completely ignored the costs of necessary capital investments. NS highlighted the effect of this oversight using the example of TCS equipment with a book value of over $200 million. *See* NS Reply III-A-63. On Rebuttal, DuPont continued to ignore these necessary investment costs. DuPont's TCS and TDIS revenue evidence must be rejected because it failed to account for the capital investment and expenses that would be necessary to generate that revenue.

### C. DuPont Used Inflated Growth Rates for Later-Year Volumes on the SARR, Thereby Overstating Future SARR Volumes and Revenues.

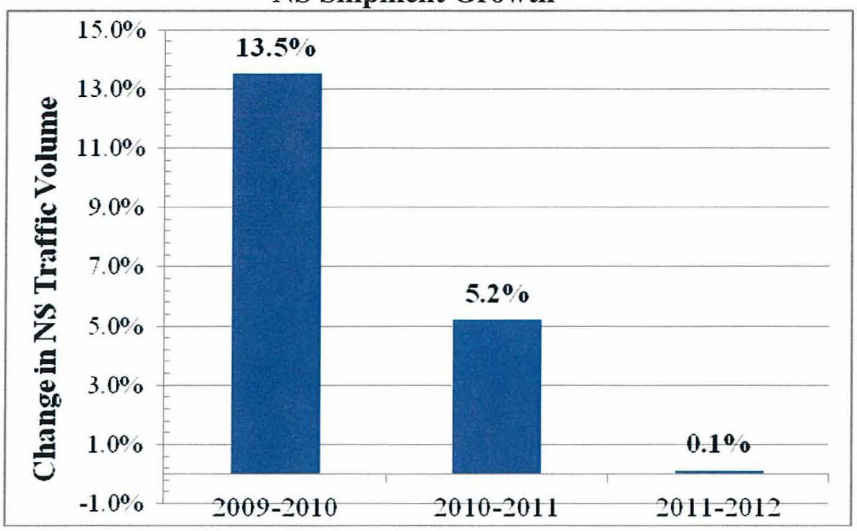
#### 1. Non-Coal Volumes

DuPont used inflated growth rates to project DRR traffic volumes, thereby overstating future DRR revenues. On Opening, DuPont fabricated a compound annual growth rate ("CAGR") approach to forecast DRR traffic volumes in years 2016-19. The sole rationale for this novel and unprecedented approach offered by DuPont on Opening consisted of a cryptic 3-word footnote, "*See AEPCO* at 23." *See* DuPont Opening III-A-9, n.13. As NS showed, the *AEPCO 2011* decision DuPont cited in no way endorsed a CAGR approach. *See* NS Reply III-A-52–53 & n.47. As NS further demonstrated, DuPont's unprecedented approach would distort future DRR traffic volumes by using as a starting point the historically low volumes NS experienced at the bottom of the Great Recession (in 2009) to generate an overstated long term growth rate. *See* NS Reply III-A-52. Rejecting DuPont's unprecedented and distorting approach, NS instead adopted the approach that the Board actually used in *AEPCO 2011* for

consumer and industrial traffic—using the growth rates in the final year of the defendant carrier's forecast to project future non-coal traffic volumes.

On Rebuttal, DuPont abandoned its reliance on *AEPCO 2011*, failing even to mention that decision, let alone attempt to show how it might justify DuPont's unprecedented "CAGR" device. Instead, DuPont claimed that its approach would "smooth out" annual variations in coal growth projections. But DuPont's manipulative approach actually does the opposite—it locks in for later years the anomalous rapid volume growth that occurred in the recovery from the deepest recession in 75 years. The erroneous assumption at the heart of DuPont's unprecedented CAGR approach is that the robust growth rates experienced as NS traffic levels bounced back from the anomalous low levels of 2009 would continue at the same rate over the long term. As NS explained, this assumption is fallacious and unsupported, and caused DuPont's evidence to substantially overstate future DRR traffic volumes. Table 6 below shows NS's traffic volume growth rate in 2009-2010, 2010-2011, and 2011-2012, demonstrating that the rate of growth has actually slowed during that period. The Board should reject DuPont's improper attempt to manipulate the data and should adopt NS's precedent-backed volume forecasts for non-coal traffic.

**Figure 6**
**NS Shipment Growth**[142]




### 2. Coal Volumes

DuPont also attempts to apply its unprecedented CAGR approach for later year coal volumes, in violation of the Board's established practice of applying EIA forecasts for years not covered by a carrier's internal coal forecasts.[143] *See* NS Reply III-A-3. EIA coal forecasts, which the Board prefers because they are generated by a neutral government agency, cover the entire DCF period and require no extrapolation or manipulation. The use of an actual forecast rather than a distorting extrapolation like DuPont's CAGR is especially important in this case because of the significant further decline in Central Appalachian (CAPP) coal volumes forecast through 2019, which would not fully be captured by DuPont's CAGR approach.

DuPont also argues against a region-specific application of the EIA forecast in favor of an inherently less precise, undifferentiated overall forecast for coal volumes from all regions. DuPont's Rebuttal Table III-A-9 purports to show that the coal traffic mix in the aggregated NS forecast is comparable to the DRR traffic mix, but that table combines CAPP and Northern

[142] Source: NS 10-Ks for 2009-2012.

[143] DuPont relies on NS's internal forecast growth rates rather than EIA forecasts for 2013-15 even though it uses EIA for 2010-12. There is little material difference in the internal forecast growth rates and EIA for those years, but the Board should adopt NS's use of EIA to remain consistent.

Appalachian (NAPP) regions' coal volumes together, neglecting the fact that the primary difference between the two traffic sets is their respective proportions of coal traffic from those two separate regions.[144] The CAPP region accounts for a higher percentage of coal on the DRR than on the real-world NS system (44.4% of DRR coal vs. 37.7% in the internal NS forecasts).[145] Because the EIA forecasts CAPP coal volumes to *decline* by 45% between 2010 and 2019, while projecting 30% *growth* in NAPP volumes during that same period, it is critical to an accurate forecast of the DRR's traffic to apply the EIA volume projections by region.

For these reasons, the Board should follow the more precise approach presented by NS and adopt the DRR coal volumes set forth in NS's Reply Evidence.

### D. DuPont's New Revenue Reallocation for Reroutes is both Erroneous and Impermissible Rebuttal that Should not be Considered.

DuPont made a major error in calculating off-SARR mileages in its Opening Evidence. That error skewed its cross-over traffic revenue allocations and as a result overstated DRR revenue in 2010 by more than $400 million. While DuPont agreed on Rebuttal that it made the error NS identified, it complained about the process NS used to correct DuPont's error and made baseless claims that NS's Reply workpapers were not adequately explained. *See* DuPont Rebuttal III-A-40. Despite all of DuPont's bluster and misdirection on Rebuttal, the parties' final variable cost calculations for non-rerouted cross-over traffic are quite similar. DRR variable costs that DuPont calculated are barely one percent different from NS's calculations of the same costs for cross-over traffic that DuPont did not re-route.[146] However for re-routed

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[144] Because significantly more of the traffic selected by DuPont for the DRR consists of CAPP origin coal than the proportion of NS coal traffic represented by CAPP coal, failure to apply the EIA's region-specific forecasts (which project NAPP volumes to increase substantially and CAPP volumes to decrease substantially) increases the overstatement of DRR coal volumes caused by DuPont's unprecedented use of a "CAGR" using the bottom of the Great Recession as its starting point.

[145] *See* DuPont Rebuttal WP "DuPont Summary of NS Internal Coal Forecast by EIA Region - Rebuttal.xlsx."

[146] Compare NS Reply WP "DRR_2010_TRAFFIC_ATC_OPENING_v1_041412 Reply.xlsx" and DuPont Rebuttal WP "DRR_2010_TRAFFIC_ATC_REBUTTAL_v3.xlsx." Most of the remaining difference is due to the treatment of missing waybill data, as discussed below.

cross-over traffic, DuPont seeks on Rebuttal to introduce a new methodology that would erroneously reallocate costs from the residual NS to the DRR and thereby over-allocate cross-over traffic revenue to the DRR. This impermissible rebuttal should be rejected without further consideartion, because it should have been presented on Opening. *SAC Procedures*, 5 S.T.B. at 446; *Xcel*, STB Docket No. 42057, at 2 (served April 4, 2003).

DuPont's assertion that NS's Reply Evidence (correcting DuPont's admitted error) was inadequately explained is both without merit and disingenuous. DuPont claims that NS's sole description of the correction consisted of only four words in its Reply narrative.[147] That assertion is false. To the contrary, NS's Reply narrative contained five full pages that detailed the erroneous steps in DuPont's Opening Evidence that NS corrected. *See* NS Reply III-A-79–83. Morever, NS provided as workpapers the SQL scripts NS used to create waybill summaries with corrected miles.[148] It is readily apparent that NS then used those corrected mileages in its ATC and URCS costing spreadsheets.

DuPont's claim that it expended significant time to understand NS's correction of the errors in DuPont's own process is baffling. NS used DuPont's own process and simply corrected a single erroneous step. While DuPont's unneccessarily complex "15-step process" made it difficult for NS to identify the source of the error, the necessary correction of that error, on the other hand, was very simple. As NS explained on Reply (and as shown in the SQL scripts) where DuPont failed to sum miles for line segments that had no SARR miles, NS simply altered the query to *include* line segments where "best_drr_ind" equaled zero.[149] NS did not need to re-run all 15 steps; it only had to correct the mileage calculations in Step 8 of DuPont's own process and then re-run DuPont's same calculations using those corrected mileages.

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[147] DuPont claims that the only explanation was that NS corrected "the off-SARR mileage algorithm." *See* DuPont Rebuttal III-A-39.

[148] *See* NS Reply WP "NS ATC SQL Scripts.xlsx," Tab "2010 ATC 272K Summary."

[149] *See* NS Reply WP "NS ATC SQL Scripts.xlsx," Tab "2010 ATC 272K Summary."

DuPont further asserts that NS's workpapers were "not appropriately linked" and "devoid of active formulae." DuPont Rebuttal III-A-40. This claim is incorrect, unsupported, and intentionally misleading. First, DuPont fails to cite a single NS workpaper in support of its broad accusation. Second, while DuPont complains that some NS workpapers were "range-valued," this practice is commonly followed by SAC complainants and defendants where spreadsheets are extremely large. Indeed, DuPont's own Opening workpapers in this case were commonly range-valued and not linked. For example, DuPont's own ATC workpapers are not linked to one another and many of the cells are range-valued.[150] If the Board were going to reject all range-valued spreadsheets, DuPont's entire SAC presentation and evidence would collapse on that ground alone. NS chose not to complain about the complexity and difficulty of managing the myriad traffic and revenue spreadsheets that DuPont presented on Opening, and NS simply submitted modified versions of these same spreadsheets on Reply. Due to the size of the spreadsheets DuPont itself created (as large as 305 MB), linking the larger spreadsheets would have made them nearly inoperable. DuPont knows this, and its complaints about portions of spreadsheets being "range-valued" are disingenuous and without merit.

The Board should accept NS's corrected mileages and ATC calculations (and workpapers) because DuPont's Rebuttal approach constitutes impermissible new evidence on Rebuttal and in any event is fatally flawed. In its Opening ATC workpapers, DuPont assigned to the DRR 100% of the NS revenues for rerouted cross-over traffic, even though many of the re-routed moves (*e.g.*, those terminating in Norfolk) clearly did not travel exclusively on the DRR. Thus, for purposes of revenue allocation, DuPont's approach did not treat re-routed cross-over traffic as cross-over traffic at all; it treated that traffic as entirely "local" to the DRR. NS pointed out this manifest error and failure to allocate any revenues for that cross-over traffic on Reply and corrected DuPont's error. *See* NS Reply III-A-82–83.

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[150] *See* DuPont Rebuttal WPs "DRR_2010_TRAFFIC_ATC_REBUTTAL_v3.xlsx;" "DRR_TRAFFIC_2010_BATCH_FOR_ATC_P3_COSTING_FIXED.xlsx;" "DUPONT_ATC_URCS_VARIABLE_COST_INPUTS_2010_FIXED_REBUTTAL.xlsx."

Because DuPont utterly failed to allocate revenue between the DRR and the residual incumbent for re-routed cross over traffic, on Reply NS was required to create a methodology to cost those movements as cross-over traffic as a necessary prerequisite to allocating those cross-over revenues. DuPont's mileage algorithms rely upon actual NS routings, so its mileage calculations for segments rerouted from the NS route of movement to the DRR lines treated those re-routed segments as off-SARR. But as a result of re-routing, those segments would be on-SARR. To properly account for the re-routing, the re-routed miles must be shifted from the NS route of movement to the SARR lines before the movements can be accurately costed. Accordingly, NS modified the URCS inputs to shift the rerouted mileages to the DRR, so that the DRR variable costs would reflect the routings that DuPont selected. *See* NS Reply III-A-83.

On Rebuttal, rather than adjusting the mileages to allow proper costing of the re-routed cross-over movements in URCS, DuPont introduced an entirely new and different methodology that would allocate off-SARR fixed costs and off-SARR variable costs to the SARR based on a prorated amount of re-routed miles. *See* DuPont Rebuttal WP "DRR_2010_TRAFFIC_ATC_REBUTTAL_v3.xlsx." DuPont should have allocated revenue on Opening where it was obliged to present its full case-in-chief. Rebuttal is too late for DuPont to present a methodology for the first time and the Board should not consider this impermissible Rebuttal. *See SAC Procedures*, 5 S.T.B at 446; *Xcel.* DuPont's Opening Evidence and methodology failed to allocate cross-over traffic revenues. NS corrected that error using a method that appropriately calculates mileages and determines the relevant URCS costs. Having failed to present evidence regarding a necessary component of its case-in-chief on Opening, DuPont is foreclosed from attempting to fix that deficiency on rebuttal by substituting a new methodology. *See Xcel*, STB Docket No. 42057 (served April 4, 2003) at 2;[151] *see also IPA* at 3

[151] *See id.* at 2 ("We are increasingly troubled by the submission of incomplete or erroneous evidence on opening in a SAC case and a complainant's reliance upon an opportunity to address deficiencies through later evidentiary submissions, to which the defendant has no opportunity to respond. The interests of fairness and orderly handling of a case dictate that parties submit their best evidence on opening, so that each party has a fair opportunity to reply to the other's evidence. Moreover, later changes to the complainant's case-in-chief complicate our review of

("[T]to be successful in a petition to supplement its case, a shipper must show, *inter alia*, that 'the material sought to be introduced . . . could not reasonably have been introduced earlier.'" (internal citations omitted)).

Even if the Board were to consider DuPont's newly minted Rebuttal methodology—which it should not—the new methodology DuPont proffers is erroneous on its merits because it allocates too much cost and hence too much cross-over revenue to the DRR. The off-SARR costs that DuPont's new method shifts to the SARR are generally higher than on-SARR costs, so shifting those costs based on relative miles distorts the ATC revenue allocation. Fixed costs are typically higher on the off-SARR segments because DuPont chose not to include in the DRR network the lower density lines on the edges of the NS network. Further, variable costs on off-SARR segments are also higher than on the on-SARR segment in those numerous instances in which DuPont assumed the residual NS would originate or terminate the traffic, or both. DuPont should not be permitted to shift a portion of the incumbent's Origination and/or Termination credits to the DRR under its new-found mileage-based prorate approach.[152]

Finally, as NS explained on Reply, in cases where waybill data were missing (either raw waybill data and DuPont's calculated miles or fixed costs), NS used averages for certain URCS inputs so that the moves could be costed and run through ATC. *See* NS Reply III-A-83. This is not an issue of "reward(ing)" or punishing one party or another, as DuPont claims on Rebuttal, but rather of using the approach that yields the most accurate results. NS's approach of fixing the URCS inputs produces more accurate results than DuPont's approach of simply applying an

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the evidence and impede our efforts to handle these cases in an orderly and timely manner. Thus, it is important that parties make their case-in-chief in their opening evidence."); *see also SAC Procedures,* 5 S.T.B. at 445-46; *Duke/CSXT*, 7 S.T.B. at 415-16.

[152] The proper allocation of cross-over traffic costs to the SARR and the residual incumbent does not depend on whether the Board chooses to apply original ATC, the "modified ATC" approach, Alternative ATC as proposed in *Rate Regulation Reforms,* or another cost-based cross-over traffic revenue allocation method. Accurate and coherent application of all such methods requires accurate cost allocation in the first instance.

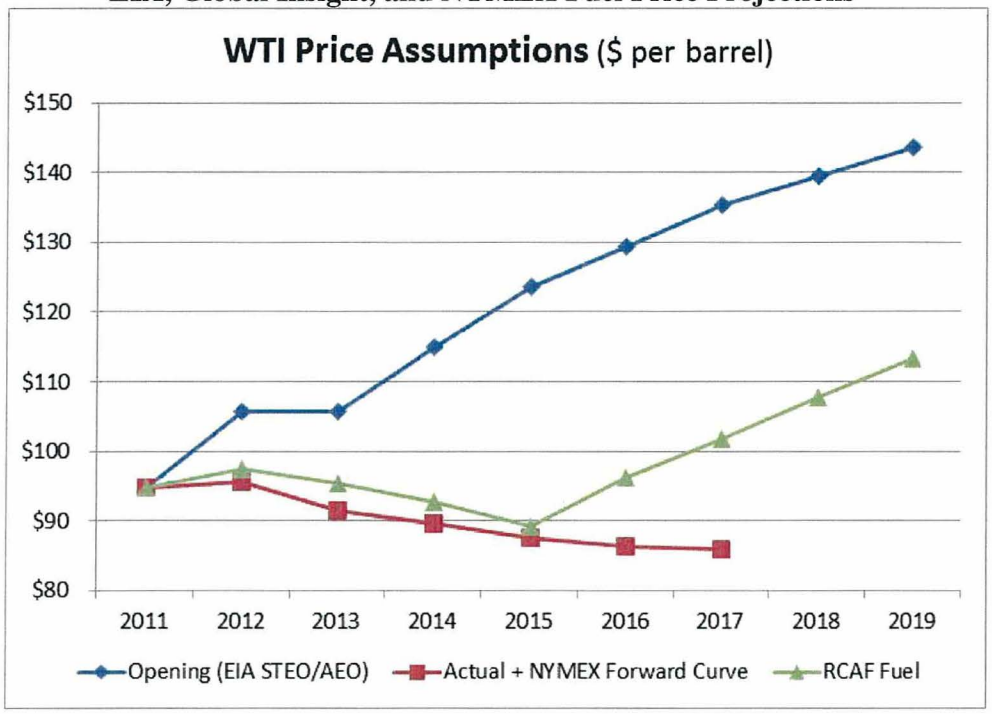
average ATC percentage based on commodity group, origin state and destination state, without regard to a movement's other relevant characteristics.

The Board should accept NS's corrected mileages and ATC workpapers because DuPont's results rely on impermissible rebuttal. DuPont's assertions that NS's workpapers were inadequate are baseless and should be rejected. And, even if the Board were to consider DuPont's impermissible new rebuttal evidence, NS's ATC calculations are the most accurate evidence in the record. For all of those reasons, the Board should adopt NS's cross-over traffic revenue allocation evidence, including its method for allocating revenues for re-routed cross-over traffic.

### E. The Same (RCAF) Fuel Index Should be Used to Forecast Prices for Purposes of SARR Fuel Costs and Fuel Surcharge.

On Opening, DuPont used an EIA forecast of WTI prices—which forecast *rising* fuel prices through 2015—as the basis for future DRR fuel surcharge revenues. *See* DuPont Opening WP "WTI & FSC Calc.xls." But for DRR operating *expenses*—including fuel costs—DuPont used Global Insight's RCAF forecast, which projected *flat*, unchanged fuel prices through 2015. DuPont thus assumes two different underlying prices for oil at the same time depending on whether the DRR is buying fuel or assessing fuel surcharges. Simple logic dictates that the same fuel price could not both rise and decline at the same time or have two different levels simultaneously. It is thus essential that the same fuel price forecast be used as the basis for projected SARR fuel expenses and projected SARR fuel surcharge revenues. Figure III-A-16 in NS's Reply Evidence, reproduced below, highlights the distortion caused by using different and divergent fuel price forecasts for operating expenses and fuel surcharge.

**Figure 7**
**EIA, Global Insight, and NYMEX Fuel Price Projections[153]**




DuPont's Rebuttal attempts to obscure the inconsistency of using one fuel price forecast for revenues and a different fuel price forecast for costs. DuPont's simplistic assertion that "price does not equal cost" ignores the fact that the price of fuel is the primary driver of the RCAF's fuel cost component. DuPont Rebuttal III-A-72. As the Global Insight RCAF analyst explained, "(o)ur [Global Insights] diesel PPI forecast drives the RCAF fuel component forecast." NS Reply WP "GI Email.pdf." NS's Reply Evidence further demonstrated that diesel prices are highly correlated to WTI prices, which in turn drive NS's fuel surcharge calculations. *See* NS Reply WP "Fuel Price Indices.xlsx."

DuPont attempts to divert attention from the fact that there cannot be two different prices for the same fuel at the same time by making the specious claim that "the same 'mismatch' NS accuses DuPont of exploiting in its SAC analysis actually does exist and is exploited by NS in the real-world on a daily basis." DuPont Rebuttal III-A-72. This red herring misses the point.

[153] Source: NS Reply III-A-70.

The question here is whether to use the same forecast to project the same fuel price for the same period. By using two different fuel price forecasts, DuPont would *create* a mismatch in which future fuel-related revenues would outpace fuel-related operating expenses and thereby distort the relationship between those costs and revenues.

The inescapable fact is that if fuel prices increase, *both* fuel surcharge revenues and fuel expenses would increase. The opposite would occur if fuel prices decrease. Time lags and similar factors may result in some variations on a daily basis, but over the course of a year or a 10-year SAC analysis period, fuel costs and fuel surcharge revenues move in parallel because they are based on the same fuel price.

*Major Issues* requires operating expenses (including fuel costs) to be escalated by the RCAF. *See Major Issues* at 40. Consistency and logic require the use of the same index to forecast the same fuel cost that is the basis for SARR fuel surcharge revenues. Accordingly, the Board should adopt NS's approach of using the RCAF Fuel index as the basis of projected DRR fuel surcharge revenues.

**F. "Leapfrog" Cross-Over Traffic Must Be Rejected.**

DuPont introduced to this case an entirely new and unprecedented variant of cross-over traffic, in which the DRR would interchange the same traffic with the residual NS multiple times, thereby forcing NS to handle that traffic on as many as three separate, discrete segments, including segments that are "internal" to the DRR network. These "leapfrog" trains effectively allowed the DRR to "leap" over difficult or costly segments of the NS network without incurring any associated construction costs; that is, DRR's selected traffic appears on the DRR's lines, disappears at points where the DRR would incur significant costs, and reappears once the traffic has traversed those segments on residual NS lines. Leapfrog traffic is an abuse of the cross-over traffic principle, which is intended as a simplifying device that replicates the results of a fully modeled SARR and SAC analysis, *without introducing bias* to the analysis. *See, e.g., Major Issues* at 24; NS Reply III-A-2.

DuPont's SAC presentation relies heavily on its new ploy to expand cross-over traffic to distort the SAC analysis in its favor. More than a quarter of the DRR's shipments travel on "leapfrog" trains, including more than one-third of its service-sensitive intermodal and auto shipments. *See* NS Reply Table III-A-13. If this manipulative and evasive new method were allowed, it would open the door to even more egregious misuse and distortion of the cross-over traffic device (*e.g.* by avoiding significant capital investment and operating costs that the incumbent must incur to serve SARR traffic or by enabling a complainant to game its RTC simulation). *See* NS Reply III-A-59. The Board should emphatically reject this abuse of cross-over traffic.

In its Rebuttal submission, DuPont complains that NS did not conduct an entirely separate *additional* SAC analysis excluding leapfrog traffic. *See* DuPont Rebuttal III-A-4. That complaint is unfounded. DuPont introduced this unprecedented distortion in its SAC presentation, and it would be unreasonable and unfair to place the burden on NS to conduct a separate, second SAC analysis to unwind the distortion caused by DuPont's manipulative SARR configuration and routing. DuPont has the burden of proof on SAC issues, and if it wishes to rely on leapfrog traffic, it must meet the burden of demonstrating that its new and unprecedented application of the cross-over device does not distort the SAC analysis or bias its results. *See Rate Regulation Reforms* at 16-17; *Major Issues* at 24. DuPont alone chose to employ the unprecedented leapfrog strategy, and it further chose not to present an alternative SAC analysis that did not incorporate that manipulative tactic. It cannot shift to NS the burdens and other consequences resulting from that gambit.

In the pending *Rate Regulation Reforms* proceeding, the Board proposes to remedy distortions of SAC analyses caused by other uses of cross-over traffic. *See Rate Regulation Reforms* at 16-17. In this case, DuPont attempts to introduce a new and potentially far more distorting expansion and mis-use of cross-over traffic. Regardless of the ultimate outcome of *Rate Regulation Reforms*, in which NS asked the Board to prohibit leapfrog traffic, the Board

should proscribe the use of leapfrog traffic as a particularly egregious abuse of SAC principles. *See Rate Regulation Reforms*, Joint Comments of NS and CSXT, at 18 (filed Oct. 23, 2012).

## V. NS'S EVIDENCE ON DRR ROAD PROPERTY INVESTMENT SHOULD BE ACCEPTED.

DuPont has understated the appropriate road property investment for the DRR by fully ten billion dollars. Its reliance on the small and unrepresentative "Trestle Hollow Project" as the source of earthwork quantities and other significant unit costs is misplaced and erroneous, in part because it is not NS and bears no relation to the DRR. Similarly, its investment cost evidence on real estate costs, bridges, yard infrastructure costs, land acquisition costs, signals (PTC issues), appropriate treatment of partial ownership interests in other railroads, and other significant engineering items is grossly understated.

Throughout DuPont's road property investment evidence—as elsewhere in its SAC presentation—it has engaged in an inappropriate game of "catch-me-if-you-can." That is, DuPont's strategy is to rely on infeasible and often undisclosed assumptions, unsupported claims and conclusions, illogical arguments and analyses, and withholding evidence until rebuttal, and challenge NS and the Board to identify and correct the resulting distortions. This is not the way this process is supposed to work, and DuPont's tactics abuse and manipulate the Board's rate reasonableness process and analysis. Taken together, DuPont's fundamental errors and omissions constitute a failure of proof, which it implicitly asks the Board to excuse, either by allowing DuPont to "fix" on Rebuttal the flaws NS identified, or by adopting the sound substitute evidence NS was forced to develop and submit in its Reply. At some point, the Board must refuse to condone such tactics and require a complainant to meet its burden of proof or face dismissal of its rate challenge. In this section, NS highlights some of the myriad errors in the road property investment components of DuPont's SAC presentation.

### A. NS's Real Estate Evidence Should Be Accepted.

DuPont's Rebuttal Evidence does nothing to correct the central flaw in its real estate valuation: the fact that DuPont's appraiser valued the DRR's land as of a date two years after the

DRR would need to acquire it. DuPont says that its use of the wrong date is of no moment because its DCF analysis indexed its real estate valuation back to 2007. But the "index" DuPont cites—which was developed not by DuPont's real estate appraisers but rather by its cost consultants—produces results completely inconsistent both with the real world and with the DuPont appraisers' other testimony. The NS real estate appraiser's estimate was based on more in-the-field observations, a more reliable averaging methodology, and most important of all an accurate assessment of what the DRR would have paid for property in 2007. NS's real estate evidence should be accepted as the best evidence in the record.

### 1. DuPont's Failure to Value the DRR's Real Estate as of the Time of Acquisition is a Critical Flaw that Completely Undermines Its Evidence.

DuPont's Rebuttal vehemently insists that its use of an index for real estate values in the DCF corrects for the fact that its appraisers valued the DRR's land as of the wrong date. DuPont fails to acknowledge, however, that this index assumes that the DRR would have paid less for its land in the pre-crash market of 2007 than it would have in the post-crash market of 2009. In other words, DuPont's appraisers valued property at the wrong time and in the midst of a deep depression in land prices, and then DuPont claims that the problem is fixed by using an "index" that results in the DRR paying even less for its right of way in 2007 than it would have in 2009.

Perhaps the best evidence of the flaws in DuPont's real estate index comes from DuPont's own real estate witnesses, who submitted testimony and analysis completely incompatible with that index. For example, while DuPont's cost consultant index indicates that real estate values increased from 2007 to 2009, DuPont's real estate appraisers admit that was not the case.[154] And the cost consultant index is irreconcilable with the way that DuPont's real estate appraisers adjusted post-acquisition sales. For purposes of indexing 2007 comparable sales to conform to a 2009 valuation date, the DuPont appraisers assumed that nonagricultural

[154] *See, e.g.*, DuPont Opening WP "DuPont SAR Land Valuation 4-24-12" at 34 ("The period from 2007 to mid-2009 was one of significant changes in the market for all types of land in the eastern United States. . . . Commercial real estate prices generally peaked in 2007, fell during 2008 and the first nine months of 2009 and then began to stabilize.").

land prices would decrease an average of 35% between 2007 and 2009.[155] But when the cost consultants indexed the real estate acquisition value back to 2007, they assumed an additional one percent decrease—not the 35% increase that would be dictated by the appraisers' approach.[156] DuPont's real estate appraisers themselves prove that the "index" on which DuPont relies does not account for the dramatic shifts between the 2007 market and the post-crash 2009 market.

Even if DuPont had used an accurate index—which it plainly did not—indexing would not remove the effects of the many post-2007 sales that DuPont included in its valuation. For example, the post-crash distress sales that DuPont included in its appraisal significantly depressed its valuations in ways that cannot be wiped away by an index. *See* NS Reply III-F-6 n.6 (listing examples of foreclosure sales, bank sales, and auction distress sales used by DuPont as "comparables").

Moreover, DuPont's claim that its approach is consistent with SAC precedent is meritless. As NS explained on Reply, the Board has held that property should be valued as of the acquisition date consistent with the construction schedule. *See* NS Reply III-F-5. On Rebuttal, DuPont did not even try to address that precedent, and instead relies on past cases where a railroad did not challenge a shipper's use of the wrong valuation date. The Board's past acceptance of an undisputed issue is plainly not controlling precedent, particularly because it is unlikely that any of those cases involved the kind of dramatic shift in the real estate market at issue here. The notion that the DRR could acquire real estate in 2007 for 2009 prices is a blatant distortion of the SAC standard, and the Board cannot reasonably rely on such transparently manipulated evidence. NS's real estate appraisal is the only evidence that properly valued the DRR's land as of the construction date, and as such it is clearly the best evidence of record.

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[155] DuPont's appraisers did not develop a comparable index for agricultural land.

[156] It is worth noting that the 38% differential between DuPont's 2009 real estate valuation and NS's 2007 real estate valuation accords almost exactly with the DuPont appraisers' own calculation that real estate prices declined an average of 35% between 2007 and 2009.

### 2. NS's Simple Averaging Approach is More Reliable than the DuPont Approach that Over-Weights the Effect of Large-Scale Transactions.

NS's Reply Evidence showed that DuPont's "weighted average" (or "global mean")[157] approach to averaging sales prices overemphasizes the effect of large-scale purchases on the per-square-foot prices that the DRR could expect to pay. *See* NS Reply III-F-26. NS used an alternative "simple average" (or "stratified mean") approach to better reflect the reality that the DRR would have to acquire its right-of-way in many small-scale transactions.

According to DuPont, the parcel sizes of the DRR should approximate the variation in parcel sizes found in the comparable sales data, and therefore, the weighted average appropriately gives greater weight to the larger parcels in that data set. *See* DuPont Rebuttal Ex. III-F-2 at 51, n.6. But DuPont's underlying premise that the size of the SARR parcels would correspond to the larger parcels in the comparable sales data is erroneous. Even making the extremely conservative assumption that every distinct valuation unit[158] on the ROW could be acquired in a single purchase such that each valuation unit would represent a single parcel, the average parcel size of the DRR would be far smaller than the average parcel size of the comparable sales, as Table 8 illustrates. For example, Table 9 shows that the average parcel size of residential land in the comparable sales data was 25.0 acres. By comparison, using valuation unit size as a conservative measure for DRR parcel size results in an average parcel size for residential land along the DRR ROW of 0.9 acres for inspected areas and 3.5 acres for areas not inspected. As such, the DRR parcels are considerably smaller than the parcels in the comparable sales data.

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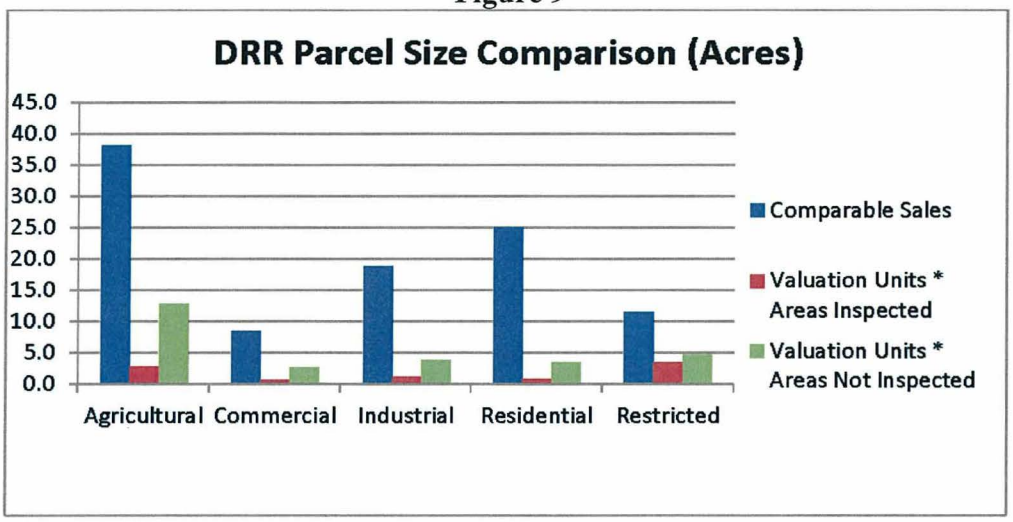
[157] On Reply, NS referred to DuPont's weighted average technique as the "global mean" technique, while it referred to its alternative—in DuPont's terms the simple average—as the "stratified mean." For simplicity, NS will adopt DuPont's terminology.

[158] A valuation unit is a contiguous segment of DRR right of way classified as Agricultural, Commercial, Industrial, Residential, or Restricted. Because valuation units often extend beyond adjacent property owner boundaries, the actual acquisition parcel size would likely be smaller than the average valuation unit.

**Table 8**
**Comparison of DRR Valuation Unit Size to Average Comparable Sales Parcel Size**[159]

| Parcel Size Comparison (Acres) | | | |
|---|---|---|---|
| | Comparable Sales | Valuation Units (Areas Inspected) | Valuation Units (Areas Not Inspected) |
| Agricultural | 38.2 | 2.9 | 12.9 |
| Commercial | 8.5 | 0.6 | 2.7 |
| Industrial | 18.8 | 1.3 | 3.8 |
| Residential | 25.0 | 0.9 | 3.5 |
| Restricted | 11.6 | 3.6 | 4.7 |

**Figure 9**




Because the average parcel size of the comparable sales is substantially larger than the average parcel size of the DRR, it would be inappropriate to give the larger comparable sales transactions proportionally more weight than the smaller-acreage transactions that are more representative of how the DRR ROW would be purchased. Yet, that is exactly what DuPont's weighted average approach does. By comparison, NS's simple average approach, which the

[159] All of the data that was used to calculate the parcel/valuation unit sizes in Table 8 and Figure 9 for the Comparable Sales, Areas Inspected, and Areas Not Inspected can be found in III-F-1 NS Reply Workpaper folders 'Sales Data,' 'Valuation Files_Sites Visited,' and 'Valuation Files_Sites Not Visited' respectively. In each of these folders, the data are broken down by either state or metropolitan area. The data were compiled by respective field and the average parcel/valuation unit size was calculated for each land use type.

Board has accepted in past cases,[160] gives equal weight to these larger transactions, thereby fully incorporating these lower unit prices into the ultimate valuation determination, while avoiding any bias that would result from giving greater weight to these large acreage transactions that are not representative of the DRR parcels. As such, NS's simple average approach is more appropriate than DuPont's weighted average approach for purposes of valuing the DRR ROW.[161]

Moreover, DuPont's claim that the Board's rejection of its weighted average approach would be a "barrier to entry" is meritless. *See* DuPont Rebuttal III-F-9. DuPont theorizes that the DRR could purchase large tracts of land at the lower unit prices that large-scale purchases typically involve, keep what it needs for the ROW, and then resell the remaining acreage. But DuPont has provided no evidence accounting for the considerable transaction costs of that approach—which include both the significantly higher up-front capital costs for the DRR to purchase more land than it needs at the outset, as well as the costs for it to market and sell that excess land. The notion that the DRR could reduce its real estate acquisition costs by becoming a successful real estate wheeler-dealer shortly before a dramatic collapse in the real estate market is ridiculous. Indeed, the Board has rejected similar claims that a SAC complainant can cherry-pick data and land prices to support a lower-cost valuation.[162] The same logic holds true in this case: DuPont cannot assume that the DRR could purchase all of its real estate at the relatively lower unit cost associated with larger parcels of land.

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[160] *See Otter Tail* at D-2.

[161] DuPont's attempt to multiply its weighted average (*i.e.,* the total price of the comparable sales divided by their total acreage) back by the total acreage of the comparable sales in order to prove the accuracy of its approach is nothing more than a mathematical ruse, as doing so *always* yields the total price of the comparable sales. *See* DuPont Rebuttal Ex. III-F-2 at 31-33. This is just a red herring to distract from the ultimate question of whether the weighted average is appropriate in the first place, given the unknown size of the SARR parcels. Indeed, even DuPont admits that the weighted average "would probably not be appropriate" for the appraisal of a single parcel of known size. *See id.* at 38.

[162] *See AEP Texas* at 77 ("Although a SARR is presumed to be a least-cost, most-efficient carrier, that does not permit the complainant to selectively choose data that supports its position, while ignoring other relevant data. In this instance, just because one parcel had been purchased at a relatively low price does not imply that all parcels could be obtained for the same bargain price.").

Finally, DuPont resorts to claiming that the NS's appraiser's quotation from an appraisal textbook in his discussion of the appropriate averaging technique was a "gross and willful misinterpretation" that "can only be characterized as misleading and disingenuous." DuPont Ex. III-F-2 at 36. But it is DuPont that is being misleading and disingenuous by selectively quoting from NS's Evidence, for the sentences immediately before and after the supposed "misrepresentation" show that DuPont's accusations are completely meritless. The supposed "gross and willful misinterpretation" stems from the following passage of NS's Reply Evidence:

> Rather than accounting for the appropriate unit of comparison (dollars per acre) of prevailing and specific individual transactions in the marketplace, the DuPont appraiser aggregated sales into a global mean to "effectively act as a single transaction" in order to analyze sales data. NS Reply Ex. III-F-2 at 12. . . . This approach leads to unreliable results because it is not representative of the volume of transactions in the actual marketplace, prevents the appraiser from analyzing the specific attributes of individual transactions, and fails to account for the more accurate dollars per acre unit of comparison. The Appraisal Institute rejects this kind of mass agglomeration, noting that "[l]ike units must be compared, so each sales price should be stated in terms of appropriate units of comparison." APPRAISAL INSTITUTE, THE APPRAISAL OF REAL ESTATE at 305 (13th ed. 2008). By amalgamating sales into a global mean, the specific attributes of each transaction and associated values are diluted and direct market comparisons become impossible, leading to unreliable results.[163]

The full passage plainly shows that NS was not arguing that the Appraisal Institute had specifically addressed the "weighted average" technique ginned up by DuPont's appraisers for this case, but rather that the weighted average's failure to account for the per-acre pricing of individual sales violated the fundamental principle that appraisers must account for the appropriate units of value.[164] It is not clear whether DuPont's appraisers' mischaracterization of this point is willfully obtuse or intentionally misleading, but it is clear that NS did not misrepresent anything.

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[163] NS Reply III-F-24–25 (emphasis added). The underlined sentence is the one that DuPont cites in isolation as evidence of a "willful misrepresentation."

[164] Similarly, NS's references to this passage from the Appraisal Institute at Reply III-F-27 and in Reply Ex. III-F-2 at 11 clearly show that NS was using this passage to illustrate that appraisers must consider appropriate units of value in conducting a valuation—not that the Appraisal Institute had specifically weighed in on the "weighted average" technique.

### 3. DuPont's Other Criticisms of NS's Analysis are Meritless.

While it is not possible to respond to all of DuPont's Rebuttal claims in this brief, NS briefly responds to some of DuPont's most prominent accusations. First, DuPont alleges that certain NS land valuations "were unsupported by the sales" comparables. DuPont Rebuttal III-F-6. But a close inspection of the record shows that NS's appraisers only valued properties at levels above comparable sales where specific evidence showed that the only sales data available was not fully comparable to the land parcel in question. For example, DuPont complains that NS's valuation of certain property in downtown Pittsburgh exceeded the average price of the nearby comparable sales. *See id.* III-F-10–11. But the DRR property at issue is located in the heart of downtown Pittsburgh, and after a detailed on-the-ground inspection NS's appraiser determined that significant real estate improvements—including a convention center, hotels and major office buildings, and a professional baseball stadium—demanded land value prices greater than the limited comparable sales data would support. Because NS's appraiser relied on extensive on-the-ground fieldwork— physically inspecting almost twice as much land along the ROW as DuPont's appraisers did—he was able to produce more discrete valuations than would have been possible relying solely on comparable sales data, which is often incomplete and frequently has little nexus to the land along the ROW in urban areas. *See* NS Reply III-F-17. Indeed, as DuPont's own appraisal report admits, "land values in an urban area are extremely sensitive to small changes in geographic area. In an urban area, sometimes moving just one block away finds you in a totally different market environment, with totally different underlying land values." DuPont Rebuttal Ex. III-F-2 at 95. There is nothing at all unusual about valuing a property at levels above comparable sales where that property's characteristics support a higher valuation.

Second, DuPont complains about NS's removal of higher end outlying sales that "were clearly inconsistent with the volume of market activity." NS Rebuttal Ex. III-F-3 at 14. But as NS explained in its Reply, NS took this step to ensure a conservative appraisal, and this step

could only decrease the appraised value of the DRR's land. This conservative approach does not impact the reliability of the NS appraisal.

Third, DuPont complains that NS erred by applying route average values that include sales data from urban areas to rural locations where little or no comparable sales data were available. *See* DuPont Rebuttal III-F-10. DuPont asserts that this practice overstates land values in rural areas. *See* DuPont Rebuttal Ex. III-F-2, at 58-63. But the example that DuPont provides of a supposed overstatement on the Birmingham, AL, to Chattanooga, TN, route proves the opposite of what DuPont claims. Specifically, a table in DuPont's Rebuttal report shows that the average value applied by NS to the rural areas where no sales data exist is $91,072 per acre and that the value was derived from 90 sales in Jefferson County (an urban county including the city of Birmingham) and two sales in rural Etowah County—a rural county. *See id.* at 54, 61. What DuPont does not show is that the average land value for the two sales from rural Etowah County was $128,912 per acre[165] while the average land value from the 90 urban Jefferson County sales was only $90,232 per acre.[166] Thus, contrary to DuPont's claim, NS's application of the relevant residential land sales data from urban Jefferson County actually produced lower land values per acre than if NS had used available data only from rural counties.

**4. DuPont's Calculation of Easement Costs Violates Board Precedent.**

DuPont's Rebuttal adheres to its incorrect position that the DRR can acquire easements for the same dollar amount historically paid by NS, with no indexing for inflation—even though most of the relevant easements were acquired many years ago. DuPont Rebuttal III-F-14. As NS explained on Reply, DuPont's approach is directly at odds with the Board's decision in *Xcel* that easements must "be valued at current costs" in order to "reflect the current value of obtaining the necessary easements." *Xcel*, 4 S.T.B. at 669. DuPont's Rebuttal does not respond to—or even acknowledge—that contrary precedent, and instead claims that it should only have

[165] NS Reply WP "Etowah County, AL - SalesData.xls", Column P converted from SF to acre.
[166] NS Reply WP "Route 1 - Birmingham, AL to Chattanooga, TN Sales Data.xls", Column P converted from SF to acre.

to pay "the fee actually paid for the perpetual easement." DuPont Rebuttal III-F-14–15. But the whole point of indexing is to calculate the current dollar value of "the fee actually paid for the perpetual easement." If an NS predecessor paid $1,000 in 1881 to acquire an easement, then the equivalent 2007 price for that easement would be far higher, simply because the value of $1,000 in 1881 was far higher than the value of $1,000 today. DuPont's refusal to index easements is thus a transparent attempt to have the DRR acquire easements in exchange for less monetary value than NS and its predecessors historically paid to acquire those easements. It is plainly not a "barrier to entry" to reject this sort of manipulation; on the contrary, the *Xcel* approach used by NS ensures that the DRR will acquire easements on the same terms that NS and its predecessors acquired them.[167]

### B. The Board Should Follow Longstanding Precedent and Practice and Apply R.S. Means Cost Data to Develop Earthwork Costs, Adopting NS's Evidence and Rejecting DuPont's Reliance on a Small, Isolated, and Poorly Documented Short Line Project as the Basis for a 7,300-Route-Mile SARR.

DuPont's evidence repeatedly used the atypical 1.3 mile "Trestle Hollow" project as the basis for positing unrealistically low and unachievable roadbed preparation costs. *See, e.g.*, DuPont Opening III-F-14–15 (using Trestle Hollow project costs as a basis for common earthwork costs); *id.* III-F-22 (applying Trestle Hollow project costs as a basis for seeding/topsoil placement costs); *id.* III-F-27 (calculating subballast costs from Trestle Hollow project costs). In SAC cases, the Board has accepted only two sources for the earthwork costs at issue: (i) Means construction cost data in most cases; and, in two cases, (ii) cost data from far more representative, larger rail projects conducted by the defendant rail carrier on lines replicated by SARRs that were much smaller than the DRR. DuPont has offered no reason for the Board to depart from its established practice and precedent and instead rely upon a 1.3 mile

[167] DuPont's citation to *TMPA I* is beside the point. The complainant in *TMPA* submitted evidence of easement costs that was "unrebutted," and the only question presented was whether the Board should accept those costs or require the SARR to acquire fee simple title to the land. *TMPA I* at 697. *TMPA I* certainly does not contradict *Xcel*'s clear and controlling holding that easements must be valued at current costs.

short line project that is neither on, nor representative of, the SARR route as the basis for roadbed preparation costs for a SARR network covering nearly 7,300 route miles.

On Reply, NS explained in detail why the short, atypical Trestle Hollow project—a 7,000-foot short line realignment project not on the SARR network—was an inadequate basis for estimates of earthwork and roadbed preparation costs for the largest SARRs ever proposed, covering 7,300 route miles of diverse terrain and conditions. *See, e.g.,* NS Reply III-F-38–44. NS refers the Board to its Reply Evidence and will not reiterate all of those arguments here. Instead, this brief highlights two significant reasons to reject DuPont's inapposite evidence and adopt the Means-based evidence developed by NS: the Board's longstanding preference for and use of Means data; and the distortions and inaccuracy inherent in attempting to extrapolate costs from a small, atypical, short line project to the greenfield construction of a new Class I railroad.

### 1. The Board Has Applied Means Construction Cost Survey Data as the Basis for Roadbed Preparation Costs in the Majority of SAC Decisions.

The Board has long relied upon Means, which provides current and comprehensive construction cost data based on national surveys of construction companies, as the authoritative source for earthwork costs in SAC cases. *See, e.g.*, *FMC*, 4 S.T.B.at 800; *Otter Tail* at D-11; NS Reply III-F-38 & n.21. Means is particularly well-suited to the present case because of the unprecedented size and scope of the DRR and the widely varying terrain, topography, and conditions through which it would be constructed. Because Means provides detailed cost data gathered from hundreds of diverse construction projects and conditions, properly selected and applied specific Means cost categories are much better suited to develop costs for such a diverse, wide-ranging project than a general, incomplete and ambiguous bid document for an atypical 7,000 foot line relocation project (the Trestle Hollow project) that DuPont used as the basis for much of its earthwork cost estimates. *See* NS Reply III-F-41.

If ever there were a case warranting the use of data derived from a broad range of projects covering diverse geography, topography, and conditions, it is this one. The DRR is one of the largest and most geographically dispersed SARR ever proposed. Means data is derived

from a survey of many construction projects throughout the United States and includes most of the specific tasks and conditions builders of the DRR would likely encounter. Because Means data covers a wide range of tasks, conditions, equipment, and job sizes, selection of the correct categories allows cost calculations to be tailored to the varying conditions likely to be encountered in diverse territory covered by the DRR. Rather than the one-size-fits-all approach of using the tiny Trestle Hollow project for the 7,300 mile SARR, Means data allows a more specific and nuanced calculation tailored to the varying conditions and terrain traversed by the DRR.

DuPont claims, without support, that Means cost data is only for small projects and does not reflect economies of scale. *See* DuPont Rebuttal III-F-16. This is wrong. Means provides costs for a wide range of construction activities of different types and sizes, from very small projects to very large projects. To cite but one example, DuPont's own evidence used Means data to develop unit costs for loose rock excavation, assuming the DRR would use a 42-CY Hauler. *See* DuPont Opening III-F-16, n.36. A 42-CY Hauler is a very large piece of equipment only used for large-scale construction work and projects. If Means were limited to small projects, it would not include the costs of such equipment. In addition, Means includes production rates and unit costs for scrapers, bulldozers, and 22 cubic yard haulers similar to the equipment that DuPont says was actually used in the Trestle Hollow project.[168] Furthermore, Means data is derived from surveys of actual construction contractors and actual projects to facilitate its primary use—as a basis for real-world contractors to develop construction project bids. If Means costs did not reflect economies of scale and scope for particular tasks, equipment, and projects, its value would be severely limited, and it would not be so widely used as an estimating tool in the construction industry.

[168] The primary reason Means costs are higher for the equipment that actually would be used in a rail construction project is that they do not include productivity benefits associated with mass excavation and instead reflect typical equipment production rates and associated costs.

### 2. The Board has Expressed no "Preference" for the Use of Costs from a Particular Railroad Project Instead of Means Cost Data.

Contrary to DuPont's suggestion, the Board's SAC decisions have not expressed a preference for the use of earthwork costs from a specific, individual railroad project instead of costs developed through the Means survey of real world contractors to develop representative actual construction costs for a wide variety of tasks and conditions. *See* DuPont Rebuttal III-F-15–16. DuPont's erroneous assertion rests on several mistaken premises. Initially, it assumes that Means cost data are somehow hypothetical and not based on "current real-world" costs. This is false—the costs developed by Means are based on surveys of actual contractors engaged in real world construction projects throughout the United States. *See* NS Reply WP" RS Means Pages_IX&X.pdf" (describing how Means data is developed). Means gathers, compiles, and organizes that real world data into detailed, specific unit costs that are widely used in the construction industry to develop cost estimates and bids for a wide variety of "current real-world" construction projects. *See id.*; *see also Duke/CSXT*, 7 S.T.B. at 476 (describing Means as "a set of nationwide standardized unit costs, adjusted for localities, used to estimate the cost of construction").

DuPont further erroneously posits that, by accepting defendant carriers' earthwork costs in two cases (while using Means cost data in virtually all other SAC cases), the Board established a preference for use of any specific rail project cost data over the use of Means cost data.[169] In two individual western cases, *WFA I* and *AEPCO 2011*, the Board accepted certain construction cost data from projects conducted by the defendant carrier on substantial portions of *the very rail lines* replicated by the SARR.[170] *See* DuPont Opening III-F-14. But DuPont cannot cite any new rule or principle regarding construction cost data announced in those cases, because there was none. The Board accepted some of the defendant carrier's own earthwork costs in

[169] DuPont concedes that the Board has used Means as the source of earthwork costs in virtually every other SAC case.

[170] Even in these two isolated, fact-specific circumstances, the Board still used Means for several costs. *See, e.g.*, *WFA I* at 87 (applying Means costs for excavating and loading blasting rock); *AEPCO 2011* at 88 (using Means to determine loose rock excavation unit costs).

*WFA* because the complainant and the defendant carrier *agreed* to use the carrier's project data in that case. *See* NS Reply III-F-40, n.27. Because the parties agreed to use defendant carrier project data for those costs for which such data was available, the Board had no occasion to address—let alone decide—the relative merits of the defendant carrier's cost data from a particular project vis-à-vis Means cost data.

Here, in contrast, NS does not agree that the proffered (Trestle Hollow) project costs are representative of the costs of constructing the SARR, because they are not. DuPont offers data from a bid for a small short line project that does not replicate any segment of the SARR and was not conducted by or on behalf of the defendant carrier. For good reasons, the Board has never expressed a general preference for data from a specific individual project over Means construction cost data without regard to the relevance or comparability of the individual project to the parameters and characteristics of the SARR and its construction costs. Any contrary claim by DuPont is simply false.[171] Rather, the Board's longstanding preference for Means cost data in the absence of better-fitting or more relevant cost data (such as current defendant carrier cost data regarding its construction of substantial portions of lines replicated by the SARR) remains sound and unchanged.

DuPont's attempt to extrapolate bid costs from the small, atypical Trestle Hollow project is readily distinguishable from the Board's acceptance of the defendant carrier's construction cost data in *WFA I* and *AEPCO 2011*. First, the 1.3 mile Trestle Hollow project is not comparable to the 7,300 route mile DRR. The DRR is well over *five thousand* times larger and would traverse widely varying terrain and conditions covering the entire eastern United States.[172] By contrast, the much larger projects used in *WFA I* and *AEPCO 2011* constituted a significant

[171] In fact, the Board has specifically found that Means can be used to "impeach a document" used to support construction costs, thus demonstrating that specific project costs are not inherently superior to Means. *See AEPCO 2011* at 103.

[172] By DuPont's calculation, the lines constructed by the DRR would cover 7,272 route miles. In addition, the DRR would operate over an additional 818 route miles using trackage and joint facilities agreements. *See* DuPont Opening III-B-5, Table III-B-2.

and substantial portion of the lines replicated by the SARRs.[173] Unlike the relatively large projects at issue in *WFA* and *AEPCO 2011,* the short and compact Trestle Hollow project simply is not representative of the vast and diverse terrain and conditions in which the DRR earthwork would be conducted. Second, the projects whose costs the Board accepted in *WFA I* and *AEPCO 2011* were conducted by the incumbent railroad on the actual rail lines replicated by the SARR. *See WFA I* at 81; *AEPCO 2011* at 86.[174] The Trestle Hollow project, however, covers no part of the 7,300-mile DRR system posited by DuPont.[175]

Moreover, even if it were otherwise sound practice to attempt to extrapolate costs from a "typical" 1.3 mile project to a 7,300-mile SARR—which it is not—Trestle Hollow was not a typical project. The density of material to be excavated in the short linear distance of the Trestle Hollow project made available economies of scale and efficiencies that would not be available to the DRR, whose excavation and earthwork activity generally would be spread over long distances. *See, e.g.,* NS Reply III-F-41 (discussing the Trestle Hollow project's excavation unit

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[173] *See WFA I* at 25-26; NS Reply WP "BNSF Orin Line.pdf;" NS Reply WP "BNSF Shawnee to Walker Miles.pdf;" NS Reply III-F-39–40.

[174] To the extent those cases might be read to indicate anything about the use of specific project data, they suggest that construction project data from the defendant carrier's own projects may in some instances be preferable to Means data for certain costs. In this case, NS made available and produced construction cost data from rail construction projects on the NS network. DuPont refused to use those costs, however, preferring to rely on a short line project that was neither on the lines replicated by the SARR nor on any NS line.

[175] Further, the fact that the comparison construction projects in *WFA I* and *AEPCO 2011* were those of the incumbent carrier allowed the Board to receive the best evidence of SARR costs. In *WFA I,* for example, WFA argued that no clearing and grubbing costs were necessary for several SARR subdivisions because certain BNSF construction documents did not appear to include those costs. *WFA I* at 81. Because the project at issue was defendant BNSF's own project, however, the railroad was able to present evidence explaining how it actually accounted for clearing and grubbing costs. The Board found that "BNSF has adequately explained why its documentation for these segments did not list a cost for these items" and added appropriate clearing and grubbing costs. *Id.* at 82. Such analysis would not have been possible if the Board had used a third party project with incomplete information such as the Trestle Hollow project proffered by DuPont in this case. While DuPont's witnesses make unsupported assertions about the content and meaning of broad, ambiguous cost categories in the skeletal Trestle Hollow bid documents, they offer no evidentiary support for those assertions. *See, e.g.,* DuPont Rebuttal III-F-48 (rejecting inclusion of a separate cost for fine grading because the cost is allegedly included elsewhere). Means allows the Board to apply average costs and avoid project-specific disputes that are difficult to resolve in the absence of clear, detailed, and supported explanatory evidence provided by a party that was directly involved in the aspect of the project in question.

price and how it relates to the high concentration of excavation volumes within a small geographic area). Construction of the DRR would require more equipment and resources to remove, move, transport, manipulate, cut, fill, place, and dispose of the same volume of material involved in the Trestle Hollow project. As a result, the efficiency and productivity of the equipment used to construct the DRR would be correspondingly lower than that enjoyed by the Trestle Hollow project. The 1.3 mile length and terrain of the Trestle Hollow project also are not representative of the varying and diverse terrain and conditions that will be encountered by the 7,300 route mile, 20-State DRR. As NS demonstrated, in many respects the Trestle Hollow project was constructed in nearly optimal conditions.[176]

Detailed evidence and explanations of the Trestle Hollow cost categories also were not available. For many items, the only "evidence" of what was included in various large and undefined cost categories are recollections and representations of DuPont witness Crouch. *See, e.g.*, DuPont Rebuttal III-F-55 (citing Mr. Crouch's "recollection" that water for compaction was used and the contractor sometimes bladed the soil so it would dry). In *WFA I* and *AEPCO 2011*, the defendant rail carrier was able to present evidence showing that certain cost categories excluded costs the complainants claimed were included. *See WFA I* at 81; *supra* at 116, n.175. Neither NS, nor the Board, has any way to verify what costs were included and which were not.

In addition, inconsistencies between bid documents and contractor notes for the Trestle Hollow project make it difficult to confirm its "real" costs and further undermine the credibility of DuPont's proffered unit costs. For example, as NS noted in its Reply,

> the Cost Tracker sheet relied upon by DuPont for the DRR's common excavation unit cost identifies 787,223 units of mass excavation. There is no indication anywhere in DuPont's supporting documentation of how that figure was derived or what the term "units" represents. DuPont treats the unit cost as a cost per cubic yard applicable to common excavation. The 6/08/06 contractor meeting notes, however, indicate the yardage for the project as 630,000 cubic yards or only 80 percent of the mass excavation

[176] For example soil moisture was found to be near optimal around Trestle Hollow. *See* NS Reply III-F-43. The DRR, by contrast, traverses a vast area with a diverse range of terrain conditions, some more challenging for construction than others. *See* NS Reply III-F-87-93.

> quantities used in DuPont's work papers. This represents a considerable difference.

NS Reply III-F-42. The very general and limited project information and data DuPont provided regarding the Trestle Hollow project were inadequate to allow meaningful analysis of cost categories or to determine what costs they included.

Moreover, if DuPont genuinely believed that costs based on specific railroad projects were necessarily better than Means construction cost data, the best available evidence would be the data NS made available in discovery concerning projects actually constructed on the NS system and reflecting NS's experience and costs on its Class I rail network. *See* NS Reply III-F-45. But DuPont chose to disregard the information NS provided in discovery about these projects in favor of the flawed and inapposite Trestle Hollow project cost information. On a project-specific basis, the NS projects provide a much better benchmark for the costs the DRR would be likely to incur. *See, e.g.*, NS Reply III-F-48, Chart-III-F-2 (comparing earthwork project costs of Trestle Hollow and NS projects).[177] The NS project data is far more representative of real-world construction expenses along NS rail lines replicated by the SARR than the atypical Trestle Hollow project, which is not even on the NS system.

DuPont cannot have it both ways. If it wished to maintain that the NS projects are not "akin" to new rail construction for the DRR and cannot form the basis for extrapolation of costs for a 7,300 route mile SARR covering diverse terrain and conditions, then certainly the similarly sized Trestle Hollow project would fail by the same standard, and the Board should follow established precedent and apply Means cost data as the best available evidence. If, alternatively, DuPont wished to adhere to its position that any actual specific rail project is better than Means data, it should have used the actual NS project costs produced in discovery, which reflect

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[177] DuPont claimed the NS projects were too small, and therefore not "akin to new rail construction like the DRR." DuPont Opening III-F-13. As NS demonstrated, however, many of the projects for which it made AFEs and cost data available were larger than the Trestle Hollow project. NS Reply III-F-46, Table III-F-10. DuPont's contention that the NS projects are "too small" would necessarily preclude use of the Trestle Hollow project, which was smaller than several of the NS projects that DuPont rejected as too small to use as the basis for DRR earthwork costs.

representative construction costs from projects on the NS system that were as large or larger than the Trestle Hollow project.

In sum, the Board has expressed no preference for particular projects as a basis for developing roadbed preparation costs for a SAC presentation. Further, no SAC decision has ever relied upon a single, small construction project that was not constructed by the defendant carrier on lines replicated by the SARR. Instead, the Board consistently has relied upon Means as an accurate and reliable source of earthwork costs. Only where representative project costs incurred by the defendant carrier on lines constituting a significant portion of the SARR network are available has the Board used such data instead of Means data. Means is particularly well suited to this SARR, a very large-scale project where no data from a project of similar scope and scale is available. By quite a margin, the DRR is the largest and most complex SARR ever presented to the Board. Because of the unprecedented size and scope of the SARR, this case is peculiarly ill-suited for the Board to experiment by departing from its established practice and precedent in favor of extrapolation of the costs of an atypical, short and poorly documented short line project to a SARR that would be built through diverse terrain and conditions covering well over five thousand (5,000) times more territory. The Board should follow established precedent by applying appropriate Means costs provided by NS on Reply.

### 3. DuPont Cannot Rely on New Evidence it Deliberately Withheld From NS and Produced for the First Time to Support its Rebuttal.

DuPont's sharp tactic of withholding relevant Trestle Hollow project documents and then springing them on rebuttal provides yet another reason for the Board to reject the use of Trestle Hollow project unit costs. On Rebuttal, DuPont relied upon additional Trestle Hollow project documents that it did not previously produce despite NS's express requests for such documents. *See* DuPont Rebuttal III-F-20-22. In its Opening Evidence, DuPont relied upon a one-page summary to support its Trestle Hollow earthwork unit cost assumptions. *See* DuPont Open. WP "Trestle Hollow Project Cost Sheet.pdf." Because that very general summary lacked detail or supporting documentation sufficient to allow meaningful review of DuPont's cost assumptions

and support, NS requested that DuPont provide supporting documents and information, including "actual construction invoices and payment records." *See* NS Reply WP "Email to DuPont Re the Trestle Hollow Project.pdf" (requesting any documents supporting Trestle Hollow project specifications and costs, including all Trestle Hollow project documents DuPont relied upon to support its case-in-chief and expressly specifying all supporting documentation for the one-page Trestle Hollow project cost sheet). In response, DuPont produced no further documents, asserted that NS's requests for documents supporting DuPont's opening evidence were inappropriate "discovery requests" and represented that DuPont "has provided all of the work papers that are the basis for its road property investment quantities and costs." *Id.* (emphasis added).[178]

Because DuPont had clearly stated that it was not relying on any other documents to support its Trestle Hollow project costs, NS pointed out on Reply that DuPont's Trestle Hollow project-based unit costs were unsupported, unexplained, and inconsistent. *See* NS Reply III-F-42. But DuPont's Rebuttal relied upon a detailed construction contractor invoice—produced for the first time on Rebuttal, thereby denying NS an opportunity to evaluate and respond to that new evidence—to respond to NS's Reply showing that DuPont's Trestle Hollow unit costs were unsupported. *See* DuPont Rebuttal III-F-21 & n.22 (relying on a five-page detailed invoice submitted as Rebuttal workpaper).

This is a particularly egregious abuse of the Board's rules regarding the permissible scope of rebuttal and the complainant's burden to present its entire case-in-chief in its opening evidence. DuPont not only seeks to rely on new rebuttal evidence that should have been produced on opening, it withheld that evidence despite NS's express follow-up request for precisely such information. The Board must not countenance such sandbagging and abuse of its processes. In order to preserve the integrity of SAC proceedings and evidentiary rules, the Board cannot allow a party to refuse to produce supporting material in response to the opposing party's

[178] This statement alone should estop DuPont from relying on new supporting material produced for the first time with its Rebuttal.

express request and then turn around and rely on new material covered by that request in its next filing. The Board should disregard that new Rebuttal Evidence and any related argument entirely, both because it was improperly withheld by DuPont and because it is produced for the first time on rebuttal. *See, e.g., SAC Procedures*, 5 S.T.B. at 446; *Xcel*, STB Docket No. 42057, at 2 (served April 4, 2003).

### C. Bridges

#### 1. Movable Bridges

DuPont's attempt to raise new arguments for the first time on Rebuttal regarding the use of federal funds in order to avoid 90% of the cost of movable bridges is both barred as a matter of law and fatally flawed on its merits. As a threshold matter, DuPont's new claim that the DRR would incur only 10% of all movable bridge construction costs because the remainder would be paid by federal Truman-Hobbs Act funding is impermissible new evidence submitted in rebuttal that may not be considered under the Board's rules. NS explained in its Reply Evidence that DuPont entirely failed to explain or support its movable bridge cost in its case-in-chief on Opening, silently applying a 10% DRR cost share in its workpapers without discussion and without providing any rationale or explanation. *See* NS Reply III-F-206–07. Such explanation and supporting evidence is an essential part of DuPont's case-in-chief which it was obliged to present in its Opening Evidence.[179]

Having failed to provide any evidence whatsoever to support its unexplained and unsubstantiated movable bridge cost assumptions (including a tacit 90% cost subsidy assumption for all such bridges) on Opening, DuPont is foreclosed from attempting to do so in its Rebuttal Evidence. The Board should adopt NS's movable bridge cost evidence as the only complete and supported evidence submitted at the proper time.

Even if the Board were to consider DuPont's untimely attempt to supplement its evidence and explain its movable bridge costs, its new arguments and evidence are meritless. On

[179] *SAC Procedures*, 5 S.T.B. at 445-46 (emphasis added); *IPA* at 3; *Xcel*, STB Docket No. 42057, at 2 (served April 4, 2003).

Rebuttal, DuPont attempts to explain the 90% movable bridge cost discount it buried in its Opening workpapers as justified by the federal Truman-Hobbs Act, which provides varying levels of federal subsidies for renovation, modification, or removal of existing movable bridges that pose an obstacle to waterborne navigation. As NS explained in its Reply Evidence, however, Truman-Hobbs funding is limited to alterations, structural changes, replacement, or removal of *pre-existing* bridges. *See* 33 C.F.R. § 116.01(c); *see also* 33 U.S.C. §§ 512 *et seq*; NS Reply III-F-208–211. Because the DRR would be constructing the original bridges, it would be required to pay the full cost of new construction, and would not be eligible for any Truman-Hobbs funding.

DuPont attempts to evade the clear limits on and purposes of Truman-Hobbs funding with a convoluted argument that the DRR may not be denied a subsidy from that program, even though NS did not obtain such a subsidy for constructing the bridges at issue. *See* DuPont Rebuttal III-F-102-04. DuPont contends that because NS would have been eligible to apply for Truman-Hobbs funding to replace movable bridges on the NS system in 2009, the DRR would also be eligible to apply for such funding. But this argument misses the point: in order to be eligible for bridge removal or replacement funds under the Truman-Hobbs Act, a rail carrier must first own an existing movable bridge. The whole purpose of the federal program is to encourage changes to existing bridges to eliminate the obstacles they pose to water navigation. Starting from nothing, a new entrant like the DRR would own no existing bridges—it would have to construct its rail bridges in the first instance. In developing stand-alone costs for a SAC presentation, the complainant must include costs for all necessary capital investment incurred by the incumbent carrier. *See, e.g.*, *FMC*, 4 S.T.B. at 797, n.161. Here, that includes the cost of the original construction of movable bridges, *not* simply subsequent costs incurred to alter or replace the bridge to better accommodate water navigation. The limitation on Truman-Hobbs funding to make changes to existing bridges is dispositive in this case.

Furthermore, DuPont's rationale is founded on the erroneous premise that all movable bridges are "entitled" to Truman-Hobbs funding. DuPont Rebuttal III-F-102 ("NS is entitled to

Truman-Hobbs Act funding in 2009 for all existing movable bridges."). NS and other rail carriers may be eligible to apply for such federal funding, but none is *entitled* to such funding. The program is discretionary and historically has received extremely limited funding. In order to obtain Truman-Hobbs cost sharing support from very limited program funds, an eligible railroad must apply and obtain approval from the Coast Guard, which in turn must decide which competing projects to fund and in what amount, from funding that is grossly insufficient to finance all eligible projects.

The DRR, like a real-world railroad, cannot assume that all of its movable bridge projects could obtain funding even if they were technically eligible. DuPont has presented no evidence whatsoever to support its extremely dubious assumption that the DRR would successfully obtain Truman-Hobbs subsidies for all 26 movable bridge spans on the DRR. Indeed, as NS explained in its Reply Evidence, only 27 bridge modifications or replacements received Truman-Hobbs funding in the 72-year history of the program from 1940 to 2012. NS Reply III-F-208. All but four of these projects were funded prior to 2009, when the DRR would be seeking to fund the construction of movable bridges. Thus, at best, federal funding was available to assist in the financing of rehabilitation, removal, or replacement of four movable bridges nationwide for all rail carriers in 2009.[180]

Thus, even if the Board were to accept the use of Truman-Hobbs funds to subsidize SARR bridge construction, which it should not, the program had insufficient funding to pay for the DRR movable bridge replacement.[181] Even for replacement or modification of existing

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[180] Furthermore, bridge projects that are selected for funding are not guaranteed a 90% contribution by the federal government. Costs are apportioned under a formula that requires the bridge owner to "bear such part of the cost attributable to the direct and special benefits which accrue to the bridge owner as a result of alteration to the bridge." *See* 33 C.F.R. § 116.50. For example, the NS bridge crossing the Mississippi River in Hannibal, Missouri is one of the two NS bridge projects which received federal funds. But the federal government only paid 78% of the cost, not 90%. *See* NS Reply III-F-211.

[181] Because Truman-Hobbs funding is not available for original bridge construction, a necessary premise of this discussion is that the DRR would somehow secure such federal funding to "replace" bridges constructed by NS. This would be contrary to basic SAC theory and

bridges (which the DRR would not own), the DRR would have been eligible to compete for funds that in the real world were exhausted by four bridge projects. DuPont attempts to obscure this reality by citing the $142 million dedicated to Truman-Hobbs in the American Recovery and Reinvestment Act of 2009. *See* DuPont Rebuttal III-F-101. But $142 million would not come close to funding the 26 movable bridges along the DRR. That $142 million was the sum total of the money available to fund Truman-Hobbs project subsidies in 2009 and beyond. The Department of Homeland Security and Coast Guard issued a report finding that the $142 million appropriation was sufficient to fund only four bridge projects.[182] Thus, even in the event that the DRR somehow were to receive 100% of available Truman-Hobbs funding from 2009 through the completion of DRR construction—which would be extremely unlikely because of the other, worthy projects that were actually selected for funding—those available funds would subsidize the construction of only four bridges.[183]

### 2. Requiring the SARR to Pay to Construct Facilities that the Incumbent Paid to Construct is not a Barrier to Entry.

DuPont further attempts to muddy the waters with a confused argument that requiring a SARR to pay to construct the same facilities with private funding that the incumbent built with private funding in the first instance somehow constitutes a "barrier to entry." DuPont's contention ignores the definition of barriers to entry, including the definition the Board articulated in the case upon which DuPont relies. *See* DuPont Rebuttal III-F-103. Barriers to entry are "those 'costs that a new entrant must incur that were not incurred by the incumbent.'"

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principles, which posit that the SARR must develop full current costs of constructing facilities needed to serve its traffic.

[182] *See* "Alteration of Bridges, Program Specific Recovery Act Plan (May 14, 2009) *available at* http://www.dhs.gov/xlibrary/assets/recovery/CG_Alteration_of_Bridges_Program_Plan_5-15-09.pdf.

[183] DuPont has offered no evidence whatsoever to demonstrate that the DRR would be able to compete successfully with the projects that were actually funded using American Recovery and Reinvestment Act funding in 2009. Indeed, DuPont has not even identified DRR bridges that it contends would be eligible to seek Truman-Hobbs funding. As the statute and governing regulations demonstrate, the mere fact that a bridge crosses a navigable waterway does not mean that it unduly obstructs waterborne navigation or would be eligible for consideration for federal subsidy under the Truman-Hobbs Act.

*Burlington Northern R.R. Co. v. STB*, 114 F.3d 206, 214 (D.C. Cir. 1997) (*citing West Texas*, 1 S.T.B. at 670). As NS demonstrated, the evidence shows that NS or its predecessors-in-interest paid the full cost of most of the movable bridges on the DRR. *See* NS Reply III-F-210–11.

NS further explained the unique circumstances affecting two movable bridges which do appear to have received federal funding for replacement. *See id.* In its Rebuttal Evidence, DuPont cites these as "examples" of NS bridges that received federal funding. DuPont Rebuttal III-F-104. But the two identified bridges are not "examples," they are the *only* bridges on the DRR system for which NS received Truman-Hobbs funding. *See* NS Reply III-F-210. DuPont has offered no evidence to the contrary. And, even if the DRR were able to obtain Truman-Hobbs funding for the replacement of these two bridges, it could only do so *after* it had incurred the full costs of constructing the bridges in the first instance. By paying the full construction cost of movable bridges, the DRR would incur a cost that the incumbent carrier itself incurred in constructing the lines necessary to carry DuPont's selected traffic.

Further attempting to manipulate the "barrier to entry" concept, DuPont contends that the SARR should be required to pay for an asset only those costs the incumbent would pay in the current market. DuPont Rebuttal III-F-103. DuPont goes on to claim that because NS already owns the movable bridge spans in question and thus might be eligible for Truman-Hobbs funds to alter or replace those bridges, the DRR must also be eligible for Truman-Hobbs funds to "replace" those bridges. *See* DuPont Rebuttal III-F-104.[184] The gaping hole in DuPont's facile

[184] To support its confused argument, DuPont engages in semantic sleight of hand using the term "replacement." As employed in DuPont's newfound movable bridges argument, "replacement" would refer to alteration, modification, or rebuilding of an existing structure using a government subsidy that was not available to the incumbent when it constructed the bridge. In contestable market theory and SAC presentations, however, "replacement" of a bridge or other infrastructure refers to the new entrant's construction of that infrastructure in the first instance, not subsequent modification or reconstruction of existing infrastructure. The remainder of DuPont's own road property investment evidence shows it does not really believe the linguistic rationale it uses to justify discounting DRR movable bridge costs by 90%. If "replacement cost" in SAC parlance referred to only the cost the incumbent carrier would incur to modify or refurbish its existing rail system, many of the other costs DuPont developed and presented in its Section III-F case-in-chief and Rebuttal Evidence would be unnecessary. *See, e.g.*, DuPont Opening III-F-8 (allocating costs for clearing and grubbing for the "original construction of the DRR lines"); *Id.* at III-F-17–18 (providing funds for lateral and yard drainage).

argument is that Truman-Hobbs funding is available only to those who already own an existing bridge. As a new entrant to the market, the DRR would not own any existing railroad bridges. Under well-established SAC principles and law, the SARR must pay the cost of constructing necessary infrastructure, *not* merely the cost of making alterations to a pre-existing rail network. Road property is the "major investment cost component" in SAC cases. *Metro Edison Co. v. Conrail*, 5 I.C.C. 2d 385, 417, n.41 (1989). The methodology for developing road property investment costs requires the SARR to "duplicate or replace (at today's cost) the incumbent carrier's investment property." *Id.* The road property investment made by the SARR must make it "capable of providing the service." *Id.* Indeed, the whole point of a "bottom-up" road property investment analysis like that posited by DuPont in this case is to determine what it would cost a new entrant to build the necessary rail infrastructure from scratch, *not* what it might cost to modify the incumbent's existing infrastructure.

Although cloaked in "barriers to entry" language, DuPont's position is contrary to fundamental SAC principles and rules. Under DuPont's theory, a SAC complainant could avoid most construction and road property investment costs by positing that, rather than pay to construct a rail network, the SARR would simply take over the incumbent's existing assets free of charge and then pay only the costs of any necessary alterations or modifications to the incumbent's infrastructure. Rate case complainants could thus assert the SARR is not responsible for roadbed preparation and building new track but may simply modify, expand, or rehabilitate existing track structures, thereby avoiding some of the most significant SARR construction costs, including land and roadbed preparation. Of course, this is not the law and would not be allowed because it would render SAC analysis and results meaningless.[185] A fundamental and indispensible component of a valid SAC analysis is calculation of the full road

[185] For example, it has long been established that a SARR must pay for the clearing and grubbing of the roadbed, as well as all earthwork necessary to prepare the roadbed. *See, e.g.*, *West Texas*, 1 S.T.B. at 705. A SAC complainant could not minimize such costs by contending that the incumbent (having already built the track) would not incur clearing and grubbing costs if it "replaced" the track today.

property investment cost necessary to construct the entire SARR. With the limited exception of costs the incumbent railroad was not required to incur, a viable SAC analysis must calculate the full costs of constructing the railroad from scratch, including movable bridges. The relevant measure is the cost of constructing a bridge, not the potentially subsidized cost of subsequently altering that bridge.

DuPont's position and evidence concerning movable bridge construction costs is barred as improper rebuttal and indefensible on the merits. For either or both of those independent reasons, the Board should reject DuPont's evidence and adopt the movable bridge costs NS developed, supported, and presented in its Reply Evidence.

### D. Other Bridge Elements

DuPont's Rebuttal rejected two major common-sense improvements that NS's bridge engineering experts made to DuPont's fundamentally flawed Opening bridge cost approach, the first regarding bridge height and the second regarding the matching of span designs with appropriate abutments and piers. DuPont's bridge height and pier and abutment assumptions for NS bridges that would be replicated by the DRR are not physically feasible and could not support rational cost estimates for feasible bridges. The two major corrections NS provided on Reply are essential to feasible bridge design. Anything less would result in DRR bridges with piers that hover in thin air (impossible) or crumble under the weight of bridge spans and passing trains.

#### 1. NS's Bridge Height Evidence is far Superior to DuPont's.

DuPont utterly disregarded the real-world maximum bridge height data produced by NS in discovery in favor of what it variously refers to as its "estimated," "average," "necessary," or "standard" bridge height. *See, e.g.,* DuPont Rebuttal at III-F-88; DuPont Opening at III-F-34. But DuPont's characterization of its approach is fiction. Contrary to DuPont's suggestion, it calculated *no* "averages" or "estimates" using the bridge height data produced by NS. Indeed, DuPont's approach did not use actual NS bridge height data at all. Rather, DuPont simply fabricated arbitrary categories of bridge heights without any support whatsoever in the actual NS

bridge data. DuPont's arbitrary assignment of a "standard" height to each bridge category is irrational and ignores that each bridge must have sufficient height to clear the specific terrain feature it crosses. For example, it cannot be true that the necessary height of a bridge over a waterway with a known maximum height of fifty feet is a "standard" eleven feet high. *See, e.g.,* NS Reply III-F-173-176.[186] Yet this is the position DuPont took on Opening and maintained in its Rebuttal. Assuming instead that this bridge is fifty feet high, as NS does in its evidence, is far more reasonable. NS's bridge height evidence should be adopted as the only reasonable and supported evidence.

On Rebuttal, DuPont made no real effort to defend or adjust the faulty bridge height approach it proffered in its Opening. Instead, DuPont simply complained that NS had provided "no evidence that all piers are always placed at the location of the bridge maximum height," and adhered to the same arbitrary and indefensible approach it used on Opening. *See* DuPont Rebuttal at III-F-89. In contrast, NS's Reply explained the basis for its assumptions, and why those assumptions are reasonable and generate pier heights that, overall, accurately represent pier heights for feasible real-world bridges.[187] Bridges generally are centered over the feature they cross, and a support pier is usually placed in the center to minimize the longest span distance. NS does not claim there would be no exceptions to its pier-centering assumption. Indeed, for bridges both over waterways and roads, NS acknowledges that there may be some instances of asymmetrical terrain that might require a pier to be placed off-center. Overall, however, NS's

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[186] This is an illustrative example. As the evidence shows, the large majority of DRR bridges—comprising thousands of bridge locations—are infected by DuPont's erroneous and indefensible height assumptions, which are untethered to actual bridge height data and substantially and systematically understate the necessary heights of NS bridges the DRR would replicate. *See* NS Reply III-F-171–175.

[187] DuPont's complaint about NS's pier spacing assumptions should not be allowed to obscure the more fundamental threshold flaw in its bridge height approach: DuPont's assumed bridge heights are entirely arbitrary and are not based on the actual bridge height data that NS produced in discovery. In contrast, NS's Reply Evidence used the actual bridge height data as the basis for its DRR bridge height approach and to derive the heights of piers necessary to support bridges with the maximum heights recorded in NS's actual bridge data. Before even considering the spacing of piers, DuPont's failure to tie its hypothetical bridge height assumptions to the real world conditions the DRR would encounter necessarily dooms its bridge design approach.

assumption that single bridge piers are centered is far more reasonable and likely to produce accurate cost estimates than DuPont's one-height-fits-all assumption.

For the first time on Rebuttal, DuPont offers a new and utterly unsupported claim regarding the maximum bridge height information produced by NS. DuPont's newly minted claim alleges that the NS maximum bridge height represents the height not of the bridge, but the height of the top of the rail on the bridge. *See* DuPont Rebuttal III-F-88. This is flatly wrong—DuPont has confused bridge height with track elevation. They are not the same thing, and the peculiar new rationale DuPont proffered on Rebuttal should be rejected out of hand.

Even if DuPont had shown that the arbitrary "standard" bridge heights it posited somehow were an accurate estimate of average DRR bridge heights—something it utterly failed to do—DuPont's averaging approach still would be fundamentally flawed and would systematically understate bridge costs. If DRR bridges were designed to their actual real-world heights, some would be taller and some would be shorter than DuPont's arbitrary "standard" height. However, because bridge costs increase exponentially with increases in height—a principle that DuPont acknowledged in Opening—it is more accurate to cost one short bridge and one tall bridge and then average the two costs rather than to first average the two bridge heights and then develop a cost. *See* DuPont Opening at III-F-34. This logic and conclusion are indisputable. And it exemplifies a fundamental premise of NS's bridge cost evidence that DuPont's approach repeatedly disregards: that any valid bridge cost method should to the fullest extent possible recognize the large variety of terrain and features over which bridges are built, since simply "averaging out the differences" will result in inaccurate cost estimates.

### 2. DuPont's One-Size-Fits-All Bridge Substructure Assumptions are Infeasible and Illogical and must be Rejected.

DuPont relies on a flawed and infeasible one-size-fits all substructure assumption, thereby rejecting the obvious principle that longer and therefore heavier bridge spans require more substantial support (*i.e.,* more and more substantial piers and abutments). This proposition

is so rudimentary and DuPont's responses are so illogical and factually incorrect that it appears that DuPont may be confused about its own methodology and NS's corrections. For example,

- DuPont mischaracterized NS's Reply Evidence by asserting that NS did not apply different pier and abutment types to different types of spans.[188]

- DuPont incorrectly asserts that its DRR replacement bridge designs and components are "currently in use in existing bridges." DuPont Rebuttal III-F-4, n.251. In reality, none of the DRR bridges posited by DuPont use the same combination of span, piers, and abutments as any of the existing bridges cited by DuPont.[189] Because those real world bridges use different combinations of components, they do not have the same design hypothesized by DuPont and do not support the feasibility of DuPont's hypothetical designs.

- DuPont asserts that it provided engineering calculations sufficient to show that its piers and abutments could support the loads imposed by its spans. This is false. DuPont provided no calculations of the loads imposed by the spans it posited and no calculations of the load bearing capacity of the piers it designed. Because DuPont failed to furnish such calculations, of course it could not compare the data that would result in the manner required for a meaningful design.[190]

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[188] At some points in Rebuttal DuPont denies that NS uses different types of piers for different span types and pier heights. "NS did not do anything different than what DuPont did other than separate the bridges into different tabs of its spreadsheet" (DuPont Rebuttal III-F-92). At other points, DuPont does acknowledge NS uses different types of piers. "[NS piers] reflect different details and quantities specifically tied to the design loads of a longer Type III span" (DuPont Rebuttal III-F-96). Review of NS's Reply Evidence shows that NS clearly explained why and how it designed new piers. "The taller a pier structure is, the less weight it can support" and "the shorter span has less dead load . . . [and] the shorter span is required to support [less] of a train's length" (NS Reply III-F-190). "NS had to design additional piers to be used with Type I and Type II spans . . . [and] NS had to design entirely new piers to be used with Type III and Type IV spans" (NS Reply III-F-191). Reply workpapers show that different piers and abutments are used for different span types and heights. *See* NS Reply WP "Bridge Construction Costs Errata Reply.xlsx," Tab "Bridges – Type I Spans Only," Cells AE2:AF12 column S and Tab "ridges – Type III Spans Only," Cells AD2:AE12 and column R.

[189] For example, compare the pier types in DuPont Opening workpapers "Type I_Photos and Plans.pdf," "Type II_Photos and Plans.pdf," "Type III_Photos and Plans.pdf," "Type IV_Photos and Plans.pdf." They are all different types of piers. Further, compare these piers with DuPont's own design for piers shown in DuPont Opening workpapers "BR01-Pier Typical.pdf," "BR02-Pier Typical Sections.pdf," "BR03-Pier USCG.pdf," and "BR04-Pier USCG Sections.pdf." These are different types of piers than any of those illustrated in DuPont's photos.

[190] *See* DuPont Opening WPs "Type I_Photos and Plans.pdf," "Type II_Photos and Plans.pdf," "Type III_Photos and Plans.pdf," "Type IV_Photos and Plans.pdf," "BR01-Pier Typical.pdf," "BR02-Pier Typical Sections.pdf," "BR03-Pier USCG.pdf," and "BR04-Pier USCG Sections.pdf."

- DuPont erroneously claims NS did not prove that DuPont's Opening bridge designs were insufficient, ignoring the calculations in NS's Reply showing just that.[191]

These points demonstrate that while DuPont argues on Rebuttal that its bridge designs are similar to NS's, validated by real-world use, and defended by engineering calculations, those conclusions are belied by the facts. At bottom, DuPont advocates an absurd and infeasible substructure design: using the exact same pier and abutment designs to support all bridge spans ranging from 20 feet to 92.5 feet in length.[192] If a particular pier were actually strong enough to support a 92.5 foot span, using the same pier to support a 20 foot span would be a gross and unparalleled waste. As NS has demonstrated, however, DuPont's proposed piers are *not* strong enough for 92.5 foot spans. *See* NS Reply III-F-196–97. Instead of DuPont's untenable approach and infeasible results, NS took the more realistic and accurate approach of designing piers and abutments tailored to the specific burdens imposed by each span type based on their weights per foot, the horizontal loads of passing trains, and the required lengths of the spans. *See* NS Reply III-F-194, 196 & 201.

After doubling down on its fictional height "estimates" and homogeneous bridge designs that render its own bridge evidence infeasible, DuPont's Rebuttal claims to identify areas where NS's evidence overstated bridge costs. *See* DuPont Rebuttal III-F-91. DuPont's criticisms of NS's evidence are unavailing. For example, DuPont claims NS reduced stress limits below minimum AREMA recommendations. Those very guidelines, however, instruct bridge engineers to make a "due allowance" to adjust the recommended minimum to account for

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[191] *See* DuPont Rebuttal III-F-96. *See* also NS Reply WP "NS Type III Bridge.pdf" at 19, showing an allowable load of 192,000 pounds for each pile in DuPont's pier design. Page 20 shows loads imposed on each pier pile by DuPont's Type III superstructure design ranging from 283,000 pounds to 435,000 pounds, or from 1.5 to 2.3 times greater than the design load capacity. Page 21 shows an allowable load of 139,500 pounds for each pile in DuPont's abutment design. Page 22 shows loads imposed on each abutment pile by Type III superstructure design ranging from 153,700 pounds to 178,300 pounds, or from 1.1 to 1.3 times the design load.

[192] *See* DuPont Rebuttal WP "Bridge Construction Costs Rebuttal.xlsx," Tab "Only Active Bridges," Cells Aj3422 and AJ5020. DuPont's Rebuttal did use a different pier type for *two* bridges. *See id.* at III-F-96.

horizontal load stress to prevent column buckling.[193] DuPont also faults NS for using four piles instead of six for smaller abutments. *See* DuPont Rebuttal III-F-94. But this cost-saving change is consistent with SAC principles and the least cost stand-alone cost standard.[194] DuPont also alleges NS adjusted the steel type in abutments from A30 to A572 in order to increase quantities. *See* DuPont Rebuttal III-F-97. But this adjustment has no effect on quantities.

A final example is emblematic of DuPont's numerous erroneous and misguided bridge design and cost claims, and its disregard for standard bridge design. DuPont claims to have identified five pier designs that NS over-designed, including one that DuPont claims would be more than 38 times stronger than necessary. *See* DuPont Rebuttal III-F-96. In support of this claim, DuPont submitted a workpaper using NS design calculations showing that the "selected reinforcement for pure bending" burden is roughly 38 times the load capacity of a 41-foot pier.[195] DuPont's cursory and careless argument fails to take into account the essential fact that piers are subject to *both* lateral bending (coming from train braking, acceleration, wind, etc.) *and axial compression* (coming from the weight of the train and superstructure). By focusing only on lateral load and bending, DuPont ignored the more substantial effects of axial load and compression. Had DuPont reviewed NS's complete calculation for lateral bending and axial compression loads—that is, whether a pier simultaneously can withstand both—it would have seen that NS's experts designed a pier with an allowable load that is only five percent over the imposed load, providing a margin that is well within standard design practice.[196] DuPont made similar errors for all piers it alleges are over-designed.[197]

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[193] *See* DuPont Rebuttal III-F-96 and DuPont Rebuttal WP "NS Pier Stress.pdf" at Page 2.

[194] *See* NS Reply WP "Bridge Construction Costs errata Reply.xlsx," Tab "Abutment Piles," Cells C21 and F18.

[195] *See* DuPont Rebuttal WP "Examples of NS Over-designed Piers.pdf" at 3 (corresponds with page 309 of NS Reply WP "NS Type III Bridge.pdf").

[196] *See* NS Reply WP "NS Type III Bridge.PDF" at 315 [1 - (53,038 allowable pier load/55,811 calculated pier load) = 4.97% ].

[197] *See* NS Brief Ex. 6 and DuPont Rebuttal WP "Examples of NS Over-designed Piers.pdf."

### 3. DuPont's New Rebuttal Bridge Height Distribution Claim for Large Bridges is Unsupported and Unreasonable.

DuPont also contests NS's assumption regarding the mix of pier heights for larger bridges. Based on their experience with designing larger bridges, NS's experts made reasonable assumptions that bridge pier heights will be evenly distributed between one-quarter of maximum height and maximum height.[198] On Rebuttal, DuPont introduced a new and unsupported claim that 75% of a tall bridge's length is at 25% of maximum height. If this claim is intended to support DuPont's Opening Evidence, it should have been presented as part of its case-in-chief on Opening. *SAC Procedures*, 5 S.T.B. at 446; *Xcel*, STB Docket No. 42057, at 2 (served April 4, 2003). But, the example DuPont relies upon to support its new position actually indicates that NS's evenly graduated distribution is a better estimate than DuPont's alternative distribution.[199] This is unsurprising because NS's approach is based on the reasonable assumption that the tall bridges traverse roughly symmetrical valleys. In contrast, the assumption implicit in DuPont's approach is that valleys crossed by bridges generally consist of gentle terrain requiring limited bridge clearance, occasionally interrupted by sudden, steep, and narrow gorges.

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[198] *See* NS Reply III-F-214.

[199] *See* NS Reply WP "NS DuPont Special Bridges Exhibit (9_29_2012).pdf." NS provided 12 examples of exceptionally tall bridges to support its approach, and in every instance the NS approach more closely approximates the actual height distribution than the new approach proffered in DuPont's Rebuttal. DuPont selected from the 12 examples the one for which DuPont's approach would generate the closest approximation of the actual height distribution. However, even for the most favorable example to DuPont's position, the NS approach still yields a much closer approximation of actual height distribution. A bridge using NS's even height distribution of 100%, 75%, 50%, and 25% of maximum height would yield a weighted average height equal to 63% of maximum height. The example bridge raised by DuPont is roughly distributed at 100% maximum height for half of the length and at 25% of maximum height for half of the length, which also yields a weighted average height equal to 63% of maximum height. A bridge using DuPont's distribution of maximum height for 25% of the length and 25% of maximum height for the remaining 75% of the length would yield a weighted average height of 44% of maximum height.

## E. Other Earthwork and Roadbed Preparation.

### 1. NS's Soil Preparation Evidence is Conservative and based on Documented Soil Conditions, while DuPont Relies Entirely on Extrapolation from a Small Project Conducted in Optimal Soil Moisture Conditions.

Both NS and DuPont provided evidence showing that soil preparation—including wetting and drying—is an integral step in the earthwork process.[200] DuPont does not include separate costs for this necessary work because it contends Trestle Hollow project costs should adequately cover "costs associated with any water for compaction that might be necessary." DuPont Opening III-F-15.[201] NS's Reply presentation analyzed diverse regional and system-wide data to determine the amount of DRR soil that would require preparation before placement as embankment. On Rebuttal, DuPont is conspicuously silent about its own dubious assumption for soil preparation: that soil conditions throughout the widespread DRR system would mirror those encountered by the Trestle Hollow project. Remarkably, DuPont then asserts that the scope of NS's actual study is too narrow.

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[200] *See* DuPont Opening WP "Trestle Hollow Project Specs.doc" at 160, Spec 3.5.10.A and B and NS Reply WPs "NS Grading Spec.pdf," "NS WP Compaction Standard Compaction Curve.docx," and "Railroad_Engineering_William_Hay-Water and Compaction.pdf."

[201] Because NS conservatively assumed that 30 percent of excavated material would be wasted, the portion of excavated soil actually used for embankment that would require subgrade preparation is effectively 29 percent (*i.e.,* 100% - 30% = 70%, and 20/70 = approximately 29%). NS's assumption that only 20 percent of excavated soil—representing 29% of excavated soil used for embankment—would require drying or wetting is conservative. In those prior cases in which the Board rejected water for compaction, the proffering party argued that 100 percent of the excavated soil would require water for compaction. In this case, NS conservatively estimates that in those areas where soil conditions would require subgrade preparation, less than one-third of excavated soils would require wetting or drying. NS used this conservative assumption to reflect the fact that subgrade preparation is most important at or near the surface and crown of the roadbed. *See* NS Reply at III-F-93; NS Reply WP "Railroad_engineering_ William_Hay-Water and Compaction.PDF" at 306 (stating that "[t]he last 2-4 ft of fill require special attention…", which NS engineers considered when conservatively choosing to apply water for compaction only to the crown of the roadbed.). The average height of fill for DRR valuation segments is about 12 feet. *See* "DRR Open Grading errata NS Reply.xlsx," Tab "Calculations," Column O. NS engineers assumed a water for compaction factor of 29% of re-used common excavation and 20% of borrow based upon the range suggested by Hay in light of the average DRR average height of fill: [2 feet lower boundary from Hay/12 feet average fill height = 16.6%] < 20% to 29% <[4 feet upper boundary from Hay/12 feet average fill height = 33.3.

DuPont first feigns confusion about NS's analysis. It claims NS's "initial identification of which areas are 'wet,' 'dry,' or 'opt' is unsupported and confusing at best." *See* DuPont Rebuttal III-F-54. DuPont also claims to be confused by the fact that the NS study evaluated data for 38 separate locations proximate to the DRR route and based on its analysis of that data identified 38 corresponding soil types. *Id.* at III-F-53. All of NS's assumptions are laid out in its workpapers. *See* NS Reply III-F-87–93. The NS study method is straightforward: record the natural moisture content (NMC) readings at one of 38 soil stations identified along or near the DRR right of way, assign an optimum moisture content (OMC) based on referencing the predominant soil type at the soil station in the cited tables, and then add wetting or drying to the soil depending on whether these two numbers differ.

DuPont then argues that the 38 stations used by NS are not representative, complaining that the link between the map NS used and the DRR network "is non-existent." DuPont Rebuttal III-F-54. DuPont's claims do not withstand scrutiny. First, DuPont's evidence relies on only one sample location—the Trestle Hollow project—for the entire 7,300 mile DRR. NS's analysis is nearly 40 times more specific. Moreover, DuPont's Rebuttal concession that the Trestle Hollow project required water for compaction confirms that NS's method is conservative. Although Trestle Hollow is not on the DRR route, application of NS's method using data from the nearest soil station would result in an assumption that it would not be necessary to wet the soil in that location. *See* NS Reply WP "DRR Soil Moisture Content R1.xlsx," Line 25. Second, the NS analysis included documented references and links to the SCAN and WSS resources it used, which DuPont obviously did not review. Third, although DuPont portrays the components of the NS soil analysis (*i.e.,* the DRR network, the soil survey locations, and the physiographic provinces) as disjointed, the interactive map NS provided clearly demonstrates their integration. *See* NS Reply WP "DRR_Geo_Loc.pdf." Specifically, the map shows that various physiographic regions have multiple soil survey stations near the DRR route, and NS engineers selected those stations for use in their estimating process. The NS approach provides at least the same level of support as the Ecosystem Domain Maps that the Board accepted in the *TMPA*

decision, and buttresses that support with location-specific soil moisture measurements. *See TMPA I*, 6 S.T.B. at 707. Fourth, NS furnished DuPont with all information necessary to look up the valuation segments and corresponding soil classifications on the map if it chose to do so. For example, NS classified soil along valuation segment ERIE-8-NY as "dry" due to its close proximity to the soil station in Corning, NY, which reports dry soil, and the remainder of soils in the state of New York as "optimum," based on data from a soil station in Geneva, NY, which reports "optimum" soil.[202] This simple and straightforward exercise is similar to tasks parties routinely perform in developing and evaluating SAC evidence. For example, parties conducted similar work when they assigned valuation segments to the SARR network.

DuPont also criticizes NS's unit costs and specifications for soil preparation. To develop unit costs for water for compaction, NS used the cost that DuPont selected from Means in its grading spreadsheet. NS simply corrected those costs to eliminate DuPont's unsupported assertion that the Means handbook mistakenly listed a cost per embankment cubic yard when it intended to list a cost per cubic yard of water.[203] DuPont provided no evidence to justify its departure, which is at best unlikely given that Means does not list any other prices denominated in cubic yards of water and that all the other Means items listed in cubic yards and related to grading refer to soil quantities. The reason costs for watering are higher than the costs of drying is that the former requires a material cost for water (including hauling) and a corresponding crew that is twice as expensive.[204]

### 2. Undercutting and Fill

Undercutting would be necessary in areas of the DRR right-of-way that traverse wetlands. As NS explained, unsuitable soils that characterize wetland areas require additional

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[202] *See* NS Reply WP "DRR Open Grading errata NS Reply.xlsx," Tab "Subgrade_Preparation" Rows 89 and 90 and NS Reply WP "DRR Soil Moisture Content R1.xlsx," Tab "DRR," Row 4.

[203] *See* DP Opening WP "DRR Open Grading.xlsx", Tab "Unit Costs", Rows 142 to 145.

[204] *See* NS Reply WP "Equipment Selection-Drying of soil for Compaction.xlsx" and DuPont Opening WP "Means Handbook pages.pdf" at 17. The drying crew is $840.44 per day whereas DuPont's Means item for water for compaction uses a B-45 crew which is $1,751 per day including material.

excavation and refilling with suitable materials. Although DuPont raises several criticisms of NS's identification of areas requiring undercutting and the costs of necessary undercutting work, its silence on two critical points alone militates in favor of adoption of NS's undercutting evidence. First, DuPont does not dispute NS's central premise that if the right-of-way traverses a wetland, then undercutting work should be accounted for somehow. Second, although DuPont offers several criticisms of NS's calculation of undercutting costs for wetlands, it does not offer alternative evidence or calculations of those costs. Thus NS has submitted the only evidence that calculates and supports costs for undercutting that DuPont concedes is necessary. In the absence of any other evidence, NS's submission is necessarily the best evidence regarding this construction cost that the parties agree is necessary, and the Board should adopt it.

Instead of presenting its own evidence regarding the costs of undercutting, DuPont simply criticizes NS's evidence with three alternative categories of argument: (i) the ICC Reports tacitly account for undercutting work; (ii) wetlands on the DRR route identified by NS may not really exist; and (iii) for any wetlands that do exist on the DRR route, NS's presentation used incorrect specifications for undercutting work and corresponding costs. *See* DuPont Rebuttal III-F-45. DuPont first claims, without meaningful explanation, that "subsidence quantities" on ICC Engineering Reports "likely" cover undercutting. Beyond that conclusory assertion, DuPont offers no meaningful argument or explanation of "subsidence" quantities, how they may be relevant to undercutting, or how undercutting quantities could be measured by ICC engineers using post-construction cross-sectional surveys. *See id.* Moreover, 152 of the 156 DRR route miles in wetlands are in areas (valuation sections) for which the Engineering Reports record no "subsidence" quantities. The near-complete lack of subsidence quantities in the very areas where undercutting would be most necessary is powerful evidence that the subsidence category is unrelated to undercutting.[205]

[205] DuPont finds "subsidence" quantities on fifteen valuation segments in seven northeastern and Midwestern states: Illinois, Indiana, Ohio, Pennsylvania, New York, New Jersey, and Virginia. Only twelve miles of the DRR traverse wetlands in these states. Contrarily, nearly all DRR route miles that traverse wetlands are in southeastern states. Alabama, Georgia, and Mississippi alone

DuPont also weakly suggests that undercutting quantities may have been estimated by the ICC engineers based upon their observation of unsuitable material in the area surrounding the completed roadbed. Such speculation is not only unsupported, it is implausible. What DuPont suggests is that surveyors might observe nearby unsuitable soils at the surface level, then somehow guess the depth and quantities *below* the surface of a railroad right-of-way that is already built, and finally lump the resulting guesswork quantities into line items for other types of excavation. Given the lack of any documentary support for this speculation, DuPont is further suggesting that the ICC surveyors would engage in this entire unorthodox process without noting, describing, or explaining it (or by simply labeling it "subsidence"). Such compound speculation without any supporting evidence whatsoever simply cannot be accepted. DuPont adds insult to injury by making the disingenuous argument that the 30% portion of common excavation that is assumed to be wasted accounts for undercutting of unsuitable soil. As DuPont's consultants know, the 30% assumption has been used by the Board for quite some time, and it is unrelated to undercutting requirements. Indeed, the Board has never accepted either of DuPont's unsupported, far-fetched arguments that undercutting quantities are included in the Engineering Reports. When the Board has rejected undercutting costs in prior proceedings, it has been because the party advocating their inclusion failed to demonstrate the need for undercutting under the specific facts and circumstances of that case. *See, e.g.*, *Duke/NS*, 7 S.T.B. at 176. But as summarized below, NS's evidence *did* demonstrate a need for undercutting in a few areas traversed by the DRR.

To determine where undercutting would be necessary in this case, NS's experts used GIS maps of the DRR route provided in discovery in conjunction with publically available wetland

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account for 122 of 156 DRR wetland miles, yet there are no subsistence quantities found for any valuation segments in these states. *See* DP Rebuttal WP "Rebuttal foundation excavation and subsidence.xlsx" and NS Reply WP "DRR Open Grading errata NS Reply.xlsx," Tab "Undercutting – Wetlands."

maps.[206] NS provided to DuPont (and the Board) a precise description of the method and sources it used, which together provide everything it needed to audit NS's work.[207] Rather than conducting a review of what NS's experts actually did, DuPont ignored that evidence and claimed that NS used "magic" to translate a one-page map of the DRR to short milepost-specific segments of the DRR in wetlands. *See* DuPont Rebuttal III-F-47. What DuPont fails to understand is that the map is *not* NS's detailed analysis. Rather the map is a demonstrative exhibit that summarizes the results of the clearly described and source-documented GIS work by NS's experts. *See* NS Reply III-F-79–80.

DuPont's final line of attack on NS's undercutting evidence is a criticism of NS's specifications of necessary undercutting work and corresponding costs. *See* DuPont Rebuttal III-F-45. Again, it is important to recognize that DuPont does not dispute that undercutting work is necessary in wetland areas. Rather, DuPont criticizes NS's assumptions regarding the specific work that would need to be done. Although DuPont faults NS for not providing additional evidence to support its experts' judgment that undercutting would require, on average, a two-foot deep excavation, it does not express disagreement with the judgment of NS's engineering experts. Nor does DuPont propose, let alone support, an alternative undercutting depth. *See* DuPont Rebuttal III-F-46. Wetlands are characterized by saturated soil, sitting water, flush vegetation, and soft and sinking surfaces. It is thus understandable that DuPont made no attempt to explain how a less than two foot depth assumption or some other undercutting approach would be more accurate.

Moreover, NS provided further supporting evidence, including NS engineering specifications confirming undercutting is to be conducted at the depth determined by the

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[206] *See* NS Reply WP "NS Reply – Undercutting Unsuitable Soil – Wetland Exhibit – Narrative.docx"; NS Reply III-F-80.

[207] *See* NS Reply WP "NS Reply – Undercutting Unsuitable Soil – Wetland Exhibit – Narrative.docx." "Those portions of the route where the track traversed a segment of wetlands equal to or greater than 0.5 miles in length and were discernible on both sides of the track at a scale of 1:160000 (approximately 1 inch = 2.5 miles) were included in this map."

supervising engineer based on conditions in the field; photographs of actual undercutting work performed by NS along the DRR route; and statements from engineers confirming that a two-feet deep undercutting assumption was reasonable and conservative based on their real world project experience. *See, e.g.,* NS Reply WP "Undercutting write-up.pdf."

DuPont also claims that borrow material would not be necessary to replace unsuitable soils, because nearby common excavation material could be used to backfill the undercut areas. DuPont's unsupported assertion ignores the fact that in a wetland area it is unlikely that nearby on-site cuts would contain significant volumes of suitable soil. Further, DuPont offered no evidence to show that transporting common excavation materials from a DRR location containing suitable soils would be less costly than the NS assumption of replacing unsuitable materials with borrow. *See* DuPont Rebuttal III-F-46.

**3. Other Earthwork**

**a. Swell**

Accounting for swell is a simple matter of correctly interpreting and applying Means. In prior cases, parties have confused the issue by submitting confused and unsupported evidence. DuPont's Rebuttal adds to the confusion. However, NS documented clearly in its Reply that Means reports unit costs in Bank, Loose, and Embankment Cubic Yards measures. The Means manual provides a clear set of instructions for applying those unit costs to the correct quantity measures. NS followed those instructions when developing Means unit costs; DuPont did not.

More specifically, the ICC Engineering Reports record earthwork quantities in bank cubic yards ("BCY"). For those cost categories for which Means uses units of measure other than BCY, the Engineering Reports quantities must be converted to allow an accurate cost calculation. With respect to hauling costs, the BCY quantities used by the Engineering Reports must be converted to Loose Cubic Yards ("LCY") in order to apply the Means unit costs, which are expressed in cost per LCY. NS properly converted the BCY to LCY to allow calculation of hauling costs. *See* NS Reply III-F-85. DuPont refuses to make this necessary conversion, raising a variety of irrelevant or unfounded arguments to attempt to justify that refusal. *See*

DuPont Rebuttal III-F-49–51. The Board should adopt NS's correct and accurate application of Means-based costs.

DuPont uses several different tacks to confuse what should be a straightforward issue, including making assertions that are irrelevant to the issue. For example, DuPont notes that contractors are typically paid in bank quantities. NS agrees this is typical, and that fact is reflected in NS's workpapers.[208] DuPont further asserts that "[t]he contractor bases his bid on these bank quantities and any additional hauling based on swell is factored into the bid." DuPont Rebuttal III-F-50. Again, NS has already confirmed this assumption using Means.[209] Neither assertion, however, addresses the crux of the present issue, which involves the conversion of different units of measure to common units.

Means analyzes actual project bids and then develops unit costs using different quantity measures, including but not limited to BCY. Logically, unit costs should be applied to corresponding quantity measures to calculate the cost of a given quantity of material or work. Thus, if Means reports unit costs for bank quantities, those unit costs should be applied to quantities measured in bank quantities, and so forth. Because different quantity measures (units) may be used in different circumstances, Means provides instructions for conversions between different units. If all unit prices could be applied directly regardless of the unit of quantity measure, conversions would not be necessary and Means would not provide conversion formulas. In a section of the manual not used by the parties to derive unit costs, Means does provide some "system component" unit costs that do not require swell adjustments. This is because the component units have already been adjusted for swell factors. As Means explicitly advises, "All costs given in these systems include a swell factor of 25% for hauling"[210]

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[208] *See* NS Reply WP "Swell and Shrinkage – Ringwald, Means heavy Construction Handbook.pdf" at 2 ("*BCY is the unit of preference in discussing earthwork of any kind. On heavy construction jobs, the cubic yard figure for which a contractor is paid a unit price is almost always in BCY*") (emphasis added).

[209] *See id.* ("*Nothing extra is paid for the loose or compacted states occupied by the same BCY throughout the course of the job*") (emphasis added).

[210] NS Reply WP "RSMeans Site Prep Worksheet – swell and shrinkage factor.pdf."

To put an end to any further dispute on this question, NS has provided an exhibit that shows that the hauling cost in the "system component" unit cost of $4.14 for one BCY is 28% higher than the same hauling cost listed for only one LCY unit of $3.24.[211] The inevitable conclusion is that Means adjusts the unit cost upwards to account for the fact that 1.00 BCY unit swells to 1.28 LCY units. *See* NS Brief Exhibit 7. When DuPont and NS assemble various Means-based line-items to generate a "system component" unit cost (*e.g.*, for adverse common excavation), they must apply swell factors—in the same manner Means does when performing the same type of work.

DuPont also speculates for the first time on Rebuttal that perhaps ICC Engineering Reports may have used a measure other than BCY. *See* DuPont Rebuttal III-F-50. But DuPont makes no showing that, contrary to longstanding understanding and usage, the Engineering Reports used some other, unspecified measure. Because DuPont does not even suggest a different unit that the Engineering Reports might have used, it provides no basis whatsoever for relying on a different unit. Moreover, DuPont's new theory is misplaced. Like DuPont, NS applies Means unit costs for excavation of bank cubic yards to the cubic yards quantities of excavation in the ICC reports. Using this as a common starting point, NS has shown that the individual Means unit price used to build up the earthwork unit costs are based on different units, consistent with each function. Excavation unit prices are based on the amount of material to be excavated. Haulage costs are based on the amount of material to be hauled which, because of swell, is different than the amount of material excavated. The costing technique applied by both parties is to build up composite costs from Means for each earthwork component and then apply those costs to the cubic yards of each quantity derived from the Engineering Reports. It is therefore necessary to convert all of the Means-based unit costs to a common basis. NS's

[211] *See* NS Reply WP "RSMeans Site Prep Worksheet – swell and shrinkage factor.pdf" for swell-adjusted cost.

adjustment to hauled quantities (to account for swell) simply states those costs in units comparable to those used by the Engineering Reports to measure excavation quantities.

NS's approach of basing the swell for loose rock on the average swell for common and solid rock excavation is reasonable. More robust modern equipment, which in some cases allows both soil and loose rock to be excavated with the same equipment, does not change the swell properties of either soil or loose rock.

**b. Waste Pits and Haul Distance**

NS developed a series of consistent, inter-related parameters and assumptions regarding the spacing of waste pits, the selection of hauler distances, and the calculation of the area of land needed for waste pits. Recognizing the substantial expense of hauling excavated materials along the right of way, knowing that the cut off for re-using common excavation for fill is 5,000 feet, and trying to give deference to DuPont's Opening assumptions, NS engineers made the reasonable assumption that waste pits would be located one mile apart. In contrast, DuPont provided no support on Opening for any assumption regarding those parameters and did not even appear to recognize they were interconnected. Then on Rebuttal, DuPont introduced several new, unsupported, vague, and unreasonable assumptions that are inconsistent with each other.

First, DuPont claimed that waste pits would not be needed in urban areas because they tend to be flat and contractors would make concerted efforts to balance cuts and fills. But DuPont provided no evidence to support those assertions or to distinguish either topography or contractor effort in urban versus rural settings. *See* DuPont Rebuttal III-F-56. Second, DuPont's Rebuttal rejected NS's assumption that waste pits would be spaced every mile, but fails to provide an alternative assumption specifying the spacing of those pits. *See id.* DuPont provides no assumptions for how its waste pits are spaced other than what its choices of hauling distance suggest, which are contradictory. Third, DuPont apparently assumes that waste pits may be spaced such that common excavation is on average hauled farther than all other types of excavation. Because only common excavation material is re-used as fill, however, it is likely to have shorter hauling distances than other excavated materials, especially if waste pits are spaced

more than a mile apart.[212] Fourth, DuPont does not explain its assumption that common excavation material would be hauled half a mile to either a nearby embankment or waste pit, while simultaneously assuming that adverse common excavation would need to be hauled only a quarter mile. If adverse conditions have an effect on length of haul, they would likely lengthen the necessary haul. Fifth, DuPont states that it accepts NS's evidence regarding an increased land footprint for waste pits and adjusts its waste pit acreage to accommodate the waste, 1:1 side slope, and 20-foot setback based on NS reply calculations. *See* DuPont Rebuttal III-F-56. However, DuPont cannot simultaneously reject the waste pit spacing used by NS and apply a ratio of total waste pit acreage to just the acres required to accommodate the waste. The two parameters are necessarily related. Specifically, the ratio applied by DuPont from NS reply is the ratio of total waste pit acres, including accommodations for 1:1 side slopes and 20-foot perimeter for equipment to the acres needed only to accommodate the waste. The formulas used by NS to determine the total acres assume waste pits are spaced every mile along the DRR.[213] DuPont assumes waste pits would be spaced every one-half mile along the DRR route, meaning that the amount of waste in each pit will be half that as NS assumed. This means that the amount of added acreage to accommodate the side slope and 20-foot perimeter—which does not scale directly with the acres required to accommodate the waste—will be proportionally larger for the smaller pits. If DuPont wished to assume a greater distance between the pits, it was obliged to develop a correspondingly larger ratio to acquire enough land to accommodate side slope and perimeter for equipment to operate.

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[212] Consistent with the 3,000-feet hauling distance for a scraper, DuPont necessarily assumes that 70% of common excavation would be re-used as fill within 5,000 feet of where it was excavated (any other common excavation over 5,000 feet is converted to borrow), which assuming even balancing of cuts and fills would be on average 2,500 feet away. *See* DuPont Rebuttal III-F-37. According to DuPont, the average one-way haul for wasted common excavation is half a mile, and the average one-way haul for all other types of excavation is a quarter of a mile.

[213] *See* NS Reply e-workpaper "DRR Open Grading errata NS Reply.xlsx," tab "Other Costs."

The numerous internal contradictions in DuPont's hauling distance and waste pit assumptions and evidence render it incoherent. The Board should adopt NS's integrated and consistent evidence concerning those items.

### c. 42-CY Haulers in Adverse Territory

NS rejected the use of 42-CY Haulers in adverse conditions areas due to limitations imposed by the terrain. *See* NS Reply III-F-66. DuPont's Rebuttal "sees no reason for this," because NS allows for using 42-CY Haulers 50% of the time for non-adverse excavation. DuPont Rebuttal III-F-38. Given that such Haulers can pass each other on double track, DuPont concludes simplistically, they must be suitable for adverse conditions. *See* DuPont Rebuttal III-F-38. Once again, DuPont misses the point. Adverse conditions are characterized by limited access to the roadbed and undulating terrain. Without flat, adjacent land the hauler could neither bypass the roadbed to avoid culverts nor navigate around bridges except by using public roads, which 42-CY Haulers would crush and destroy.

## F. Rail Transportation

NS explained in its Reply that using unadjusted rail costs reported in the Annual Report R-1 would understate the rail costs for the DRR because the reported costs effectively assume free transportation over the residual NS network to DRR railheads. Accordingly, NS added transportation costs based on the distance between NS's connection 3.9 miles away from the rail plant in Steelton, PA, and the DRR railheads. *See* NS Reply III-F-140. As DuPont acknowledges, any rail NS purchased from the Steelton plant and reported in the R-1 would only include transportation costs for the 3.9 miles on foreign lines. *See* DuPont Rebuttal III-F-81. However, DuPont argued that R-1 rail costs may reflect purchases from other rail plants, that these rail plants may be located in such a way that NS relies on foreign lines to transport the rail the majority of the distance, and that therefore the R-1 prices already include sufficient transportation costs to distribute rail over NS's network, and thus also to the DRR railheads. Given the limited number of rail plants and distribution options, DuPont's position is illogical and infeasible.

NS's assumption that all DRR rail would be sourced from the Steelton plant is highly conservative. In 2009, the EVRAZ facility in Pueblo, CO[214] was the only operational rail production plant in North America other than the ArcelorMittal facility in Steelton.[215] The discovery document "Purchase Orders 2007-2009.xlsx" confirms NS purchased 136 pound standard relay rail exclusively from ArcelorMittal in Steelton and EVRAZ in Pueblo, as well as from IAT International Inc.,[216] which imports steel from the Czech Republic.[217] Like NS, the DRR would incur significant foreign line transportation charges for rail purchased from Pueblo.[218] Those costs are reported in the R-1. What is not in the R-1 are costs for transporting over the remaining average distance from the foreign line connection with the residual NS to the ultimate DRR railhead. Contrary to DuPont's assertion, including as a DRR expense the cost of transportation of rail over the residual NS system is not "double counting." Once rail is received on the NS network, NS incurs real-world costs to transport the rail to its final points of distribution. Likewise, the DRR would be required to incur the cost to transport the rail to its railheads. Neither transportation cost is accounted for in the R-1 costs for rail. Similarly, receiving rail at any port with an NS connection along the eastern seaboard from an importer would result in a longer average haul to final points of distribution across the NS network than

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[214] *See Evaz Pueblo Rail Mill, available at* http://www.evrazna.com/LocationsFacilities/RockyMountainSteelMills/RMSMRailMill/tabid/72/Default.asp

[215] *See* ArcelorMittal, *available at* http://www.workforarcelormittal.com/AboutArcelorMittal/ArcelorMittalFacilities/ArcelorMittalSteelton/tabid/277/Default.aspx (noting there are only three rail plants in the U.S.)

[216] IAT International, Inc., *available at* http://www.iatint.com.

[217] *See* "Purchase Orders 2007-2009.xlsx", Tab "2007-2009." Filter column A for 2009 dates and filter Column J for descriptions that contain "Rail" and "136RE" and "Std" (for standard rather than premium rail, which NS also purchases from another rail importer, Sumitomo Corp.). EVRAZ, Mittal, and IAT are the only three suppliers.

[218] A Steel Dynamics rail production plant began operating in Columbia City, IN in 2010, but was not online when 2009 R-1 rail prices were collected and is thus not a possible source plant for the DRR, *See Rails made in Columbia City SDI plant approved by four railroads and Amtrak,* Indiana Economic Digest, Oct. 4, 2010, *available at* http://www.indianaeconomicdigest.net/main.asp?SectionID=31&SubSectionID=135&ArticleID=56446.

from the Steelton plant, which has a central location in the NS network.[219] Finally, NS notes that even though NS determined that the actual average distance using a realistic distribution strategy from the NS connection in Steelton to the DRR railheads would be 1,221 miles, NS conservatively applied a cost for only an 847 mile rail shipment.[220]

DuPont chose to use rail costs that did not specify a source location. It cannot now pretend that there are (unidentified) source locations and distribution options that do not exist in the real-world. Given the ambiguity inherent in DuPont's rail cost selection and the reality and limitations of rail production, NS developed the most economical and feasible assumptions. DuPont failed to account for rail transportation costs on Opening and failed to support the new approach it attempted to introduce on Rebuttal. DuPont's erroneous rail transportation cost assumptions do not excuse the exclusion of those real and significant costs. Because only NS's evidence properly accounts for those costs, the Board should adopt NS's rail transportation cost evidence.

### G. DuPont's Arguments in Support of its Yard Lighting Proposal are Without Merit.

DuPont proposes blending parts of its Opening yard lighting systems—which were based on either 20 or 50 undocumented types of light pole per facility placed in an unexplained configuration—with parts of NS's Reply yard lighting systems. On Rebuttal, DuPont complains NS uses "stadium lighting" that is not typical and too expensive. Neither of these complaints have merit since DuPont both confirms that many NS yard facilities use some type of "stadium lighting" and generally accepts the unit costs for installing the specific type of lights developed by NS engineers. DuPont's only real criticism is that NS installed too many lights. *See* DuPont Rebuttal III-F-132. In short, DuPont infers that because it counted fewer "stadium type" lights in

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[219] Clearly, the average distance to points of distribution across a network from a point in the center of the network (in this case, Steelton) is shorter than the average distance from a point on either side of the network (in this case, Kansas City in the west or ports along the eastern seaboard).

[220] *See* NS Reply WP "Track Construction Errata Reply.xls," Tab "RAIL REPLY COSTS," Cell C10.

aerial photographs of yards than NS installed on corresponding DRR yards as a result of its photometric analysis, it is more reasonable to accept DuPont's undocumented configuration of lights that have no bearing to any NS yards or photometric analyses. DuPont had ample opportunity to submit light configuration schematics (or at least basic descriptions) that established which portions of which yards they believed necessary to light, and accordingly choose a set of lights (along with necessary documentation of the specifications and costs of these lights) that would accomplish this task. At the very least, DuPont could have demonstrated how it was DuPont believed that NS over-accomplished this task as alleged in Rebuttal. DuPont did neither. Instead DuPont submitted an analysis of aerial pictures that from an engineering standpoint could only be given the grade of "incomplete."

There are three major problems with DuPont's "aerial count" method that together prove that the "photometric" method used by NS is a far superior option. First, the aerial photography submitted by DuPont is only detailed enough to identify very large light poles and shows nothing regarding the total light coverage at the yards. Determining the total light coverage—the central purpose of designing lighting systems—requires information on the wattage and number of lights housed on each pole.[221] Aerial photographs do not show this. As on Opening, NS engineers have no way of evaluating DuPont's proposed Rebuttal total light coverage. On Opening, DuPont asks to use an unknown light type with undocumented costs in an unknown configuration. On Rebuttal, DuPont asks these lighting systems remain unchanged except for certain terminal yards, where it allows that a handful of unknown light types that can be seen in

[221] Light coverage depends not only on pole height, but also on the number and wattage of bulbs on the pole. More bulbs and higher wattages combine to provide larger radiuses of light coverage for the same heights of poles, which allows poles to be spaced further apart. DuPont's aerial photographs show various light configurations, as shown in DuPont Rebuttal workpaper "DRR Facilities Lighting Rebuttal.pdf": The Shelbyville, KY automotive yard has some type of large lights spaced about every 200 feet on page 23; the Austell, GA intermodal yard has some type of large lights spaced about every 400 feet on page 15; the Moraine, OH flat yard has some type of smaller light spaced about every 100 feet apart on page 28. However, DuPont makes no attempt to quantify the light coverage of these configurations nor even recognizes that information on pole height and the number and wattage of bulbs is required to do this.

aerial photographs may be replaced one-for-one with the lights developed by NS engineers. *See* DuPont Rebuttal III-F-133–134.

Second, DuPont does not at any point explain what it believes the correct standard to be for light coverage at yards. DuPont suggests that the light coverage at the yards used as design templates is the correct standard, but then fails to give any meaningful demonstration as to what this standard is. NS maintains that providing light coverage at the entire yard is necessary for security and to safely facilitate yard operations, including overnight switching and servicing, as is common practice in freight industry. *See* NS Reply III-F-273. To accomplish this task, NS engineers consistently use 100 foot tall light polls that house twelve 1,000 watt bulbs each, which can be spaced 500 feet apart. The value of using actual NS yards as "templates" is to define the areas requiring light coverage, as opposed to DuPont's misguided interpretation that the point of templates is to speculate on what types of lights these yards employed based on examining aerial photographs. Whether the yard is illuminated with smaller lights or larger lights is a matter of available technology and engineering discretion. Smaller lights have lower costs per pole yet require more poles, and larger lights the opposite. The fact that other lighting systems are configured in various ways is irrelevant in light of that fact that DuPont has provided no documented, much less workable, alternative configurations.

Third, DuPont's treatment of conduit and duct banks—the most significant cost item when installing a lighting system—remains either undocumented or inaccurately revised in Rebuttal. NS explains in its Reply that three phase power is standard for yard lighting and submits costs for 4 inch conduit and corresponding cables, rather than DuPont's unsupported cost for ¾ to 2 inch conduit without any cable. *See* NS Reply III-F-274. NS further points out DuPont included only 2,000 feet of conduit for yards with 50 light poles, or 40 feet per pole, which is clearly insufficient in light of the measurements NS performed of the "template" yards to determine the lengths required to distribute power for lighting throughout the yard. DuPont neither adds cable as it stated it would in Rebuttal nor shows why 2,000 feet of an undocumented

type of conduit is sufficient for DRR yards.[222] In limited cases for terminal facilities, DuPont accepts NS costs for conduit and cable and the basic process used to determine the lengths of these, but inexplicably installs only a pro-rated share of the length equal to the share of lights it proposes. As discussed above, the aerial photography submitted by DuPont shows very little in terms of lighting specifics; it does, however, very clearly demonstrate that cable and conduit length would not change depending on the frequency of light spacing.[223] The same length of cable would still be required to provide lights throughout the yard, regardless of how many lights are "hooked up" to the cable.

**H. Yard Pavement.**

On Rebuttal, DuPont criticizes NS's yard pavement quantities for failing to demonstrate that every existing NS yard has pavement, rather than some other type of surfacing, and for not providing evidence that NS yards have the same quantities of pavement specified for the DRR yards. *See* DuPont Rebuttal III-F-131. These criticisms are misplaced. DuPont itself assumes that all DRR major yards require some pavement but, unlike NS, furnishes no evidence to support its specific quantities, types, uses and other assumptions related to pavement. *See* DuPont Rebuttal III-F-131.

Regarding the use of pavement at DRR yards, NS and DuPont both accept using pavement at some areas of each DRR yard. *Compare* NS Reply III-F-272 *with* DuPont Rebuttal III-F-131. Whether and how NS paves every single yard on its system is irrelevant, as are Mr. Crouch's late recollection of his "experience" that some NS yards have dirt or gravel parking lots. Similar to DuPont's position on Opening, NS's evidence uses pavement for all yard surfacing. DuPont first raised the notion of gravel or dirt in its Rebuttal. Such an argument

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[222] DuPont states that it neglected cable in Opening and corrected this in Rebuttal, but a review of DuPont's Rebuttal workpapers show no cable items were added. *See* DuPont Rebuttal III-F-134 and "DRR Facilities Cost Rebuttal.xlsx."

[223] *See, e.g.*, light coverage at the Austell, GA intermodal yard: NS Reply WP "09 Yard Lighting and Roadway Quantities.pdf" at 3 compared to DuPont Rebuttal WP "DRR Facility Lighting Rebuttal.pdf" at 15-17. For DRR's adjustment to length, *see* DuPont Rebuttal WP "DRR Facilities Rebuttal.xlsx," Tab "Large Intermodal," at Cell D8.

could and should have been presented on Opening and therefore, it is prohibited on Rebuttal. *See SAC Procedures*, 5 S.T.B. at 446; *Xcel*, STB Docket No. 42057, at 2 (served April 4, 2003). Moreover, DuPont failed to include any new costs for gravel or dirt consistent with Crouch's observations.[224] Unlike DuPont, NS accurately developed pavement quantities from actual yards, including parking lots, access roads, perimeter roads, and inspection cart paths and supported it calculation with workpapers.

### 1. NS's Pavement Quantities Evidence is far Superior to DuPont's Unsupported Numbers and Unexplained Assertions.

DuPont's claim that NS did not provide evidence for its pavement quantities is wrong. It is, in fact, DuPont that did not provide any measurements or calculations supporting any of its pavement quantities. Instead, all of DuPont's pavement quantities appear as hard coded pavement ton amounts without any explanation.[225] NS, on the other hand, provided detailed information on how it determined pavement quantities based on measurements of the square feet of various types of paved areas at actual NS yards and a series of calculations to determine the resulting tons of pavement, including assumptions about depth and weight of each type of pavement.[226] On Rebuttal, DuPont did not take issue with any of these measurements, assumptions, or calculations, nor with the actual yards that the NS engineers chose as "template" facilities for the DRR yards. DuPont simply asserts the quantities are "overstated." *See* DuPont Rebuttal III-F-133. DuPont's assertion is undermined by its own actions on Rebuttal where it accepts the NS quantity calculations for certain of the DRR intermodal, automotive, and bulk transfer facilities on the DRR. *Id.* Further, when developing its Rebuttal lighting quantities

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[224] DuPont includes a number of costs for paved surfaces in its Opening and Rebuttal facilities costs but no costs for gravel or dirt surfaces. *See* DuPont Rebuttal WP "DRR Facilities Cost Rebuttal.xlsx," "Tab "Major," Cells C4:C6 and C16; s*ee id.*, Tab "Minor," Cells C4:C6 and C11; *see id.*, Tab "Construct Major", Cells D26 and D28; *id.*, Tab "Construct Minor," Cells D23 and D25.

[225] None of the pavement quantities provided by DuPont in Opening or Rebuttal have any supporting evidence of measurements or calculations. See *Ibid.*

[226] *See* NS Reply WPs "09 Yard Lighting and Roadway Quantities.pdf" and "NS Reply Yard Lighting and Paving Costs for Facilities List.xls."

DuPont supported applying the exact assets in place at the actual yards used as "templates" to corresponding DRR yards. *See* DuPont Rebuttal III-F-132–134. However, in the case of paving, DuPont asks the Board to accept its Opening quantities for flat yards, which have neither measurements pertaining to paved areas based on either yard diagrams or typical yards, nor calculations supporting the resulting tons of pavement that DuPont ended up using for yard surfacing. *Id.*

**2. DuPont Failed to Support its Proffered Unit Costs.**

Beyond quantities, DuPont's Rebuttal disputes NS's unit costs for Aggregate Base and Asphalt Concrete, which are both average prices based on high volumes of purchases by the California Department of Transportation,[227] and proposes instead its Opening prices to "Furnish and Compact Crushed Stone for Road Base" and "Furnish and Install Wearing Course," neither of which have supporting documentation showing the price or specific details of the item other than the line entries made by DuPont in its own spreadsheets.[228]

The reason NS did not use these prices when estimating the costs of paving DRR yards is simple: DuPont did not show where the prices came from, nor define the specific type of pavement, nor even show the intended use of the pavement in the DRR yards. If NS's engineers had accepted the unit costs for DuPont's undocumented pavement items, they would have no way of knowing the appropriate depth or tons per cubic yard of this pavement, which is necessary to accurately determine resulting pavement quantities. To this end, NS engineers selected a reasonable mix of Class II and Class III aggregate base and hot asphalt mix concrete as is typical for roadbeds, and then applied corresponding depth and weight assumptions to estimate yard quantities. *See* NS Reply III-F-273. Because DuPont's unit costs are unsupported, the Board should rely on NS's unit costs. In sum, DuPont has failed to explain or support its pavement quantities or unit costs, let alone how they might fit together. Accordingly, the Board

[227] *See* NS Reply WPs "01 Agg Base Class 2 and Class 3.pdf" and "02 Asphalt Concrete.pdf."
[228] *See* DuPont Rebuttal WP "DRR Facilities Cost Rebuttal.xlsx," Tab "Bulk Transfer," Rows 4 and 5.

should adopt NS's yard pavement costs as the only coherent and supported evidence in the record.

## I. NS has Presented the Only Supported Evidence of the Costs of a Feasible PTC System that Satisfies the Requirements of Government Regulations.

DuPont failed to demonstrate that the DRR could install a full Positive Train Control ("PTC") system in 2009 that would comply with all requirements of federal law. The primary problem with DuPont's assumption that the DRR could install such a system is that the necessary technology did not exist in 2009. Indeed, the necessary technology and equipment is still in development and not yet ready for deployment today, four years later. Because the PTC system DuPont posited did not exist in 2009, the DRR initially would be required to install a Centralized Traffic Control ("CTC") system and to deploy a PTC system later, when the PTC system that DuPont posited becomes available. *See* NS Reply III-F-220–226; 49 U.S.C. § 20157. Separately, DuPont did not justify or support its PTC system costs in its Opening and made insufficient adjustments on Rebuttal.

DuPont's premise that the DRR would implement a PTC system in mid-2009 that would meet all requirements of U.S. law faces two insuperable obstacles. First, DuPont cannot rely on NS's PTC system costs (the NS system did not exist in 2009) for a different, unspecified PTC system that DuPont claims the DRR might have implemented in 2009. Second, DuPont did not explain how the limited technology that existed in 2009 could be adapted, brought to scale, and implemented for a 20-state, 7,300 mile Class I freight railroad in a manner that would meet applicable statutory and regulatory requirements without enormous additional cost.

### 1. DuPont Cannot Rely on NS PTC System Costs to Install PTC in 2009 Because NS's System did not Exist at that time.

DuPont cannot rely on NS's PTC system costs as a basis for the DRR's PTC expenditures because DuPont's assumption that the DRR could install a fully operational, compliant PTC system by June 1, 2009 is not feasible. NS's PTC system, and all other systems that could meet 2015 federal requirements, were not available in mid-2009. In fact, according to the FRA, the necessary technology is still not fully available today, four years later. For

example, an FRA report issued in 2012 concluded that "freight and passenger railroads have encountered significant technical and programmatic issues that make accomplishment" of the December 2015 implementation date—six years after the date DuPont posits the DRR would implement a PTC system—"questionable." *See* NS Reply WP "2012 FRA PTC Report" at 4. NS recently updated FRA on its progress toward PTC in a report required by federal regulations. *See* 49 C.F.R. § 236.1009. NS gave several examples of remaining technological obstacles to deployment of PTC in the real world. For instance, the locomotive onboard software that is a critical component of a working PTC system is not yet fully functional. *See* NS Railway Annual Reporting of Progress Toward Achieving NS Planned PTC Locomotive Deployment for Period 2012 (2013) at 4 (NS Brief Exhibit 8). Similarly, the back office server software necessary to operate PTC currently cannot be scaled for implementation across the NS system. *Id.* at 6. As rail carriers have explained to the FRA, they are committed to meeting the regulatory requirements of PTC, but there are many challenges to doing so across the entire nationwide rail network by 2015.

DuPont relies on NS's PTC system costs while simultaneously claiming the DRR would implement some other unspecified system that purportedly existed in mid-2009. DuPont failed to explain how it could use NS's PTC system costs to calculate the costs of a different system, using different technology, from the system NS is still developing for implementation by the end of 2015. *See* DuPont Opening III-F-39. There is no evidence that NS's PTC system costs reflect the costs of other train control technology that may have been available in 2009, and DuPont makes no argument to the contrary. The PTC system costs DuPont relied upon in its SAC evidence are for the specific system NS is developing and implementing.

To support the assumption that the DRR would implement a PTC system in 2009, DuPont was obliged to develop and support the costs of a feasible compliant system—using technology that actually existed in 2009 and earlier. DuPont cannot have it both ways. Either it may rely on NS costs for a system that NS is still developing that did not exist in 2009, or it could attempt to develop costs for a modified version of some other technology that existed in

2009 but would not meet the standards and requirements of the national PTC system required by U.S. law and regulations. DuPont's use of NS PTC system costs for a system to be installed in 2009 constitutes a failure of proof, and NS has presented the only viable evidence.

On Rebuttal, DuPont sought to dismiss the technological limitations and barriers to implementing PTC in 2009 and insisted the DRR would install a PTC system in that year. *See* DuPont Rebuttal III-F-108-110. As demonstrated below, DuPont's newly minted Rebuttal claim that the DRR would deploy some system other than the NS-based system it posited on Opening fails on two related grounds: (i) DuPont offers no evidence to show that, in 2009, the limited train control technologies it references would meet the requirements for PTC systems under the technology-forcing U.S. law; and (ii) even assuming, *arguendo,* that it might have been technically possible to modify existing technology to meet US law requirements by mid-2009, DuPont's SAC presentation did not account for the huge additional investments and research and development costs that would have been necessary for DRR to achieve such a feat.

**2. DuPont Failed to Show that Technology Existing in 2009 Could Meet 2015 PTC Standards.**

DuPont's Rebuttal briefly referenced two technologies that it claims could provide some PTC functions. Critically, DuPont made no attempt to show that those systems would meet the requirements of the extensive transcontinental network PTC system mandated for U.S. freight railroads. The first system DuPont mentioned is the European Rail Traffic Management System ("ERTMS"). *See* DuPont Rebuttal III-F-110. ERTMS is an evolving European system that began developing standards in 1993. Its specifications are still being developed and finalized today. *See* NS Reply WP "2012 FRA PTC Report.pdf" at 24. DuPont did not explain how the operational requirements and relevant infrastructure and equipment on European rail systems compare with those used by United States rail carriers, let alone how ERTMS would satisfy the different standards and requirements for PTC systems under U.S. law. The second system it referenced is the ACSE system in limited use by Amtrak. But FRA has rejected the ACSE

technology due to its "high cost and inability to interoperate with other PTC systems." *Id.* at 7.[229]

DuPont also argued that any PTC system installed by the DRR in 2009 would set the standards for systems adopted by other Class I railroads. *See, e.g.*, DuPont Rebuttal III-F-112. But the flawed and non-compliant systems DuPont claims the DRR would use in 2009 could not be a model for other U.S. carriers seeking to comply with governing PTC regulations and requirements. It is far more likely that by 2015 the DRR would require substantial modifications to and replacement of its non-compliant, 2009-era train control system.

### 3. DuPont Failed to Include the Tremendous Additional Costs Associated with Implementing a Full, Compliant PTC System in 2009.

DuPont entirely ignored the additional costs necessary to upgrade and implement any such technology to meet the regulatory requirements for a PTC system mandated by the Rail Safety Improvement Act of 2008. Any hypothetical, limited function, non-interoperable train control equipment that theoretically might have been installed by a U.S. freight rail carrier in 2009 would not meet the requirements of governing law and regulations for PTC systems to be installed by the end of 2015. DuPont's short, conclusory discussion on Rebuttal fails to prove otherwise. If the SARR were to install a limited "PTC-lite" system using technology and equipment in existence in 2009, at a minimum that system would require numerous and significant upgrades to meet the requirements of U.S. law for PTC in 2015.

DuPont also failed to account for the substantial additional development costs and investments that would be essential to any attempt to implement an adequate pre system on the

[229]DuPont ignored the fact that neither of the 2009 systems it mentioned for the first time on Rebuttal (ERTMS and ACSE) is suited for wide-scale deployment on the freight network in the United States. Neither would meet the FRA's requirements for compliance with the U.S. PTC mandate. FRA approval is critical because governing regulations require that "[b]efore placing a PTC system under this part in service, the host railroad must .... receive a PTC System Certification" from FRA. 49 C.F.R. § 236.1015. The FRA Report also cited other PTC systems that are not ready for large scale deployment today, including the Incremental Train Control System and the Electronic Train Management System. NS Reply WP "2012 FRA PTC Report.pdf" at 4, 8.

DRR in 2009. An AAR study found that American railroads had already spent over $1.5 billion and millions of man hours to develop PTC through 2012. *See* NS Reply WP "PTC Implementation Report.docx" at 18. Some of that investment and development has been conducted collaboratively by the industry. *See, e.g.*, NS Reply WP "2012 FRA PTC Report.pdf" at 16 (describing industry consortium that is acquiring radio spectrum necessary to operate PTC).

If the DRR were to develop its own PTC system years ahead of the rest of the industry, it would not be able to reap the benefits of other rail carriers' collective investments and would be required to incur significant additional research and development costs. For example, DuPont has offered no evidence to address how it would acquire its own radio frequency spectrum, develop a radio system and equipment, or develop the other new technology necessary for a fully 2015-compliant PTC system without relying on joint industry efforts and investments conducted from 2009 to the present. Thus, even under the dubious and unsupported assumption that all of the necessary technology could have been developed, tested, and implemented in an accelerated time schedule, DuPont failed to include funding to cover the huge development costs of such an expedited program.

**J. The DRR Would Incur Real Estate Acquisition Costs.**

DuPont objects to the real estate acquisition costs documented in NS's Reply Evidence, alleging that requiring the DRR to pay such costs would be a "barrier to entry." DuPont Rebuttal III-F-143–145. But it is not a barrier to entry to recognize that there are transaction costs to acquiring real estate. Railroads in fully contestable markets must incur costs for appraising and surveying land, for title work, and for closing transactions—just like every other entity purchasing real estate. DuPont's attempts to analogize real estate acquisition costs to an "assemblage factor" is meritless. An assemblage factor imposes a special cost on the SARR as a new entrant: namely, having to pay more than ordinary market value for its land because it would be assembling a corridor. Real estate acquisition costs, on the other hand, simply recognize that real estate transactions have associated transaction costs (which is a familiar reality to anyone that has bought a house). And DuPont's suggestion that NS may not have

incurred costs when acquiring its property is meritless. Every title, deed, and land sale contract that NS made available to DuPont in discovery shows that NS and its predecessors devoted substantial resources to negotiating and entering agreements with landowners, securing title, surveying property, and recording land interests. *See, e.g.*, documents in DuPont Opening WP folder "Deed Documents."[230] The DRR, too, must account for this cost.[231]

**K. The DRR Must Account for Ownership Costs of Partially Owned Facilities.**

NS's Reply Evidence proposes a reasonable and fair way of accounting for the ownership interests on Partially Owned Lines that would be required for the DRR to transport all the traffic it selected. The Partially Owned Lines are the lines of the Conrail Shared Asset Areas ("SAAs"), the Belt Railway of Chicago ("BRC"), the Indiana Harbor Belt Railway ("IHB"), and the Terminal Railroad Association of St. Louis ("TRRA") over which DuPont proposes the DRR would operate. NS's Reply demonstrated that NS holds partial ownership interests in each of these railroads and that its operating rights over the Partially Owned Lines are part and parcel of its ownership interests. *See* NS Reply III-F-308–316.

In its Opening, DuPont completely ignored NS's ownership interests in the Partially Owned Lines and asserted that the DRR would use "trackage rights" to operate over them. This decision left NS in a dilemma, for the DRR plainly cannot use NS operating rights that are bound up with an ownership interest without accounting for that ownership interest. *See* NS Reply III-F-301–307. One option would be to require the DRR to pay to construct the full infrastructure of the Partially Owned Lines—just as it must construct fully owned lines. But that option would require the DRR to obtain a greater ownership interest in the Partially Owned Lines than NS has today. Another option would be to attempt to account for the costs for DRR to acquire stock

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[230] DuPont alleges that a small portion of the DRR's right of way was acquired by "land grant," but that objection only applies to a Chattanooga-Meridian line that constitutes just five percent (465) of the total number of DRR valuation units.

[231] Contrary to DuPont's position, the very fact that the Board has not considered real estate acquisition costs in the past does not prevent the Board from accepting these real-world costs in this case, either as part of the DRR's mobilization costs or as a separate category of costs entirely.

ownership in the relevant entities equivalent to NS's ownership share. But attempting to value stock in these closely held terminals and switching railroads is hopelessly speculative. NS settled on a third option as the most reliable—prorating the construction costs of the Partially Owned Lines commensurate with NS's ownership share. *See id.* at III-F-316. This approach has the advantage of according with ordinary SAC procedure for determining ownership costs—*i.e.*, full replacement costs—while only requiring the DRR to pay for the NS-owned interest on the Partially Owned Lines.

DuPont's Rebuttal does not seriously contest the central factual point: NS only has the operating rights that DuPont proposes that DRR could use on these lines because NS is a co-owner of those lines. DuPont's claim that the DRR can ignore ownership costs because the Partially Owned Lines are "independently operating third parties" misses the point, which is that the DRR cannot use NS's operating rights without accounting for the ownership costs that NS incurred to obtain those rights.[232] But DuPont's main focus is on attacking NS's methodology for calculating ownership costs. DuPont first alleges that using replacement costs is inappropriate because "NS did not acquire its ownership interest . . . by constructing a portion of the facilities." DuPont Rebuttal III-F-155. But replacement cost is the standard method for valuing all railroad ownership interests in SAC cases—not just ownership for lines the railroad constructed. Few modern railroads themselves constructed the lines that they operate.[233] And replacement costs are far more reliable than attempting to estimate a fair acquisition value for stock interests in terminal and switching railroads—a point that is aptly illustrated by DuPont's

[232] DuPont's argument that the Conrail SAAs and IHB should not count as Partially Owned Lines because the stock ownership of those lines is held by NS's parent NS Corp. is nonsense. The question here is whether DuPont's assumption that the DRR would use NS's operating rights on these lines without accounting for ownership costs is reasonable. Because NS Rail's right to operate on the Conrail SAAs and the IHB plainly stem from the ownership interest that NS Corp. acquired, it hardly matters whether the stock is held by NS Corp. or NS Rail. *See* NS Reply III-F-308–312.

[233] For example, substantial portions of the DRR's fully-owned right-of-way were acquired by NS in the Conrail transaction, but there is no question that replacement costs are the appropriate way to value that road property investment.

proposed estimates of stock ownership costs, which rely on cherry-picked data and multilayered extrapolations. Having done nothing on Opening to address the costs of NS's ownership stakes, Rebuttal was far too late for DuPont to begin proposing novel methods for estimating those costs.

Finally, DuPont's allegations of "offsetting revenues" from the Partially Owned Lines is meritless, because DuPont's basic assumption that NS is receiving a revenue stream as an owner from the Partially Owned Lines is incorrect. For example, DuPont's suggestion that NS receives cash distributions from Conrail is wrong. The "equity earnings" that DuPont points to were just that: an adjustment to NS's equity balance, not a cash distribution. And DuPont's sheer speculation that NS might be claiming a share of income from the BRC, IHB, or TRRA is not true. NS received no cash distributions from those entities at the times DuPont alleges. The only income that NS realized from the Partially Owned Lines is the revenue that it earned from operating over those lines. If the DRR is to earn the same revenues, then it must account for the same ownership interest. The Board should accept NS's reasonable methodology for the ownership costs of Partially Owned Lines.

## VI. NS'S EVIDENCE ON DISCOUNTED CASH FLOW ISSUES SHOULD BE ACCEPTED.

The parties have a variety of disputes relating to the appropriate application of the discounted cash flow model and the Maximum Markup Methodology, which are discussed below.

### A. DuPont's Land Inflation Index is Significantly Overstated.

DuPont created an index to adjust real estate values in the DCF model comprised of an urban and agricultural land component. Both components overstate the likely inflation in land values over the DCF period.

DuPont's urban land inflation is significantly overstated because the underlying index measures more than just appreciation in unimproved land, which is the relevant statistic. The National Council of Real Estate Investment Fiduciaries ("NCREIF") commercial property index

that DuPont's cost consultants used measures the "total rate of return … of investment performance of a very large pool of individual commercial real estate properties acquired in the private market."[234] That total rate of return is computed by adding the net operating income and capital return.[235] The inapplicability of DuPont's cost consultants' application of the NCREIF index to the DRR land costs is apparent from a comparison of the performance of that index over the 2007 to 2009 time period with the performance of the combination of land price indexes used by DuPont's real estate appraisers over the same period. Specifically, the index used by DuPont's real estate appraisers shows a 33% drop in land values from 1Q07 to 2Q09[236] while the NCREIF index drops only 6.7% over the same time period.[237]

Unlike the unimproved land of the DRR ROW, the NCREIF index measures the performance of institutional investments in high-quality real estate in top-tier markets. A large portion of the U.S. commercial real estate market remains mired in the aftermath of the 2008 world financial crisis and a sluggish economy, and it will struggle to remain solvent for many years to come. NS has evaluated the likely performance of the prices for the specific types of DRR real estate assets using two indices, Moody's Commercial Property Price Index ("MCPPI") and the CoStar Repeat Sale Indices ("CCRSI"), both of which support this assessment of the market. *See* NS Reply WP "Inflation Indices.docx." On Rebuttal DuPont criticized NS's consideration of these indices because they are transaction-based. *See* DuPont Rebuttal Ex. III-G-1 at 8. Yet the Moody's index is the same source that DuPont's real estate appraisers used to index the value of real estate purchases for the DRR.[238] DuPont has not explained why an index used by its appraisers to adjust DRR land values is unsuitable for use by its cost consultants to

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[234] *See* NCREIF Property Index Returns at http://www.ncreif.org/property-index-returns.aspx.
[235] *See FAQs Property Level Data and Indices,* NCREIF, http://www.ncreif.org/faqsproperty.aspx.
[236] *See* DuPont Opening WP "Moodys-REAL Commercial Property Price Indices.xlsx."
[237] *See* DuPont Rebuttal WP "DRR Land Appreciation Rebuttal.xlsx." Weighted average of Urban indices, Tab "Composite."
[238] *See* DuPont Opening WP "DuPont SAR Land Valuation-April 24 2012.pdf" at 34-35. The MCCPPI replaced the discontinued Moody's/REAL CPPI.

perform the very same exercise. The explanation is simply that it does not give DuPont's cost consultants an answer they like.

To index land values for rural land, DuPont uses land value summaries published by the USDA that purport to show the total value of U.S. farm real estate. *See* DuPont Opening at III-G-5. Specifically, DuPont used actual changes in farm land values as reported by the USDA for the 2007 through 2012 time period, and a forecast for the 2013 to 2019 period based on the calculated rate of change in farm land values from 1930 through 2012. The implicit assumption of DuPont's approach is that the long run trends in farm values will continue through 2019 and into perpetuity. There are two major problems with this assumption. First, the estimates of land values in the USDA report are based on an annual survey of properties in which all agricultural producers operating land within the boundaries of the sampled land segments are contacted and asked for an estimated value of all land and buildings for the operator's entire farming operation and the estimated percent change from the previous year. Because it is based on a survey and not actual sales data, there is no basis for assuming that the index accurately captures the changes in prices for actual transactions.

Second, DuPont has not explained why the average change in land values as reported by the USDA is sustainable for the DRR rural land values. In its Reply, NS explained that farm values are based on farm income; that uncertainties related to farm performance and future government farm subsidies suggest that historical increases in farm income levels may not be sustainable; and that the recent increase in agriculture land values is not a good indicator of future prices. *See* NS Reply WP "Inflation Indices.docx." The record-high land values achieved in 2011 and 2012 are not sustainable during the entire DCF period. DuPont relies on the USDA historical trends, but dismisses the fact that the same agency projects only modest increases in exports, flat crop prices, and increased production costs in future years, all of which will result in lower net farm income through 2019. *See id.* at 1-4. As a result of lower net farm income, global competition, and anticipated increases in the cost of credit, it is likely that farmland values will actually decline, rather than appreciate, on average through 2019.

DuPont attempts to downplay this link between basic economic factors and land values by selectively referencing USDA reports. The more recent study that DuPont cites as "evidence" that there is "little correlation between land values and farm income"[239] in fact concedes that "[c]hanges in farm earnings will determine whether farmland values will continue recent patterns and remain affordable."[240] The report also supports NS's argument that the farm values have been bolstered by historically low interest rates.[241] The inevitable rise in interest rates will have a compounding effect to diminish farm values as farm income drops.

NS uses the CPI (consumer price index) as the best forecast of future land inflation for both urban and rural real estate. Urban real estate remains mired in the aftermath of the 2008 world financial crisis and a sluggish economy, and it will struggle to outpace the CPI for many years to come. Similarly, the recent and rapid increase in rural land prices is not sustainable, and over the long-term the appreciation in farm land value will revert to a rate consistent with the CPI, which is forecasted at 2.39% through 2019. The Board should use the CPI to account for land inflation.

### B. NS's Cost of Equity for 2012 Through 2019 More Accurately Represents the DRR's Cost of Capital.

DuPont improperly overweighted the impact of the 2006 cost of equity in calculating its average cost of equity to be used for the cost of capital in years 2012 through 2019. Even though the construction period of the DRR includes only one month of 2006, DuPont uses the full year in the average cost of equity for future years. NS's Reply Evidence used a weighted average to more accurately reflect the actual construction and operation periods.

In Rebuttal DuPont cited the *AEP Texas* decision out of context to argue for 2006's inclusion, claiming that "as many years as possible should be examined to derive a more accurate

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[239] See DuPont Rebuttal Ex. III-G-1 at 2.

[240] *Cynthia Nickerson et al., Farmland Values on the Rise: 2000-2010*, USDA ERS (Sept. 20, 2012).http://www.ers.usda.gov/amber-waves/2012-september/farmland-values.aspx#.UVXdy2f0fdk.

[241] *Id.*

average." DuPont Rebuttal III-G-3. The issue in *AEP Texas* arose because the complainants attempted to use an average cost of equity from a selected three-year period rather than using all available eight years of data since the construction of the SARR.[242] The case did not address partial years, much less reaching back a single month to grab a lower cost of equity.

The goal, as stated in the *AEP Texas* decision, is to forecast an accurate average of the future cost of equity. The actual time period of the construction and operation of the DRR should be used to calculate that average and because DRR construction is assumed to commence in December 2006, the 2006 cost of equity should be weighted accordingly.

### C. The DRR Would Incur Equity Flotation Costs.

The DRR would directly bear a cost to raise equity, just like other direct costs associated with construction of the DRR. The fee that must be paid to underwriters to raise the necessary financing is no different in kind from the fee that must be paid to engineers to design the DRR. Contrary to DuPont's Rebuttal arguments, equity flotation costs are not included in the Board's 2006 through 2011 railroad cost of capital determinations, as evidenced by the AAR's detailed filings in STB Ex Parte No. 558.[243]

In *AEPCO*, the Board opined that, to include a separate equity flotation fee, there would have to be evidence of the existence and size of equity flotation fees for stock issuances of similar size as that needed by the SARR. At approximately $17.2 billion, the DRR would be one of the largest stock offerings in history. These types of offerings are rare, but NS identified the Facebook IPO as an example of a similar-sized offering, in which Facebook incurred equity flotation fees of 2.1%. *See* NS Reply at III-G-5–6. NS also provided evidence of recent public offerings and the associated equity flotation costs. *See id.* DuPont's Rebuttal questioned the relevance of this IPO to that of the DRR, but the fact that Facebook is not a railroad is not material to the size of its flotation fees. What is material is the comparative size of the Facebook

[242] Complainants initially attempted to use a single year to project the cost of equity for future years. *See AEP Texas* at 107.

[243] *See, e.g.*, Comments of AAR, *Railroad Cost of Capital—2012*, STB Ex Parte 558 (Sub-No. 16) (filed Apr. 19, 2013).

and DRR stock offerings. If anything, the Facebook flotation fees are understated, because Facebook's notoriety and oversubscription should have driven down the costs of floating its equity. NS's projected flotation fees of 2.1% for the DRR are supported and reasonable.

### D. DuPont's Debt Amortization Approach Should Be Rejected.

DuPont departs from long-standing SAC precedent by not amortizing the DRR's debt over 20 years, assuming instead that the DRR will only pay the interest on its debt. NS, on the other hand, complied with Board precedent. DuPont's proposed change to debt amortization is a major modification to the DCF model, and more importantly is inconsistent with DuPont's corresponding assumption that the DRR cost of debt will be locked in at the average cost of debt over its construction period.

On Rebuttal DuPont claims that the DRR would not issue 20-year debt instruments, implying that it would issue a series of short- and long-term debt instruments. *See* DuPont Rebuttal III-H-3. However, this argument ignores that fact that the cost of debt for the 10-year SARR period is calculated based on the weighted average of the debt rate during construction. That cost of debt does not change during the SARR period. DuPont cannot assume that it would be able to issue new debt during the SARR period at the rate determined during construction. The Board should adopt NS's debt amortization because it is consistent with Board precedent.

### E. DuPont's Terminal Value "Correction" Should Also Be Rejected.

Related to its failure to amortize the DRR's debt, DuPont argues that there is a perceived mismatch in the DCF model between the DRR's assumed capital structure and the amount of tax deductible interest calculated as assets are replaced. DuPont modifies the calculation of DRR future cash flows to assume that interest on its original debt will be paid forever, but this change to the DCF model compounds DuPont's assumption that the DRR will only pay the interest on its debt: not only does the DRR fail to pay down its debt over the SARR period, it never does.

DuPont's proposed solution to extend the DRR interest payment into perpetuity does not remedy its perceived mismatch. Again, the DRR cost of debt is locked in at the rates in place

during the DRR construction period. DuPont's assumption that these rates will remain in effect in perpetuity creates a new mismatch between the interest rate and the debt term.

### F. DuPont's Assumptions Regarding Bonus Depreciation Overstate the Amount of Benefit to the DRR.

DuPont recognizes that the Board expressed concern in *AEPCO 2011* that complainant's assumption that a new entrant could enjoy the full benefit from this temporary tax shield as suspect. *See* DuPont Opening at III-H-6. Nevertheless, DuPont assumes a staggering $6.3 billion of the DRR's road property investment would be written off in the first year. This abuse of a temporary tax shelter creates a serious distortion of SAC results, which is exactly what concerned the Board in *AEPCO 2011*. *See AEPCO 2011* at 141-42. Allowing the DRR to take full advantage of the recent bonus depreciation provisions creates a reverse barrier to entry that would bestow cost savings to a new hypothetical entrant that were not available to the incumbent. On Rebuttal DuPont attempts to equate bonus depreciation to the complainant's ability to design an "optimally efficient" SARR or to pay market prices for construction.[244] *See* DuPont Rebuttal III-H-6. But bonus depreciation has nothing to do with efficiency or market pricing; it is a temporary tax shelter that the DRR is allowed to enjoy only because of the Board's simplifying assumption in SAC cases that a SARR, regardless of length, can be built during a three year construction window that, in this instance, included the temporary bonus depreciation tax shield window. The Board should not accept DuPont's distorting and over-reaching assumptions regarding bonus depreciation.

### G. DuPont Uses the Wrong Useful Lives for Asset Depreciation.

DuPont uses 15-year depreciation lives for certain asset accounts, even though NS on Reply clearly identified the Internal Revenue Code provision that classifies these accounts as carrying a 20-year asset life. On Rebuttal DuPont ignored this evidence and simply relies upon

[244] DuPont also claims that NS misapplied its bonus depreciation limits. NS did not make an error, but rather made a simplifying assumption that the bonus depreciation limits would apply to the 7-year assets to the extent they exceeded the amount DuPont claimed before impacting the 15-year assets.

past practices to justify using 15 years. *See* DuPont Rebuttal III-H-8. The Board should correct this error and adopt 20-year tax lives for these assets.

### H. The Board Should Escalate Operating Costs Using Car-Miles Rather than Tons or Ton-Miles.

DuPont departed from the Board's established practice of escalating operating expenses based on tonnage volumes by using ton-miles. NS agrees with DuPont that tons are not the best metric to capture cost increases on such a diverse network as the DRR.[245] However, DuPont's use of ton-miles instead of car-miles overweights changes in the heavier commodities such as coal and underweights lighter commodities such as intermodal. The difference in commodity weights is important for the DRR, which handles one of the most diverse traffic groups in SAC history. NS believes that the marginal costs to handle additional traffic are more closely tied to the number of cars than to the number of tons in those cars.

### I. The Board Should Accept NS's PTC Implementation Schedule.

DuPont has made the infeasible assumption that PTC would be installed on the DRR system by the time the DRR commenced operations in 2009. This assumption is an impossibility because the requisite PTC technology was not available in 2009. NS instead assumed that PTC would be rolled out as an overlay system that would be completed by the FRA's December 31, 2015 mandate. NS therefore modified the DCF model to prevent recovery of the PTC investment before the actual PTC expenditures take place.

On Rebuttal DuPont primarily focuses on whether PTC will actually be implemented by the FRA's 2015 deadline.[246] However, as DuPont's accurately notes, the *AEPCO 2011* decision held that the existing law calls for PTC to be implemented by the end of 2015. *See* DuPont

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[245] Contrary to DuPont's position on Rebuttal, NS's Reply did not criticize DuPont for adopting an alternative to "the Board's standard use of tons." It merely pointed out that DuPont's approach and NS's alternative are a departure from standard Board practice in coal cases. Thus NS's position on the issue is not "chaotic and internally inconsistent" as DuPont claims. *See* DuPont Rebuttal III-H-15–16.

[246] Among additional arguments, DuPont points out that NS did not apply bonus depreciation to PTC investments made during 2010-13. As described above, this approach is consistent with NS's view that the bonus depreciation available to the DRR should be limited.

Rebuttal III-H-14. The SAC analysis must follow the existing law, and the law has not changed since the *AEPCO 2011* decision. The SAC analysis cannot rely on assumptions that would result in the DRR being in violation of the law.

**J. NS's Modifications to the MMM Model are Necessary and Proper.**

First, in the event that the Board determines that DRR revenues exceed DRR costs and application of the MMM becomes necessary, the Board should account for the unique costs imposed by TIH traffic by applying MMM in a two-step process that distributes costs attributable to handling TIH traffic only to the DRR TIH traffic, and then allocates the remaining non-TIH costs to the entire DRR traffic group. The Board developed MMM to allocate the total SAC costs among all of the movements that defendants select on the SARR according to the URCS variable costs of those movements. In *AEPCO 2011*, the Board recognized a mismatch between the URCS variable costs and the trainload service provided on the SARR for certain crossover moves. In this case, a similar mismatch occurs because the URCS variable costs do not properly capture the TIH-related costs that the DRR would be required to incur to support the traffic DuPont selected.

On Rebuttal, DuPont claims that this modification to MMM is unlawful because it is being done outside of a formal rulemaking. *See* NS Reply III-H-18. However, this modification does not alter the fundamental MMM methodology of allocating SAC costs to the DRR traffic group. Rather, it merely refines the MMM methodology to more accurately align SAC costs to the costs of handling that traffic.

DuPont also claims that this approach falls under the Board's prohibition of movement-specific adjustments to URCS. However, this type of systematic adjustment to a class of traffic should is distinguishable from the movement-specific adjustments that the Board addressed in *Major Issues*. The Board's goal in disallowing adjustments to system average URCS was to simplify jurisdictional threshold calculations for issue traffic. The MMM adjustment proposed by NS is completely different. It is a simple process to more accurately assign SAC costs to all TIH traffic. DuPont also attempts to equate this TIH MMM adjustment to the mileage based

adjustment that defendants made in the *WFA II* case. Again, DuPont is wrong, but its paraphrasing of the Board's *WFA II* decision in that case supports the goal of NS's modification: "MMM figures out how to cut the pie into individual sized pieces: one piece for each shipper in the traffic group. This piece of the pie reflects the part of the total SAC costs that each shipper is responsible for covering." DuPont Rebuttal III-H-20. The TIH moves are responsible for covering their TIH-related costs.

The second MMM issue still in dispute involves the index used to escalate URCS variable costs in the MMM model. The Board clearly instructed parties in both its *AEP Texas* and *WFA II* decisions to use the RCAF-A to escalate variable costs in the MMM model. Instead, DuPont strained its interpretation of the Board's decision in *Oklahoma Gas & Elec. Co. v. UP* to rationalize the use of the Board's standard URCS indexing approach in the MMM analysis, even though *OG&E* only involved short-term indexing of URCS costs. The Board should ignore DuPont's attempt to change the indexing methodology and continue to use the RCAF-A.

### K. If the Board Finds that DRR Revenues Exceed its Costs, it must Perform a Cross-Subsidy Analysis.

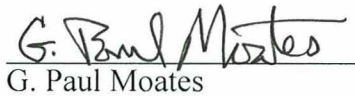
NS's Reply Evidence demonstrates that the cumulative present value of the revenue *shortfall* over the 10-year SAC analysis period is approximately $18 billion. *See* NS Reply I-71. As a result, all of the challenged rates are reasonable under the SAC constraint, and this case should be dismissed. But in the event that the Board were to find that the DRR's revenues exceed its costs, it must conduct an internal cross-subsidy analysis to determine whether that result was the product of impermissible internal cross-subsidies. While it is impossible to perform a meaningful internal cross-subsidy analysis unless and until the Board details its findings regarding all relevant DRR costs and revenues, NS believes that certain DRR line segments, including DRR line segments such as those between Birmingham and Mobile, AL, and between Spartanburg and Charleston, SC, may fail the Board's internal cross-subsidy test. In that event the Board should dismiss this case. *See PPL Montana*, 6 S.T.B. at 295-96; *Otter Tail* at 23. The Board has made clear that its role is not merely "to blandly call balls and

strikes," but rather to provide active review and application of all its tests. *Xcel*, STB Docket No. 42057, at 4 (decided Jan. 19, 2005). That same rule must apply to protect against potential cross-subsidies that are identified by the defendant but are untestable before the Board rules on the SAC evidence.

## VII. CONCLUSION

As summarized above and shown in NS's Reply Evidence, DuPont has failed to establish that NS possesses market dominance over the transportation covered by the challenged rates in 99 Complaint traffic lanes, and therefore that those lanes must be dismissed for lack of jurisdiction. NS's Reply Evidence further demonstrates that a proper application of the SAC test shows that the challenged rates are well below maximum reasonable levels and that DuPont is entitled to no relief whatsoever.

Respectfully submitted,



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Dated: June 14, 2013

## CERTIFICATE OF SERVICE

I hereby certify that on this 14th day of June 2013, I caused a copy of the foregoing Brief of Norfolk Southern Railway Company to be served by hand-delivery upon:

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# EXHIBIT 1

**Examples of Impermissible Rebuttal**

This Exhibit lists a number of instances in which DuPont improperly presented evidence on Rebuttal that could and should have been included in its Opening Evidence. The Board should refuse to consider any of this improper evidence. DuPont's sandbagging strategy—one made evident by its submission of a 156-page Opening Stand Alone Cost Narrative but a 511-page Rebuttal SAC filing—should not be countenanced.

The Board's rules for presenting rebuttal evidence are clear: "Rebuttal presentations are limited to responding to the reply presentation of the opposing party. Rebuttal may not be used as an opportunity to introduce new evidence that could and should have been submitted on opening to support the opening submissions. New evidence improperly presented on rebuttal will not be considered." *General Procedures*, 5 S.T.B. at 445–46.

The Board has refused to consider rebuttal evidence that contravenes this standard. *See, e.g.*, *TPI* at 9 (granting motion to strike certain rebuttal arguments because "Board rules clearly direct that complainants put forth their best and most complete case on opening"); *AEPCO 2011* at 43 (refusing to consider AEPCO's new mechanism for calculating fuel costs as impermissible rebuttal, noting that "attempting to introduce this evidence on rebuttal violates stand-alone rate case evidentiary rules, because defendants do not have an opportunity to challenge the specifics of building such a pipeline."); *see also Xcel*, S.T.B. Docket No. 42057 (served Apr. 4, 2003) at 2 ("We are increasingly troubled by the submission of incomplete or erroneous evidence on opening in a SAC case and a complainant's reliance upon an opportunity to address deficiencies through later evidentiary submissions, to which the defendant has no opportunity to respond. The interests of fairness and orderly handling of a case dictate that parties submit their best evidence on opening, so that each party has a fair opportunity to reply to the other's evidence.").

The chart below identifies some of the areas in which DuPont submitted improper Rebuttal Evidence that the Board should refuse to consider.[1]

| | |
|---|---|
| **Car Classification** | On Opening DuPont's operating plan presented no car classification or blocking plan for general freight traffic. DuPont's attempt to present "classification car counts" for the first time on Rebuttal is improper. DuPont Rebuttal III-C-126; NS Brief at 23. |
| **Crew Deadheading** | DuPont's Rebuttal Evidence presented a new analysis of crew imbalances, using new calculations, which are utterly divorced from its Opening Evidence. DuPont Rebuttal III-D-20–23. DuPont's new Rebuttal analysis should be rejected. NS Brief at 54–55. |

[1] DuPont's Rebuttal contains numerous other examples of improperly submitted evidence. This Exhibit merely captures some of the most egregious examples which are discussed in more detail in NS's Final Brief.

| | |
|---|---|
| **Triple Crown Car Costs** | DuPont relied upon a new source to estimate Triple Crown car costs on Rebuttal. *See* DuPont Rebuttal WP "DRR Car Costs_Rebuttal.xlsx." DuPont's Rebuttal Triple Crown car costing evidence should be disregarded. NS Brief at 59. |
| **G&A Benchmarks** | DuPont presented G&A evidence on Rebuttal replete with first-time references to new benchmarks that could have and should have been presented on Opening. DuPont's new benchmarks constitute improper rebuttal. NS Brief at 61. |
| **"Roanoke discount" for Outside Counsel Spending** | On Rebuttal, DuPont introduced a "Roanoke discount" for the DRR's outside counsel spending, theorizing that all DRR outside counsel could be based in Roanoke. DuPont Rebuttal Ex. III-D-1 at 40. This new and unsupported claim for depressing outside counsel spending should have been presented on Opening. NS Brief at 67. |
| **Yard Cleaning Costs** | On Rebuttal DuPont adopted a new position on yard cleaning costs—that the DRR would not need to clean its yards annually. DuPont Rebuttal Ex. III-D-2 at 40. This position is contrary to its position on Opening and is not permissible Rebuttal Evidence. NS Brief at 74. |
| **Revenue Reallocation for Off-SARR Mileages** | On Rebuttal, DuPont introduced a new methodology that erroneously reallocated costs from the residual NS to the DRR and over-allocated cross-over traffic revenue to the DRR. This impermissible Rebuttal should be rejected. NS Brief at 93. |
| **Trestle Hollow Costs** | On Rebuttal, DuPont relied upon new Trestle Hollow project documents it did not include in its Opening workpapers or produce to NS in response to workpaper requests. DuPont Rebuttal III-F-19–23. The Board should disregard that new Rebuttal Evidence as having been improperly withheld and as impermissible on Rebuttal. NS Brief 118–20. |
| **Movable Bridges** | DuPont provided no explanation for its assumption that the DRR would pay only 10% of construction costs for movable bridge cost in its Opening. DuPont's attempt to remedy this deficiency on Rebuttal by presenting new explanations for its assumption must be rejected as improper Rebuttal. NS Brief at 120. |
| **Bridge Height** | DuPont offered new unsupported evidence regarding the methodology for measuring bridge height on Rebuttal, confusing bridge height with track elevation. DuPont Rebuttal III-F-88. DuPont's new and confused evidence must be rejected. NS Brief at 128. Further, DuPont on Rebuttal introduced a new claim that 75% of a tall bridge's length is at 25% of maximum height. This unsupported claim is also improperly submitted on Rebuttal. NS Reply |

| | |
|---|---|
| | Brief at 132. |
| **Swell** | On Rebuttal, DuPont presented a new theory regarding the proper measurement for swell without any factual support. DuPont Rebuttal III-F-50. DuPont's theory is misplaced, impermissible Rebuttal. NS Brief at 141. |
| **Rail Transportation Costs** | DuPont failed to include the cost of transporting rail to the many distant DRR railheads using the residual NS, assuming free transportation over the residual NS network. In Rebuttal, DuPont both impermissibly and illogically argued that NS's R1 costs would include these costs. NS Brief at 145–46. |
| **PTC Implementation** | On Rebuttal, DuPont presented a new claim that the DRR would deploy a different form of PTC other than the NS-based system it posited on Opening. DuPont Rebuttal III-F-109–10. DuPont cannot change its theory on Rebuttal. NS Brief at 154. |
| **Stock Ownership Costs for Partially Owned Lines** | Having failed to account for any cost of ownership in the partially owned lines on Opening, DuPont presented a novel method for estimating those costs on Rebuttal through stock interests. DuPont Rebuttal III-F-155. This new evidence constitutes impermissible Rebuttal Evidence that cannot be considered. NS Brief at 159. |

# EXHIBIT 2

**BEFORE THE**
**SURFACE TRANSPORTATION BOARD**

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**M&G POLYMERS USA, LLC v. CSX TRANSPORTATION, INC.**

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**DOCKET NO. NOR 42123**

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# COMMENTS OF AMICUS CURIAE NORFOLK SOUTHERN RAILWAY COMPANY

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**Dated: November 28, 2012**

**BEFORE THE**
**SURFACE TRANSPORTATION BOARD**

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**M&G POLYMERS USA, LLC v. CSX TRANSPORTATION, INC.**

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**DOCKET NO. NOR 42123**

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**COMMENTS**
**OF AMICUS CURIAE**
**NORFOLK SOUTHERN RAILWAY COMPANY**

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In this case, the Board issued its decision on September 27, 2012, addressing CSX Transportation's ("CSX") market dominance over the movements challenged by M&G Polymers ("M&G"). The Board concluded that M&G had viable motor carrier alternatives for most of the challenged movements despite the complainant's arguments that customer preference, product integrity concerns, and infrastructure constraints rendered these alternatives infeasible. *See M&G Polymers USA, LLC* v. *CSX Transp., Inc.*, STB Docket No. NOR 42123, at 12-13 (Sept. 27, 2012). Having found that the transportation alternatives were feasible, the Board manufactured a new test, which it called the "limit price" test, in order for the Board supposedly to gauge the effectiveness of the feasible alternatives in constraining the railroad's pricing.

The first step in the Board's proposed approach is to set a "limit price," which the Board defines as the highest price a railroad could theoretically charge a shipper "without causing a significant amount of the issue traffic on a particular rail movement to be diverted to any particular competitive alternative." *Id.* at 3-4. Next, the Board would calculate a "limit price R/VC ratio," defined as the ratio of the limit price to the rail

carrier's "variable cost of providing the service at issue." *Id.* at 4. This limit price R/VC ratio then would be compared to the railroad's most recent Revenue Shortfall Allocation Method (RSAM) figure. If the limit price R/VC ratio exceeded the RSAM figure, the Board would preliminarily conclude that "the alternative cannot exert competitive pressure sufficient to effectively constrain the rate at issue." *Id.* If the limit price R/VC ratio is less than the current RSAM figure, the Board would preliminarily conclude that "the competitive alternative effectively constrains the rate at issue." *Id.* As a final step, this "preliminary" conclusion may be subject to change if the Board determines that there are "*certain intangible qualities*" that contribute to the effectiveness or lack of effectiveness of the limit price to constrain the railroad rate at issue. *Id.* (emphasis added). These intangible qualities are characterized as "certain unquantifiable benefits" or "certain unquantifiable costs." *Id.* at 14. The Board concluded that most of the transportation alternatives that were feasible failed the limit price test, and therefore that CSX was market dominant over those movements.

Norfolk Southern Railway ("NS") submits these comments as an amicus curiae pursuant to the Board's order of October 25, 2012. *M&G Polymers USA, LLC v. CSX Transportation, Inc.*, STB Docket No. NOR 42123, at n.10 (Oct. 25, 2012). First, adoption of the test in this case would not bind non-parties, including amici curiae such as NS, and would be subject to appeal by such non-parties if applied in a subsequent case to which they were a party. Second, adoption of the "limit price" test in this case would violate the Administrative Procedure Act. Third, it is clear that the "limit price" test as a presumption is unlawful, uneconomic, and bad policy.

## I. Adoption of the "Limit Price" Test in This Case Would Not Create a Binding Rule on Amici Curiae.

Norfolk Southern submits these comments as an amicus curiae, as instructed by the Board. *See M&G Polymers USA, LLC v. CSX Transportation, Inc.*, STB Docket No. NOR 42123, at n.10 (Oct. 25, 2012). As an amicus, NS is not a party to this action. *See Clark v. Sandusky*, 205 F.2d 915, 917 (7th Cir. 1953) ("An amicus curiae is not a party to the action. . . ."); Black's Law Dictionary 83 (7th ed. 1999) (defining an amicus curiae as "[a] person who is not a party to a lawsuit"). As a result, NS has no right to bring an appeal or otherwise contest the Board's ultimate decision in the current case. *See* 28 U.S.C. § 2344 (only permitting "[a]ny *party* aggrieved by the final order" to seek judicial review) (emphasis added); *Erie-Niagara Rail Steering Comm. v Surface Transp. Bd.*, 167 F.3d 111, 113 (2d Cir. 1999) ("To the extent that non-parties were once permitted to appeal ICC decisions, that avenue was closed by the clear language of the Hobbs Act when it became applicable to the ICC in 1975."). *See generally Moten v. Bricklayers, Masons and Plasterers Int'l Union of Am.*, 543 F.2d 224, 227 (D.C. Cir. 1976) (per curiam) (holding an amicus may not appeal from a judgment). Therefore, it is clear that even if the Board does apply a "limit price" test in *M&G*, regardless of its exact specifications, NS and other participants in subsequent adjudications will retain their right to challenge the Board's application of its new precedent in those cases because: (1) NS is merely an amicus curiae; (2) NS has no right to appeal a decision in *M&G*; and (3) the Board's decision to permit amici curiae does not change the *M&G* adjudication into a rulemaking. *See General American Transp. Corp.* v. ICC, 872 F.2d 1048, 1060 (D.C. Cir. 1989) (finding "no authority for [the] theory that an adjudication is converted into a rulemaking solely because an agency solicits and entertains the

comments of those who have an interest in prospective application of the principle under study"). If the Board were to consider applying the "limit price" test in a case to which NS was a party, NS will litigate the legality of the test at that time. *Id.* (noting that adjudicatory rulings do not "harden into rules").

## II. Adoption of the "Limit Price" Test in This Case Would Violate the Administrative Procedure Act

The new "limit price" test would be a sharp break from the Board's existing and longstanding rules on qualitative market dominance, which were adopted through notice-and-comment rulemaking by the Interstate Commerce Commission ("ICC") in *Market Dominance Determinations*, 365 I.C.C. 118 (1981) (hereinafter "*Market Dominance Determinations*"). The Board would violate the Administrative Procedure Act ("APA") by attempting to amend through this adjudication rules that were adopted by the agency (and amended by the agency) in notice-and-comment rulemakings. *See, e.g.*, 5 USC § 553(b) (requiring notice of proposed rulemaking to be published in the Federal Register).

In 1976, the ICC first adopted market dominance "rules, setting out the factual situations that would trigger a rebuttable presumption of market dominance." *Market Dominance Determinations—Product and Geographic Competition*, STB Ex Parte No. 627 (STB served Dec. 21, 1998). In adopting a set of rebuttable presumptions, the ICC specifically said it was attempting to devise rules that were "practical and capable of prompt administrative application." *Id.* at 2-3.

During the next iteration of rulemaking regarding market dominance, the ICC specifically terminated the use of rebuttable presumptions for the purposes of qualitative

market dominance analysis, stating, "[w]e have decided to discontinue the use of rebuttable presumptions as a tool to develop this qualitative evidence." *Market Dominance Determinations* at 119; *id.* at 120 ("Time has shown that the use of rebuttable presumptions has not enhanced the accuracy of market dominance determinations. While they did serve a useful purpose while we gained experience, the factors determining the degree of competition faced by a rail carrier are too numerous and too varied to be gauged, with any reasonable degree of accuracy, by so few measures."). Indeed, not only did the ICC reject reliance on rebuttable presumptions generally, it also specifically rejected rebuttable presumptions based upon revenue to variable cost ratios ("R/VC") concluding, "[t]here are any number of reasons why a high price/cost ratio may not be indicative of true market power on the part of the railroad. Reliance on such ratios will, therefore, not only be misleading, but will preclude more relevant information from being introduced." *Id.* at 122. The ICC instead adopted legislative rules governing submissions and individualized consideration of evidence of qualitative market dominance. *Id.* at 132-34.

The Board may not now reverse those legislative rules in an individual adjudication.[1] Indeed, the Board acknowledged the need for a notice-and-comment rulemaking to amend the qualitative market dominance rules established in *Market Dominance Determinations* by conducting even further rulemaking to amend the agency's rules on consideration of product and geographic competition, as opposed to altering those rules through adjudication. See *Market Dominance Determinations*—

[1] The fact that the Board labels the rule change announced in the Decision a "refinement" of its procedures does not change the fact that it is truly a reversal in policy. *See M&G Polymers USA, LLC* v. *CSX Transp., Inc.,* STB Docket No. NOR 42123, at 21 (Sept. 27, 2012). .

*Product and Geographic Competition*, STB Ex Parte No. 627 (STB served Dec. 21, 1998). The Board's consistent use of rulemakings to set the rules regarding market dominance presentations in rate case has created settled expectations.

Given this history, adoption of the new "limit price" test in this case would be an impermissible amendment of the market dominance rules that were adopted through notice-and-comment rulemaking and specifically rejected rebuttable presumptions and tests based on R/VC ratios. *See Am. Mining Congress v. Mine Safety & Health Admin., 995 F.2d 1106, 1109 (D.C.Cir.1993)* ("[i]f a second rule repudiates or is irreconcilable with a prior legislative rule, the second rule must be an amendment of the first," subject to notice and comment requirements); *Broadgate Inc. v. U.S. Citizenship and Immigration Services*, 730 F.Supp.2d 240, 244 (D.D.C. 2010) (An "agency's intent to exercise legislative power may be shown where the second rule effectively amends the previously adopted legislative rule, either by repudiating it or by virtue of the two rules' irreconcilability."). Although an agency has discretion in the first instance to determine whether to adopt a binding rule through a rulemaking or to establish precedent in an adjudication, the agency's initial decision has consequences. *NLRB v. Bell Aerospace Co. Div. of Textron, Inc.*, 416 U.S. 267, 293 (1974). A properly adopted rule becomes binding and must be changed through notice-and-comment rulemaking.[2] *See General*

[2] On the other hand, agency use of adjudications to resolve issues provides the agency more flexibility to resolve novel questions that have not been address through notice-and-comment rulemaking. *SEC* v. *Chenery Corp.*, 332 U.S. 194 (1947) ("[P]roblems may arise in a case which the administrative agency could not reasonably foresee, problems which must be solved *despite the absence of a relevant general rule*" (emphasis added)). Simply put, the choice to pursue precedent through adjudication means that the decisions "do not harden into 'rules'" and can be altered or reversed in subsequent adjudications. *General American Transp. Corp.*, 872 F.2d at 1060. But the agency chose to adopt and amend its rules regarding market dominance through notice-and-comment rulemaking and not through adjudications. *See Market Dominance*

*American Transp. Corp.* v. ICC, 872 F.2d 1048, 1060 (D.C. Cir. 1989) (distinguishing rules, "which cannot be altered or reversed except by rulemaking," from longstanding adjudicatory precedent, which can be altered or amended in an subsequent adjudication). And the agency may not avoid its obligations under the APA by *de facto* amending a rule in an adjudication. *Marseilles Land and Water Co. v. FERC,* 345 F.3d 916, 920 (D.C. Cir. 2003) (holding that "an administrative agency may not slip by the notice-and-comment rule-making requirements needed to amend a rule by merely adopting a *de facto* amendment to its regulation through adjudication"); *see Shalala v. Guernsey Mem'l Hosp.,* 514 U.S. 87, 100 (1995) (an agency interpretation that "adopt[s] a new position inconsistent with . . . existing regulations" must follow APA notice-and-comment procedures). Accordingly, any application of the Board's new "limit price" market dominance rule would be invalid absent notice-and-comment rulemaking in compliance with the APA.[3]

## III. The "Limit Price" Test Is Neither Lawful Nor Reasonable

The "limit price" is unlawful because, at the end of the day, all it does is presume market dominance based on the level of R/VC ratios in violation of Section 10707(d)(2) of Title 49. Further, the Board provides no rational explanation for reincarnating a test

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*Determinations*, 365 I.C.C. 118 (1981); *Market Dominance Determinations—Product and Geographic Competition*, STB Ex Parte No. 627 (STB served Dec. 21, 1998).

[3] In this proceeding, however, no notice was filed in the Federal Register, and the Board's decision to allow parties to comment as *amicus curiae* does not satisfy the requirements of the APA. *General American Transp. Corp.* v. ICC, 872 F.2d 1048, (D.C. Cir. 1989) (finding "no authority for their theory that an adjudication is converted into a rulemaking solely because an agency solicits and entertains the comments of those who have an interest in prospective application of the principle under study"). Therefore, application of the "limit price" test in this or other adjudications exceeds the Board's authority.

based on R/VC ratios that was long-ago rejected or for relying on RSAM, which tells us nothing about the competition in the marketplace for a specific movement. Despite lots of jargon and precise-looking mathematical formulas, there is also no economic basis for the test, which fails to take into account the individual market factors that the Board's predecessor has found must be considered to determine the effectiveness of otherwise feasible transportation alternatives. *See, e.g., Market Dominance Determinations*, at 133. Indeed, the fallacy of the limit price test is revealed by the absurd results it generates. Accordingly, the Board should abandon the "limit price" test.

First, the "limit price" approach suggested by the Board in this case is not a lawful means to determine whether competition is effective. The limit price approach directly contradicts the statute's language and is at odds with Congress's expressed opposition to the use of rebuttable presumptions based on variable costs for qualitative market dominance purposes. Section 10707(d)(2) explicitly prohibits the Board from establishing a presumption that a "rail carrier has or does not have market dominance over such transportation" because the rate yields a revenue-to-variable cost ratio "equal to or greater than 180 percent." The RSAM for each Class I railroad is above 180%. One reason the statute prohibits presumptions like the one the Board seeks to adopt here is that those presumptions do not have any relation to the actual competition in the transportation marketplace for specific movements of specific commodities.

Although the Board attempts to dodge the statutory limitation by comparing its manufactured R/VC ratio for the transportation alternative to the defendant railroad's RSAM, this is just gimmickry. Although the "limit-price" test uses the rate levels charged by the competitor rather than the railroad's rate as the starting point for calculating the

R/VC of the limit price for the transportation alternative, in a competitive marketplace one would expect in many cases that the carrier's rate and the competitor's rate would be roughly comparable (on a quality-adjusted basis).[4] For example, in *E.I. DuPont v. Norfolk Southern Railway Company*, STB Docket No. NOR 42125, Norfolk Southern will provide extensive evidence that there are feasible transportation alternatives for 96 of the challenged lanes. In addition, NS will show that these alternatives are effective, including showing that in most of these lanes the rail rate and the truck rates are within ten percent or less of one another. NS demonstrates this largely by using the actual contracts DuPont has entered into with the transportation alternative and other evidence mandated by the rules regarding market dominance that the agency adopted in prior notice-and-comment rulemaking.[5] Because the rate levels of actual competitors will

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[4] How much adjustment must be taken into account depends on the specific movement at issue and accounting for various factors such as the needs of the customer and the nature of the commodity. But both the rail rate and the rate of the transportation alternative will be set with these factors in mind, so those two rates remain linked in a competitive market.

[5] *Market Dominance Determinations*, at 133. In that decision, the ICC established the currently applicable rules for market dominance evidence:

"b. Motor carriage. -- Unlike rail or water alternatives, the availability of many motor carrier alternatives for transportation services between two points can, in most instances, be taken for granted. Therefore, the feasibility of using motor carriage as an alternative to rail may be viewed as depending exclusively on the nature of the product and the needs of the shipper or receiver. Effective competition from motor carriage may be deduced from the following types of evidence:

(1) the amount of the product in question that is transported by motor carrier where rail alternatives are available;

(2) the amount of the product that is transported by motor carrier under transportation circumstances (e.g., shipment size and distance) similar to rail;

(3) the amount of the product that is transported using motor carrier by shippers with similar needs (distributional, inventory, et cetera) as the shipper protesting the rate;

(4) physical characteristics of the product in question that may preclude transportation by motor carrier; and

approach one another, the level of the rail rate is essentially what determines whether a rate passes or fails the "limit price" test. In the end, the test involves little more than comparing the rail rate (or a rate close to the rail rate) to the RSAM and judging whether that rate exceeds RSAM.

Whether the rail rate is high should not be a factor in a market dominance determination. Indeed, it is a consideration that is prohibited by the statute. 49 U.S.C. § 10707(d)(2). The Board is not permitted to judge market dominance by asking whether rate levels appear to be reasonable. The Board's "limit price" test, by contrast, pre-supposes that *even a rate produced by competition between a railroad and trucking companies* might nonetheless be "too high" for the competition to be deemed "effective" simply because the rail rate is too high relative to the railroad's RSAM. This throws out the market dominance threshold test altogether in favor of a test that is premised on an unlawful measure of whether a rate appears reasonable.[6]

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(5) the transportation costs of the rail and motor carrier alternatives.

Other types of evidence on the feasibility or nonfeasibility of motor carriage as an alternative to rail will also be considered."

[6] It is beyond dispute that the R/VC ratio of a challenged rate is not determinative of whether a rate is reasonable. Whether a challenged rate is reasonable is determined by faithful, consistent application of the stand-alone cost test (or SSAC or Three-Benchmark test, as applicable), and nothing more. Some shippers seem to want to assume or imply that the R/VC ratio yielded from a particular rate for a particular shipment indicates something about the reasonableness of the rate. *See, e.g.*, Opening Comments of Alliance for Rail Competition, et al., *Rate Regulation Reforms,* Ex Parte 715, at 7 (assuming rates in SAC cases should be reduced to 180%). The Board knows well that such assertions are simply wrong and contrary to 49 U.S.C. § 10707(d)(2)(b). Moreover, just as the Board has found that "a rate may be unreasonable even if the carrier is far short of revenue adequacy," (*id.* at 16 (quoting *Rate Guidelines – Non-Coal Proceedings,* 1 STB 1004, 1017 (1996), the converse is also true – a high rate may be reasonable even if the carrier is far in excess of RSAM or any other R/VC measure.

Second, the Board cannot offer a rational explanation for reversing a prior decision of its predecessor or for using RSAM in a market dominance inquiry. Given the failings of the "limit price" test described in this filing, it is unsurprising that the Board has provided no rationale for it. If the Board intends its RSAM benchmark to reflect what real competition in the marketplace would yield for a particular movement at issue in a rate case, it is entirely arbitrary and unsupported. The Board merely *asserts* that a rate producing an R/VC ratio above RSAM "is a useful indicator that competitive transportation alternatives – whether intermodal or intramodal – do not exist and are not effectively constraining the rate." Likewise, it merely states as an article of faith that a limit price above RSAM "provides an objective indication of monopoly pricing." The Board's only discussion of these issues is at pages 15-17, and is purely conclusory. The Board has not and cannot provide a rational, sound, economic explanation for these bare assertions.

Moreover, the limit price test simply reincarnates a long-ago rejected test that relied on a comparison of the rail rate to some multiplier of the variable cost of the move without explaining why the ICC's rejection of that test was wrong. In 1981, the ICC considered establishing a rebuttable presumption that "market dominance will arise where the rate in issue exceeds the variable cost of providing the service by 60 percent or more." *Market Dominance Determinations*, at 122. But the ICC rejected the notion that cost ratios (if they could be properly calculated) demonstrated anything about market dominance:

> But we question whether, even if calculated on the basis of accurate cost information, they reliably indicate the presence or absence of market dominance. Ratios do not, for instance, tell us about the degree of market power possessed by the railroad, since they do not tell us whether a proposed rate will actually

> move traffic over an extended period of time. If the rate is high, shippers may find alternatives more attractive, forcing the rate back down again. Some may accept the high rate because of a preference for the carrier or because of a premium service associated with it. There are any number of reasons why a high price/cost ratio may not be indicative of true market power on the part of the railroad. Reliance on such ratios will, therefore, not only be misleading, but will preclude more relevant information from being introduced.

*Id.* The fallacy of using R/VC ratios in market dominance determinations was recently confirmed by the Board's independent economists:

> The weak relationships between R/VC ratios and market structure factors illustrated in Table ES-4 imply that correctly assessing the presence of market-dominant behavior requires direct assessment of relevant market structure factors. Thus, regulatory reforms that would establish R/VC tests as the sole quantitative indicator of a railroad's market dominance are not appropriate.

Laurits R. Christensen Associates, Inc., *A Study of Competition in the U.S. Freight Railroad Industry and Analysis of Proposals That Might Enhance Competition—Revised Final Report* at ES-14 (Nov. 2009). The Board has provided no reasonable or economically-sound reason for contradicting its predecessor's prior findings.

Similarly, there is no plausible explanation for using RSAM in a market dominance inquiry. "RSAM measures the average markup over variable cost that the defendant railroad would need to charge all of its "potentially captive" traffic (traffic priced above the 180% R/VC level) in order for the railroad to earn adequate revenues." *Simplified Standards for Rail Rate Cases*, STB Ex Parte No. 646 (Sub-No. 1) (Mar. 19, 2008). RSAM therefore is a general measure that is exclusively about the railroad as a whole. It is not a measure of whether the railroad faces actual competition for a particular shipment or how robust that competition is. The information contained in RSAM is unrelated to any specific market and therefore it has no bearing as to whether a rail price in a specific market is effectively constrained by competition. *Market*

*Dominance Determinations*, at 122 ("There are any number of reasons why a high price/cost ratio may not be indicative of true market power on the part of the railroad. Reliance on such ratios will . . . be misleading. . ."). Moreover, the focus on the price of alternatives to the rail transportation at issue on the one hand and RSAM on the other means that the analysis the Board is undertaking is completely untethered to the actions of the shipper and the railroad in the real world marketplace and is therefore "misleading." This failing alone dooms the "limit price" test.

Third, the "limit price" test lacks any economic foundation because (1) it does not look at the specific transportation market for the movements at issue; and (2) the test produces absurd and arbitrary results.

The "limit price" test fails to examine the specific transportation market at issue. For example, the transportation of a large bulk commodity is different from the transportation of small volume moves of plastic pellets. Accordingly, the prices that two competitors will charge in each situation are different. The factors that determine how each competitor would price are not considered in the "limit price" test. That test does not look at factors such as the customer's demand, the service characteristics and difference in service that each competitor can provide, and constraints each competitor must take into account when pricing such as driver shortages or other capacity constraints. *Market Dominance Determinations,* at 120 ("[T]he factors determining the degree of competition faced by a rail carrier are too numerous and too varied to be gauged, with any reasonable degree of accuracy, by so few measures."). Instead, the only market information used in the proposed limit pricing test is the price limit for the transportation alternative. That calculation itself is flawed and meaningless because it

is not the competitor's true R/VC ratio because the test uses the defendant railroad's variable costs rather than the competitor's. Thus, it is not clear what this price limit could accurately measure because it has apples in the numerator and oranges in the denominator.[7] Nevertheless, even if the price limit for the transportation alternative had meaning, it is still not used to examine the level of competition for the movement at issue because the test never compares the transportation alternative's pricing of the specific movement to the railroad's pricing of the same movement. Instead, the Board relies on a measure that has no relation to the transportation market for the specific movement – RSAM, which is calculated for the railroad as a whole.

The Board offers no evidence or analysis as to why rates above RSAM could not result where there is actual and robust market competition. In fact, one might expect this in market circumstances where, among other things:

- many variable costs are not well captured by a railroads' URCS-based costs;
- providers face significant fixed costs and uncertainties about how those costs will be recovered;
- providers face high opportunity costs arising from constrained capacity and other factors; and
- the opportunity to switch modes is available and feasible but there are some costs associated with switching from one transportation provider to another in the short term -- even though the availability of alternative transport options may provide real discipline whenever supply chain options are up for reevaluation.

*See id.* These market factors are simply not captured in a test that relies on price ratios (either of the railroad or properly calculated for the competitive alternative). As the ICC warned, "[t]here are any number of reasons why a high price/cost ratio may not be

[7] The Board provides no rational explanation for what the price limit for the transportation alternative could possibly mean given this flaw.

indicative of true market power on the part of the railroad. Reliance on such ratios will, therefore, not only be misleading, but will preclude more relevant information from being introduced." *Id.* at 122.

Moreover, the Board's approach of presuming market dominance whenever a "limit price R/VC" is higher than the carrier's RSAM and ignoring the actual competition and market factors that drive that competition for the transportation of the specific movement leads to absurd and arbitrary results. Even in instances in which the price of the transportation alternative is in fact *significantly lower* than the carrier's own price, the Board's test could lead to a presumption of market dominance. For example, if a rate for a particular shipment from a chemical plant served by a rail carrier generates an R/VC ratio of 600%, the Board's test would find that the carrier is presumptively "market dominant" *even if a truck alternative existed that was moving some of those same shipments at a rate 35% cheaper than the rail rate.* Such a result is entirely driven by a relatively high limit price R/VC ratio in comparison to the RSAM rather than the market. A similarly absurd result can occur for a high-priced commodity where the customer has the option of two rail carriers. Even in the instance of a *dual-served* chemical plant, if the R/VC ratios were higher on both carriers than the corresponding RSAM figures, then the Board's test would lead to *both* carriers being presumptively "market dominant." Obviously, a test that yields such illogical results is not an accurate gauge of effective competition. In fact, there could be a situation in which trucks, barges, and rails all actively compete for a movement but at prices higher than RSAM (perhaps because of capacity constraints at the point and time of the price bids), still leaving the railroad market dominant.

These absurdities were a major concern to the ICC when it rejected a test very similar to the "limit price" test. "Since the simplicity of the cost test requires that a standard costing methodology be used, there is no way of avoiding the distorting inaccuracies of such a test. Many rates falling above a designated revenue-to-variable cost ratio would, on the basis of more accurate cost estimates, in fact be below it." *Id.* The ICC determined that such a test was so inaccurate that it could not even be used as a rebuttable presumption of market dominance – regardless of what additional evidence it permitted parties to provide in the market dominance inquiry. *Id.* at 120-121. The Board offers no explanation for why the same results are no longer the significant concern they have always been.

Fourth, the Board's assertions that its RSAM-based test is a mere "refinement" of its approach to qualitative market dominance, and would establish only a "preliminary" conclusion of market dominance, cannot save the test. In fact, the test appears quite rigid. The other factors the Board says it will consider appear limited to factors that would properly be regarded as quality-based adjustments to the relative prices of the competing alternatives, and not evidence going to the heart of the question whether the competitive alternative has in fact provided market discipline. Indeed, the public version of the Appendix to the September 27 Decision seems to confirm that the presumption is nearly iron-clad – regardless of the "intangible qualities." It appears no "intangible qualities" could overcome a discrepancy between the limit price and RSAM of any size.

## IV. CONCLUSION

In sum, the proposed test is unlawful under the express terms of the Board's statute, irrational, and economically unsound. Its creation of a presumption based on R/VC ratios violates the statute that makes clear the level of the rate has no bearing on market dominance. Moreover, the test simply ignores the actual market for transportation and produces bizarre results. Accordingly, there can be no rational explanation that overcomes the findings of the ICC more than 30 years ago. Namely, "[t]here are any number of reasons why a high price/cost ratio may not be indicative of true market power on the part of the railroad. Reliance on such ratios will, therefore, not only be misleading, but will preclude more relevant information from being introduced." 364 I.C.C. at 122.

Respectfully Submitted,

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John M. Scheib
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Three Commercial Place
Norfolk, VA 23510

***Counsel to Norfolk Southern Railway Co.***

**Dated: November 28, 2012**

**Certificate of Service**

I hereby certify that I have served all parties of record in this proceeding with Norfolk Southern's Motion to Participate and Comments by United States mail.

Garrett Urban

Norfolk Southern Railway Co.

Date: 11/28/2012

# EXHIBIT 3

# REDACTED
# HIGHLY CONFIDENTIAL EXHIBIT

This exhibit contains Sensitive Security Information ("SSI") that is controlled under 49 C.F.R. Parts 15 and 1520. No part of the records marked SSI may be disclosed to persons without a "need to know," as defined in 49 C.F.R. Parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C. § 552 and 49 C.F. R. Parts 15 and 1520.

# EXHIBIT 4

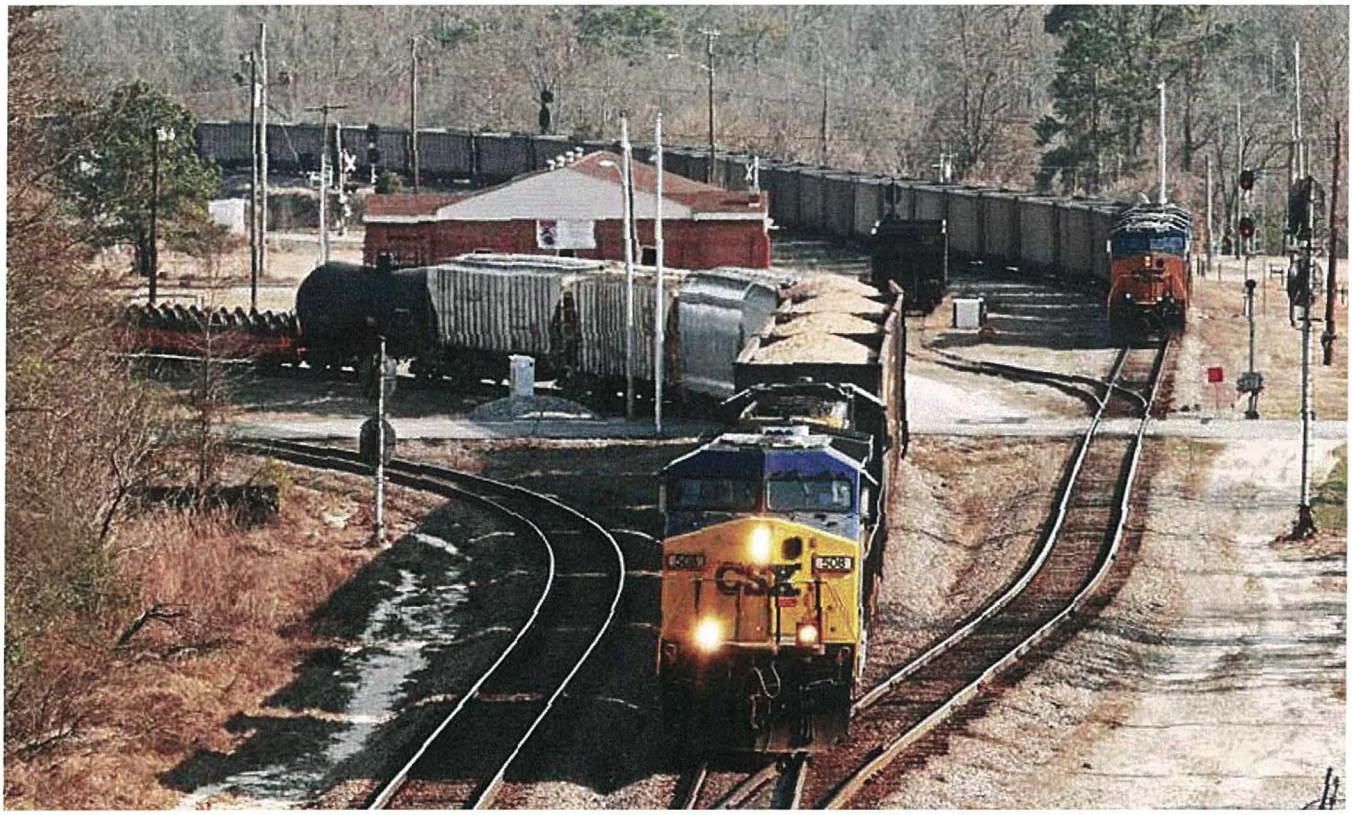
# REDACTED
# HIGHLY CONFIDENTIAL EXHIBIT

# EXHIBIT 5

# ULTIMATE TECHNOLOGY

## RAILROADS MEET THE WIZARD

## SOFTWARE THAT MADE THE UNCONTROLLABLE CONTROLLABLE



**A westbound manifest freight pulls out of Hamlet, N.C., while an empty coal train waits to follow on March 8, 2010.** Michael S. Murray

"Why should we listen to you?" asks a train-service employee in 2004 of Tony Ingram, then the new chief operating officer of CSX Transportation, at a "town hall" meeting in Waycross, Ga. The employee continues: "You guys at the top change every year. Maybe we should wait for the guy after you." Years later Ingram would relish telling this story, because it bespeaks the revolving-door management, disorganization, and lack of discipline he was intent on ending, lest he be swept aside, too. Ingram prevailed. He changed the operating culture of CSX for the better and retired last year a hero.

And oh, by the way, net earnings at CSX Corp. went from $339 million in 2004 to $1.4 billion in 2008, before the Great Recession took hold. It's impossible to calculate how much of that $1 billion improvement is attributable to operating efficiencies, but a great deal of credit has to go to Tony Ingram's black box: the ONE Plan.

Almost beneath the radar of even career railroaders, a revolution has occurred in the past dozen years in how railroads plan their operations and then execute those plans. Once they scheduled trains using pencil and paper. Then with computers they began to track and even schedule individual cars as well. Now, software on a laptop computer can churn out an entire operating plan that optimizes a railroad's resources, telling it what trains to run at what times over which routes. It's as if the Wizard of Oz were pulling the levers, except this time, they're real, and they really work.

### MOST COMPLEX AND HARD TO MANAGE

Of all the Class I railroads, CSX needed the Wizard most. Years of repeated turnover at the top of operations management had left local supervisors confused. So they improvised. They wouldn't originate a train if not enough cars were on hand, or they waited half a day for more to show up. If too many cars appeared, they'd order up an extra train. They called this smart railroading. But with every terminal acting in this fashion, all CSX got was chaos.

CSX was not alone in this regard, just the worst offender by 2004. Big railroads today are hugely complex. Each has thousands of origin-destination pairs. Terminals and line segments can be overwhelmed if everything comes in at the same time. The Class I networks had grown beyond the ability of any one person or existing software to manage.

The incubator of innovation was Massachusetts Institute of Technology. There, civil engineering professor Joseph Sussman and his students developed improved car-scheduling software. One student, Carl Van Dyke, upon earning his masters degree, worked for a decade to perfect commercial software whose output would be a com-

plete operating plan: what trains to run on which days of the week, what time to run them, the blocks of cars assigned to each train, and the classification and block-swapping assignments of each terminal. He used algorithms, in which continual recalculations seek to find the most efficient way to organize the railroad's output and get cars from point A to point Z. Think of it as a gigantic balancing act.

Van Dyke kept adding complexity to his algorithms to reflect capacities of individual trains, terminals, and line segments. Finally, in 1992, he left a consulting company to start his own business, MultiModal Applied Systems, of Princeton, N.J. He called his software product MultiRail. The Wizard had arrived.

MultiRail revamped the operating plans of every Class I railroad but Kansas City Southern, and it was to Van Dyke's company that CSX went for help in devising the ONE Plan. In an interview with the Wall Street Journal, Van Dyke called CSX "the most complex and hard to manage of any railroad in North America." Although field managers were involved in devising the ONE Plan and signed off on the finished design, there was skepticism that it would work.

"Tony is a man of simple messages, firmly stated, and his message was, 'Just run the plan,'" says David Brown, who worked with Ingram at both Norfolk Southern and CSX and succeeded him at the end of 2009. "Railroaders used to think of themselves as quick shooters, improvisers. Tony's two priorities were safety and on-time originations, which is code for 'Follow the plan.'" Ingram set specific operating goals and reviewed the results every day. Managers who fell short felt the heat.

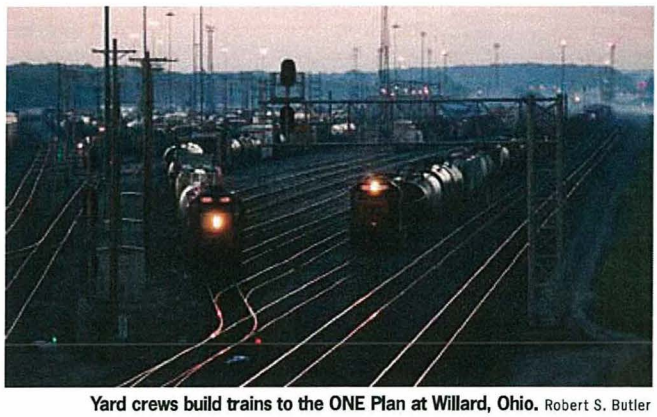
Brown calls the ONE Plan vital to CSX's service improvements. "We can create trip plans for customers' cars based on what we really believe we can achieve, instead of what we thought might get done. We originate trains on time about 85 percent of the time and better than that for intermodal. Our goal is for 85 percent of cars to be on the right train on the right day, and we have done even better."

When CSX instituted the ONE Plan in 2004, it hoped to create efficiencies that would save $150 million a year. It's safe to assume that goal was achieved, and then some. Case in point: Hump yards in close proximity at Indianapolis, Cincinnati, Louisville, and Nashville all built trains for each other, meaning that very few trains bypassed the next yard. All four yards were constantly plugged. By redefining each yard's role and building blocks that bypassed intermediate classification, the ONE Plan opened up all four terminals. Moreover, this kind of scheduled railroading avoids unpredictable costs; fewer cars are online, fewer crews are needed, and fewer extra trains are dispatched. As Brown puts it: "We don't have to build the railroad for Easter Sunday."

## MODELING FOR EFFICIENCY

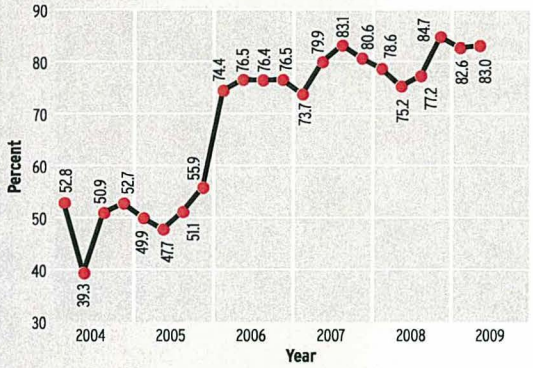
MultiRail (now owned by consulting company Oliver Wyman) and related software helped CSX quickly reconfigure ONE Plan schedules when the recession savaged its business. "Railroads were doing this daily during the recession, as business went down," says Rod Case, Van Dyke's lieutenant at Oliver Wyman. "The computer system understands all the ways to get across the network and all the restrictions by car type. Every car chooses its most efficient way to go, and then you look at the load factors and so forth." Within six weeks of the sudden downturn at the end of 2008, CSX had downsized schedules. The software even modeled how service could be provided without using Buffalo's Frontier Yard, and CSX ended up closing the hump yard last year. In the first quarter of 2009, the railroad's operating ratio actually fell, meaning that costs declined faster than revenue.

Over the years, many well-intentioned men tried to bend the good-old-boy culture at CSX. Ingram, and now Brown, have succeeded where others failed. Don't forget, though, they had something the others did not: a little help from Carl Van Dyke's Wizard.

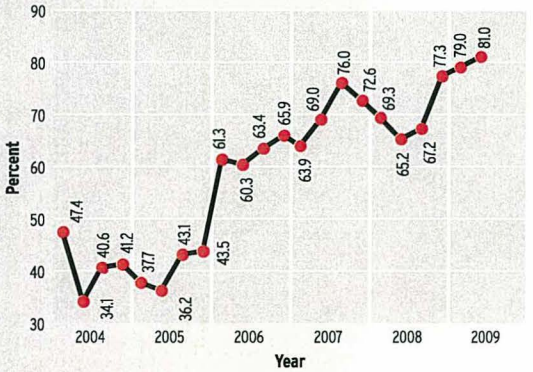


**Yard crews build trains to the ONE Plan at Willard, Ohio.** Robert S. Butler

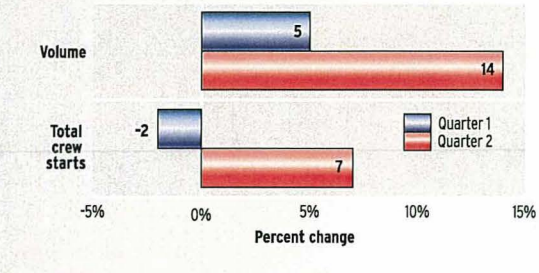
**ON-TIME TRAIN ORIGINATIONS**
Percentage of trains leaving yards on time

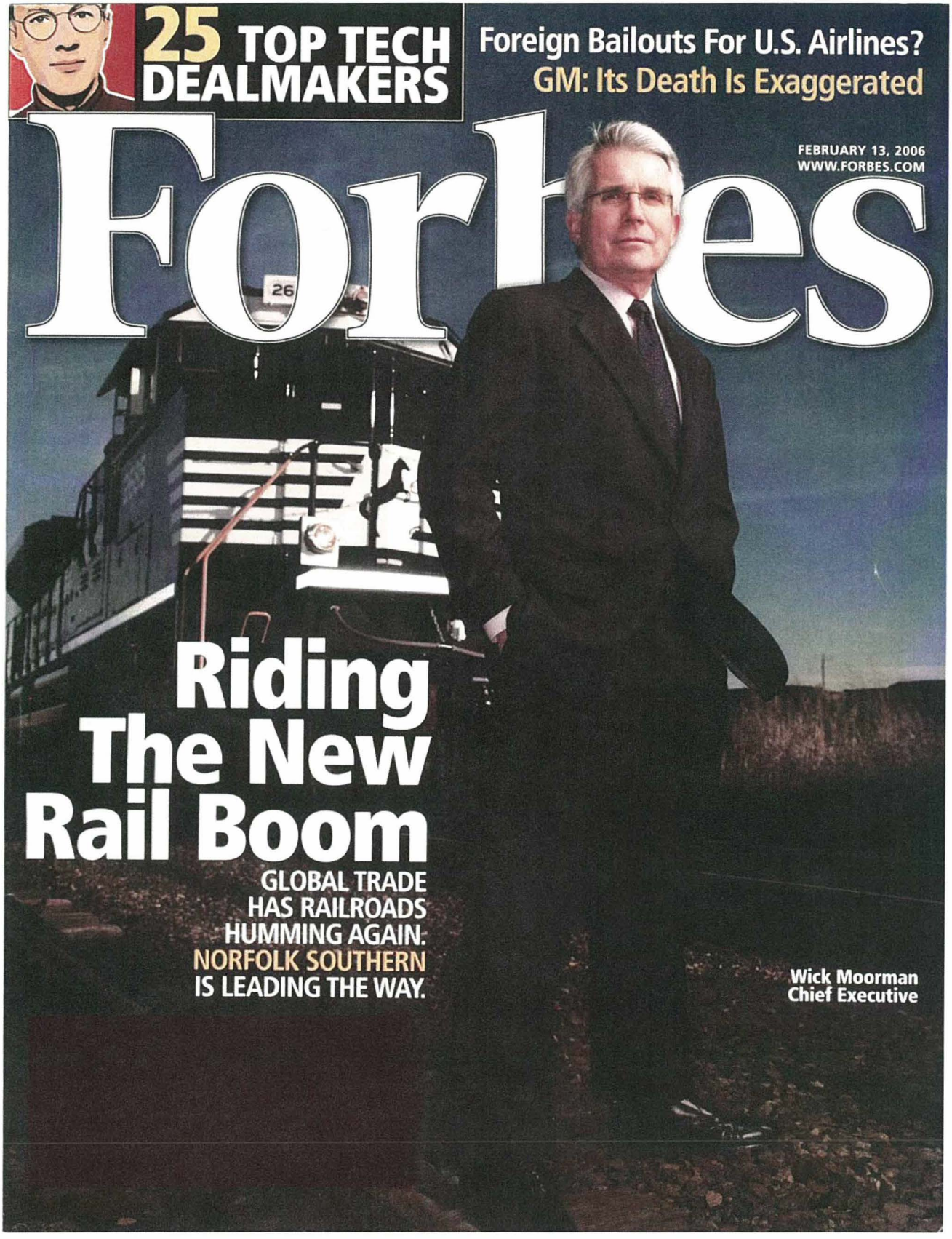



**ON-TIME TRAIN ARRIVALS**
Percentage of trains arriving at yards on time




**YEAR-OVER-YEAR CHANGE IN VOLUME AND CREW STARTS (2009 VS. 2010)**




25 TOP TECH DEALMAKERS
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GM: Its Death Is Exaggerated
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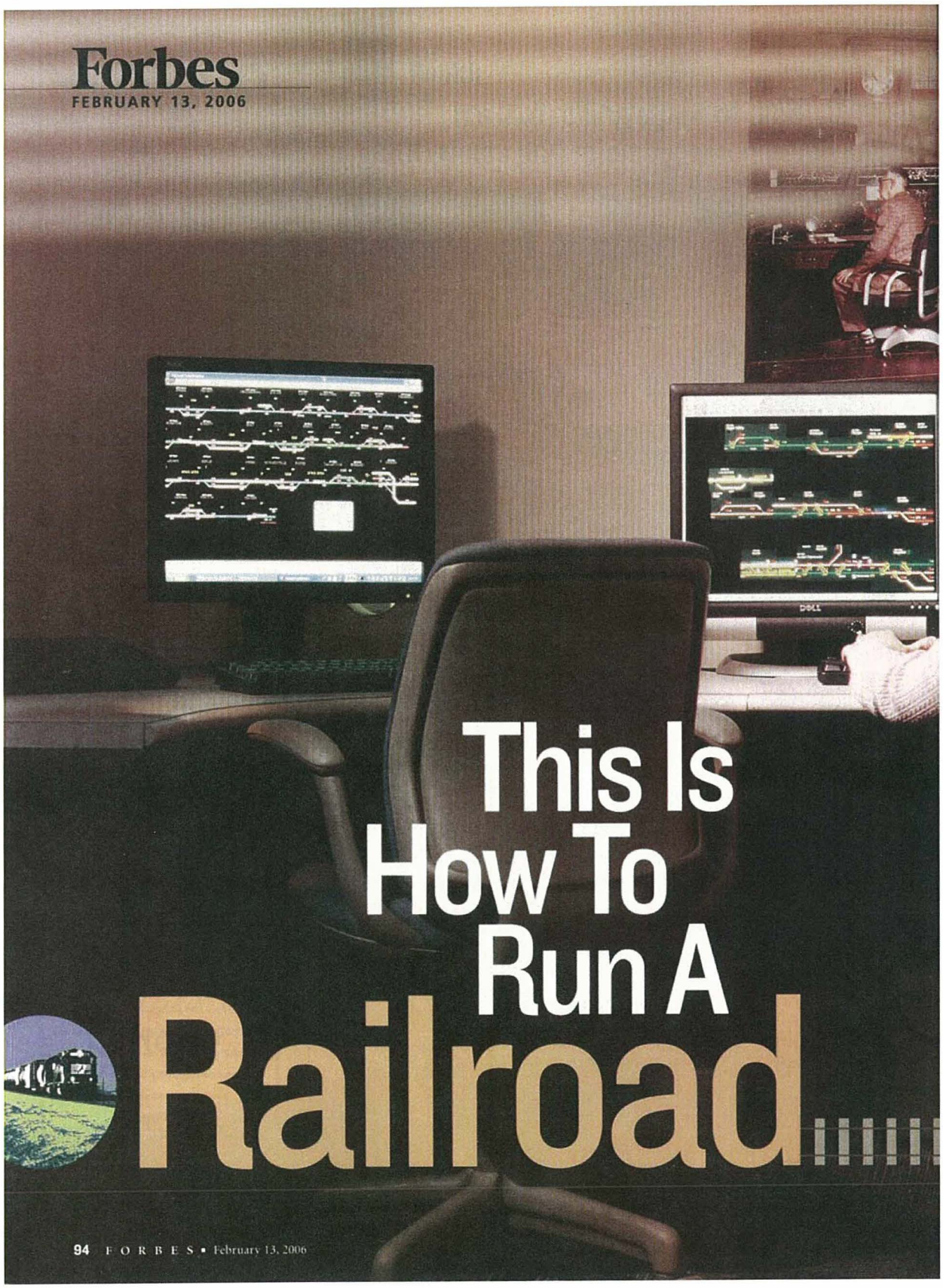
Riding The New Rail Boom
GLOBAL TRADE HAS RAILROADS HUMMING AGAIN. NORFOLK SOUTHERN IS LEADING THE WAY.
Wick Moorman
Chief Executive


Forbes
FEBRUARY 13, 2006
This Is How To Run A Railroad
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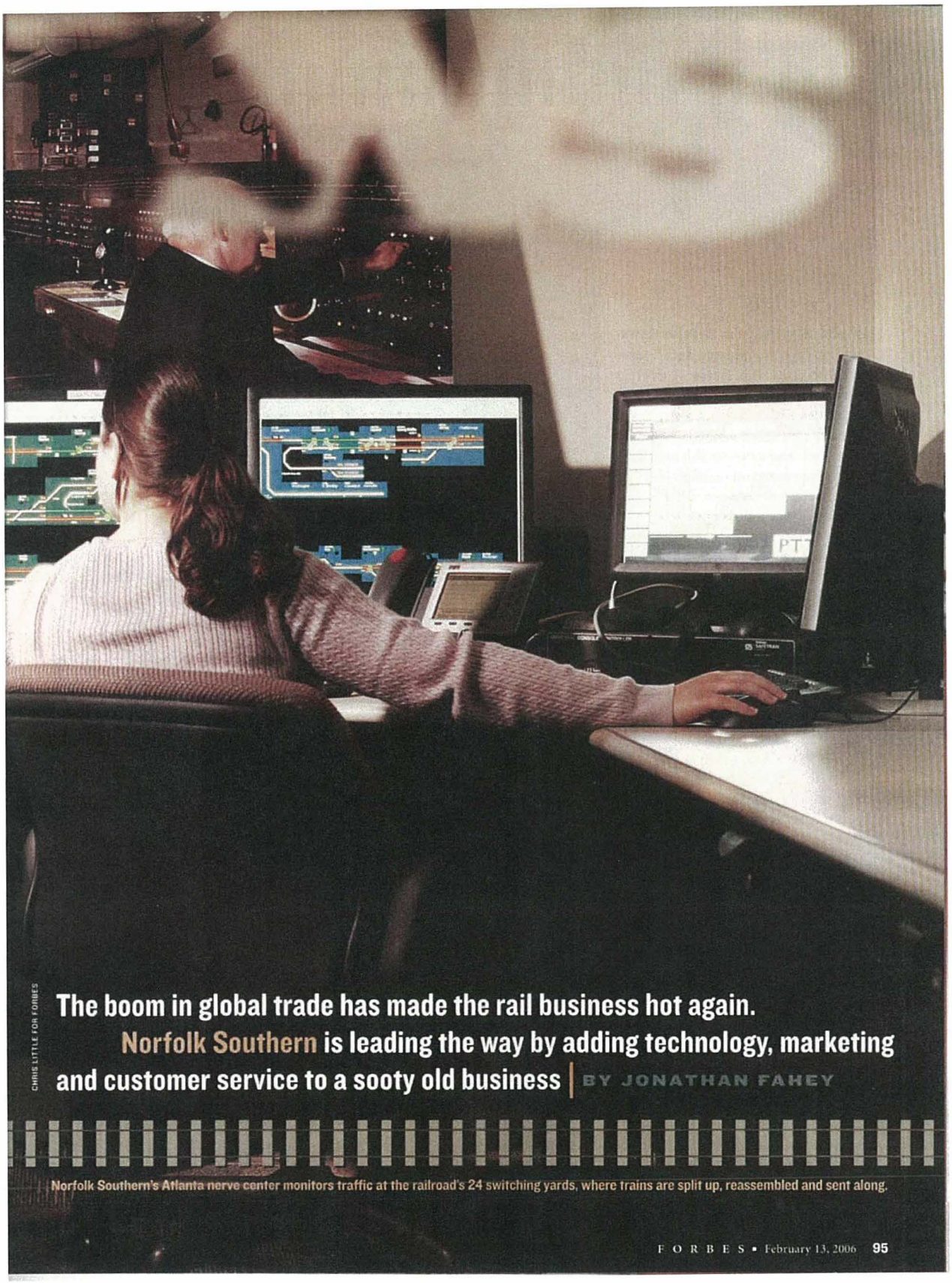
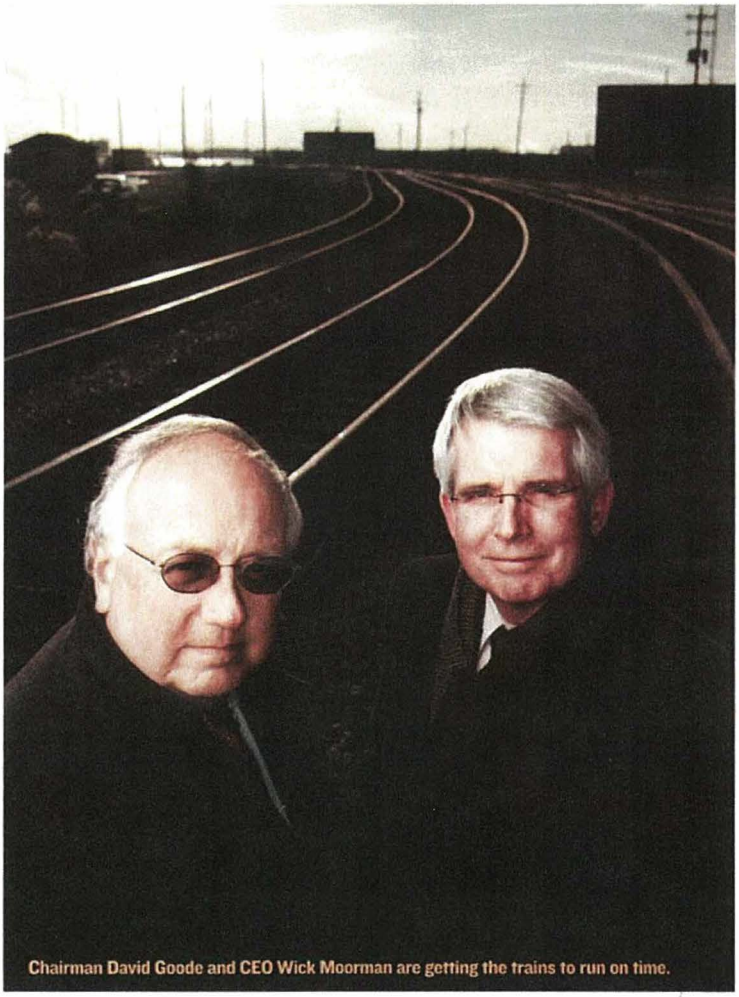


CHRIS LITTLE FOR FORBES

**The boom in global trade has made the rail business hot again. Norfolk Southern is leading the way by adding technology, marketing and customer service to a sooty old business** | BY JONATHAN FAHEY

Norfolk Southern's Atlanta nerve center monitors traffic at the railroad's 24 switching yards, where trains are split up, reassembled and sent along.

# NORFOLK SOUTHERN



Chairman David Goode and CEO Wick Moorman are getting the trains to run on time.

**Norfolk Southern's 5-mile long** switching yard in Elkhart, Ind. looks more 1906 than 2006. Heaps of rusting steel parts, disfigured barrels and stacks of railroad ties litter the dreary expanse. Tufts of brown grass struggle through coarse gravel. The trains are shipping flat-panel televisions and other things that did not even exist a decade ago. So where is the railroad's new technology?

Look above the drab boxcars sparsely covered with chipped paint and the 120 train tracks into a glass-walled control tower at the center of the yard. There sit five operations workers behind twinkling computer screens. It is here that Norfolk Southern has finally learned how to run a railroad. All railroad companies are booming these days, thanks to the rise in oil prices, which has made rail-shipped coal more attractive, and to the flattening of the world's economy, which has sent steel, grain and televisions coursing around the globe. U.S. railroads did 1.7 trillion ton-miles of traffic last year, up 2.4% from 2004. Norfolk Southern is shipping these goods more efficiently than competitors like CSX and Union Pacific because it decided to haul a 19th-century business into the 21st.

Norfolk's logistics—involving the use of algorithms that search for the shortest routes, fastest tracks and fewest handlings—essentially got the trains to run on time. Remarkably, that hoary concept had been ignored by the industry until Norfolk made it a priority. Just a few Norfolk advances: Carload volume is up 14% since 2000, but the number of cars needed to move that volume has dropped 11%. Average speed is up 7% to 22 miles per hour. Average time in the yard, called dwell time, is down 7% to 23 hours.

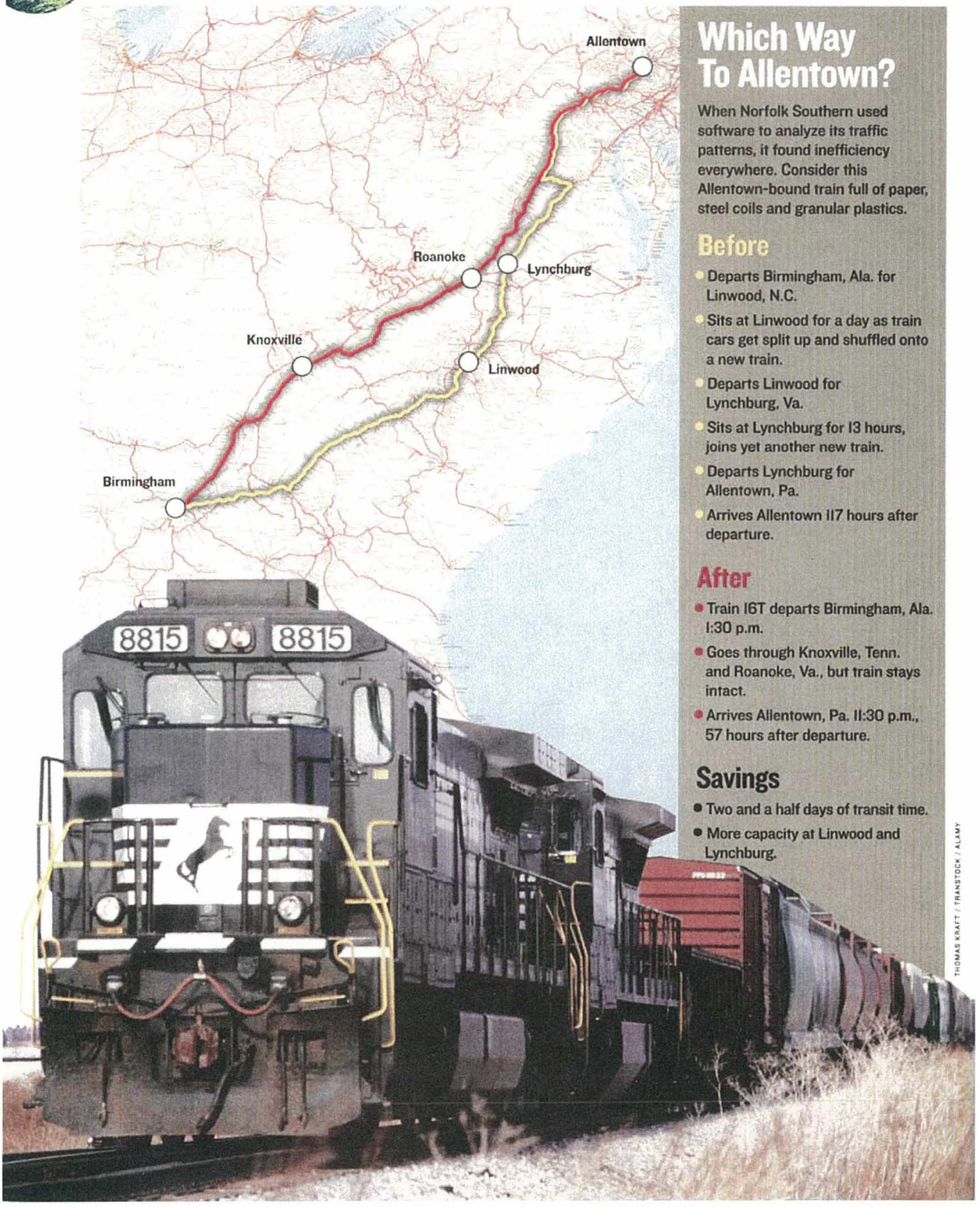
Indeed, Norfolk's system is so far ahead of other railroads' that it sells its software to rivals. The ultimate competition, after all, is trucks. All of this has made Norfolk's recent performance recall the Jay Gould era: Its revenues grew 17% during the most recent four quarters (through September 2005) to $8.2 billion. Profits have grown 66%, from $700 million to $1.2 billion. Norfolk Southern's discipline gives it the best net margins of the U.S. railroads. Its 14% bests Burlington Northern's 12%, CSX's 11% and Union Pacific's 6%. The company's share price is up 85% since the beginning of 2004.

Norfolk's new chief executive officer embodies his company's transformation. Since its maiden run (a 6-mile route near Charleston, S.C.) on Christmas Day 1830, the company has been overseen by bankers, operation chiefs and even tax lawyers. On Nov. 1, 2005 Charles (Wick) Moorman took over. He was formerly head of information technology.

"We were once the Internet of our day, and now we are again as relevant as we have ever been," says Moorman, 53. Haven't we heard this before? Sure, but Moorman and many on Wall Street argue that this isn't just a cyclical upswing. As manufacturing has moved abroad, more finished goods need to crisscross the country from ports. Sourcing of parts and materials is also ever more global.

BILL CRAMER FOR FORBES

NORFOLK SOUTHERN




# Which Way To Allentown?

When Norfolk Southern used software to analyze its traffic patterns, it found inefficiency everywhere. Consider this Allentown-bound train full of paper, steel coils and granular plastics.

## Before

- Departs Birmingham, Ala. for Linwood, N.C.
- Sits at Linwood for a day as train cars get split up and shuffled onto a new train.
- Departs Linwood for Lynchburg, Va.
- Sits at Lynchburg for 13 hours, joins yet another new train.
- Departs Lynchburg for Allentown, Pa.
- Arrives Allentown 117 hours after departure.

## After

- Train 16T departs Birmingham, Ala. 1:30 p.m.
- Goes through Knoxville, Tenn. and Roanoke, Va., but train stays intact.
- Arrives Allentown, Pa. 11:30 p.m., 57 hours after departure.

## Savings

- Two and a half days of transit time.
- More capacity at Linwood and Lynchburg.

THOMAS KRAFT / TRANSTOCK / ALAMY

These trends are unlikely to retreat.

Norfolk, like the rest of the railroad industry, spent a half-century in a siege mentality, slouching along by shrinking and slashing costs, tangled in rat's-nest mergers and wrestling with its feather-bedding unions. In 1955 a million people worked for the big U.S. railroads; now just 160,000 do (29,000 at Norfolk). Yet while productivity boomed—ton-miles moved per employee have increased to 11 million from just 600,000 in 1955—the industry was unable to raise prices from 1980 to 2004. It suffered from overcapacity and bad service, and the newly deregulated trucking industry was siphoning customers. It was rare when a large railroad earned even its cost of capital.

In 2000 Norfolk's David Goode, then chief executive (now chairman), had had enough. "We were losing business, and we were losing pricing power, too," Goode says. "The only way to change the game was to concentrate very hard on improving our service—that's the basic product we have—so we could sell it better."

While competitors pulled in reins, Norfolk Southern continued to spend on engineers and conductors, despite Wall Street's frowns. Most importantly, Goode assembled a group of employees under Moorman to overhaul how the company ran its network. The goal: To get the trains to run on a tight schedule and thereby move more trains through the system faster and more reliably.

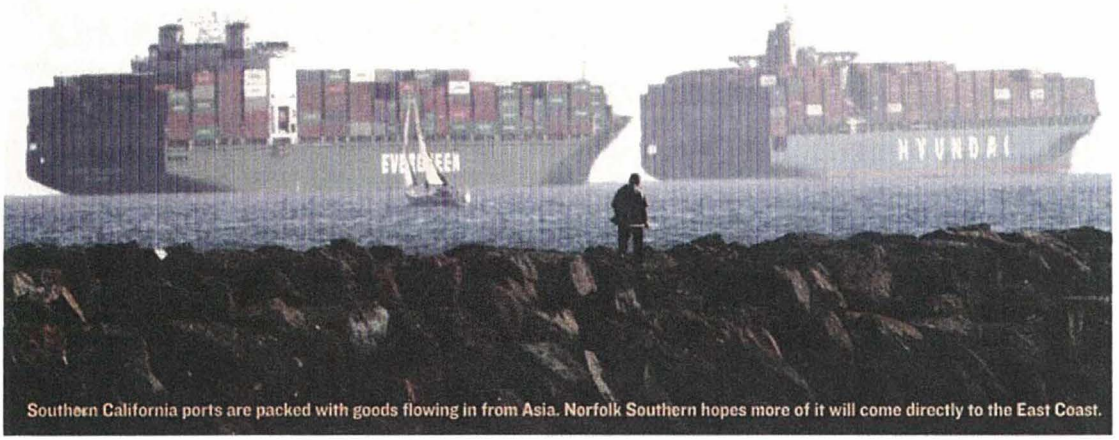
To the train industry this concept was revolutionary. "I came from the 'We're the railroad, we'll get to your load when we're ready' days," says Brig A. Burgess, a second-generation rail man who started with the company 30 years ago building bridges and is now in charge of Norfolk Southern's busiest region, which encompasses most of the upper Midwest. "This was a huge change."

Like most railroads, Norfolk Southern used to run on an ad hoc basis—a train would leave the yard when it was ready. There were schedules, sure, but they were written in pencil. If a yardmaster was faced with a so-called light train, one with just 60 cars, he might let it sit in the yard for another day until another 60 cars bound for the same location came in. The yardmaster assumed he was saving the company money by not using a crew and fuel to run a light train.

But the long train brought costs of its own. Ten trains would arrive in the span of two hours, then there would be none for eight hours. Locomotives and crews got bunched up in yards when they were needed elsewhere, so the company had to pay for extra crews to move the locomotives around. The longer other railroads' cars were sitting on Norfolk Southern's tracks, the higher the fees charged to those companies. And, of course, the delay might rankle customers whose stuff was sitting on the tracks for an extra day.

Moorman wanted a technology answer, so he bought software from a small firm called MultiModal Applied Systems. Norfolk Southern was looking to determine how it could best deliver its cars—by avoiding unnecessary stops, finding the best meeting points for the cars and making the fewest trips to switching yards. Two months of waybills, or 2.5 million shipping orders, were inputted into the software.

**Rail-carried shipping container traffic is up 38% since 2001.**




Southern California ports are packed with goods flowing in from Asia. Norfolk Southern hopes more of it will come directly to the East Coast.

REED SAXON / AP

The finding: waste and inefficiency. For instance, sections of different trains headed from Birmingham, Ala. to Allentown, Pa. would follow each other, getting joined at stops along the way, such as Linwood, N.C. and Lynchburg, Va. The system didn't know that the complete train to Allentown could have been put together in Birmingham.

"We could get the train going in the right direction, but we didn't know where it was ultimately going to end up," explains Bryan Harres, who runs the Atlanta operation center. "All we were seeing was where the car was wanting to go next. We didn't know if we had 5 cars or 50 cars going to that same final desti-

NORFOLK SOUTHERN

nation." Starting in 2002, the new software could accomplish that task.

The software also worked to reroute trains around trouble spots that could delay delivery. Planners assigned "impedance" values to points in the network. A big switching yard like Elkhart would have a low value, because it could handle a lot of traffic quickly, while a small yard would have a high value. Double-track rail would have a low value, and single-track sections a high value. The software would then add up the impedances just like an electrical engineer adding up impedances in an amplifier circuit.

Last year Norfolk Southern went through the entire exercise again, this time developing software internally that can now continually adjust to changing or temporary conditions and suggest new trains, routes and times. In July, for example, while the Elkhart yard was rebuilding 26 miles of track, the system diverted 500 cars a day to other yards. Customers didn't notice. When Hurricane Katrina hit, the system rerouted trains scheduled to be switched in New Orleans, and later shuffled new trains into the schedule to haul thousands of mobile homes from Elkhart to Louisiana.

The system also allows the company to price its service better. Now sales representatives can see if a new customer's cars can easily hitch onto a direct train or whether they will need to take a more circuitous, and costly, route.

The company says the two operating overhauls cost $5.8 million and resulted in annual savings of $100 million.

Once the train is rolling through the system, it is governed by another array of computer programs. A car in a yard that is in danger of missing its train will show up yellow on the system in front of those folks in the Elkhart control tower, so they will know to move it quickly to its train. New tools are also being given to the dispatcher. Now dispatchers can view only the traffic in their region. Under the new system, software will analyze the entire Norfolk network every hour and, to keep traffic flowing efficiently, suggest changes in speed, routing and train meeting places.

Burgess has been able to tap into the company's systems to discover countless minor, easily fixable problems. He found

## Railway Rulers

The West Coast haulers, Union Pacific and Burlington Northern, are the biggest. Next, the two East Coast players, then the Canadians.

**The Big Six railroad revenues, most recent 12 months, in billions of USD**

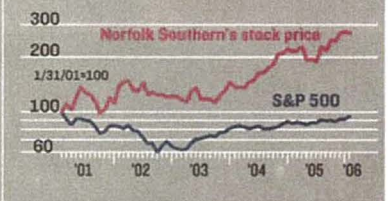

## Fewer Firemen, More Tons ...

The number of railroad workers has been declining for a century even though more and more goods are being shipped by rail.


¹Class I railroads. *Source: Association of American Railroads.*

## Better Performance

Most railroad stocks have seen big gains since an explosion in traffic that started at the end of 2003. Norfolk Southern had prepared itself for the boom.




*Source: FT Interactive Data via FactSet Research Systems.*

SLIM FILMS FOR FORBES

that a furniture maker near Elkhart would let cars full of wood sit on tracks every year at the same time, clogging the rail sidings. It turns out the furniture maker would buy a whole year's supply of wood when the price was good but didn't have the space or the manpower to unload the big shipments. Norfolk Southern simply provided storage for the customer's cars off the network. "What we found is that customers need help fixing their own problems," says Burgess.


Sources: Bloomberg; Reuters.

Timeliness has also allowed Norfolk Southern to get more business from its traditional rival, trucking companies. As measured by ton-miles, trucks controlled 32% of the nation's freight in 2002, the most recent year statistics are available, while trains delivered 28%. By value, though, trucks hauled 64% of the market, to trains' 4%.

But the trucking industry has been beset with a chronic shortage of drivers, rising fuel costs, clogged highways and new federal rules that reduce the number of hours truckers can drive. So, slowly, trains are starting to take business from trucks. Even trucking companies themselves, like Schneider National and JB Hunt, are turning more to rail. They drop containers onto flatbed rail cars, then pick them back up on the far side.

This truck-to-train traffic is up 18% since 2002. On a train one crew of two men can haul hundreds of 40-foot containers. A train can carry a ton of goods 202 miles on a gallon of fuel, while a truck can take it only 59 miles. Also, railroads don't pay as much fuel tax as trucking companies. Fair enough, since the taxes pay for asphalt.

Paul Bergant, who runs JB Hunt's intermodal business, said his company began using Norfolk Southern in 1998 and now puts 250,000 loads a year on its tracks. "That's faith," he says. "As they have improved their reliability and service, it has allowed us to move more and more with them."

James Ginochio, Toyota's U.S. rail logistics manager, says any haul shorter than 500 miles will almost certainly go by truck, and anything longer than 1,000 miles by rail. Distances in between are up for grabs. "On a short-distance move, the more they can tighten their consistency and performance, the more business they can get," he says.

Norfolk's growth presents Moorman with his next problem. Technology notwithstanding, at some point Norfolk Southern, and the country's other railroads, will have to build. Moorman's answer: Go east. He wants Norfolk Southern to be the primary rail carrier for imported goods from East Coast ports. The West Coast ports are clogged, so Moorman thinks more container ships carrying Asian goods bound for the Midwest and East will dock east of the Mississippi. The port of Norfolk is undergoing an $880 million expansion that it hopes will attract the ships. Norfolk Southern is spending up to $100 million to upgrade its main route from Norfolk to Columbus, Ohio, where it is building a yard at the old Rickenbacker Air Force Base to offload the double-stacked containers. (The federal highway bill includes an additional $90 million for this project.) "We are going to have the shortest high-capacity route from the port of Norfolk into the Midwest, and we think that that will pay big dividends for us," he says.

Norfolk Southern's slick systems and tight schedules don't make it immune to a slowing economy, a dip in coal demand or pullbacks in Asian trade. But provided it manages all the newfound traffic smoothly, investors may see gains from a railroad company the likes of which haven't been seen in decades. "There were a couple of times during my 40-year career where people wouldn't have given very good odds on the private rail system even surviving," Chairman Goode says. "But now the business is established in a growth pattern, and it's got legs." F

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# The Canadian Pacific Railway Transforms Operations by Using Models to Develop Its Operating Plans

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North American railways have traditionally practiced tonnage-based dispatching, running trains only when they have enough freight. As a result, their customer service and their use of crews, fixed assets, locomotives, and railcars are poor. Canadian Pacific Railway is using new decision-support tools developed in-house and by MultiModal Applied Systems to create a scheduled railway. These tools use operations research approaches, such as an optimal block-sequencing algorithm, a heuristic algorithm for block design, (very fast) simulation, and time-space network algorithms for planning locomotive use and distributing empty cars. This implementation has saved $300 million Canadian (US$170 million) from mid-1999 through autumn 2000. We estimate it has saved at least an additional $210 million Canadian during 2001 and 2002 in fuel and labor costs alone. Labor productivity, locomotive productivity, fuel consumption, and railcar velocity have improved by 40, 35, 17, and 41 percent, respectively. Furthermore, Canadian Pacific Railway now provides its customers with reliable delivery times and has received many customer and shipping association awards for its improvement in service.

*Key words*: decision analysis: applications; transportation: freight-materials handling.

Over 3600 freight railroads operate in Canada, Mexico, and the United States. They form a seamless integrated system that provides the world's most efficient, cost-effective freight service. North American railways operate over 170,000 miles of track and produce US$42 billion in annual revenues. Railways remain the backbone of North America's freight-transportation network. Furthermore, the rail industry is at the center of many critical issues: improving North America's productivity, reducing road congestion, improving transportation safety and border security, and reducing greenhouse gas emissions.

Incorporated in 1881, Canadian Pacific Railway (CPR) is one of Canada's oldest corporations and was North America's first coast-to-coast transcontinental railway. CPR transports rail freight over a 14,000-mile network extending from Montreal to Vancouver and throughout the US Northeast and Midwest. Alliances with other carriers extend CPR's market reach beyond its own network and into the major business centers of Mexico (Figure 1).

In the mid-'90s, CPR was struggling with high costs, low profitability, and rising customer-service requirements. CPR thought its traditional operating strategies would not be adequate for dealing with these issues. CPR needed a new plan.

Although rail is an old technology, today's railways are complex operations. Every day CPR receives approximately 7,000 new shipments from its customers going to destinations across North America and for export. It must route and move these shipments safely and efficiently over its 14,000-mile network of track. It must coordinate the shipments with its operational plans for 1,600 locomotives, 65,000 railcars, and over 5,000 train crew members and take into account the capacity and storage space at 250 yards. Overall, CPR has 6,000 customers shipping via 20,000 distinct origin-destination pairs. In planning, it must also account for track-maintenance windows and connections with other railways. These vital connections account for 40 percent of CPR's business. The railway must manage and integrate a complex set of issues and assets efficiently, seven days a week, 24 hours a day.

To meet rising customer expectations and to make a return on capital investment, CPR decided to make a wholesale change in its operating philosophy.

Like most large North American railways, CPR used a tonnage-based approach in dispatching trains, holding all trains until it had enough tonnage to fill them to capacity. Under the tonnage-based approach, the operating plan may list a train as operating every day,

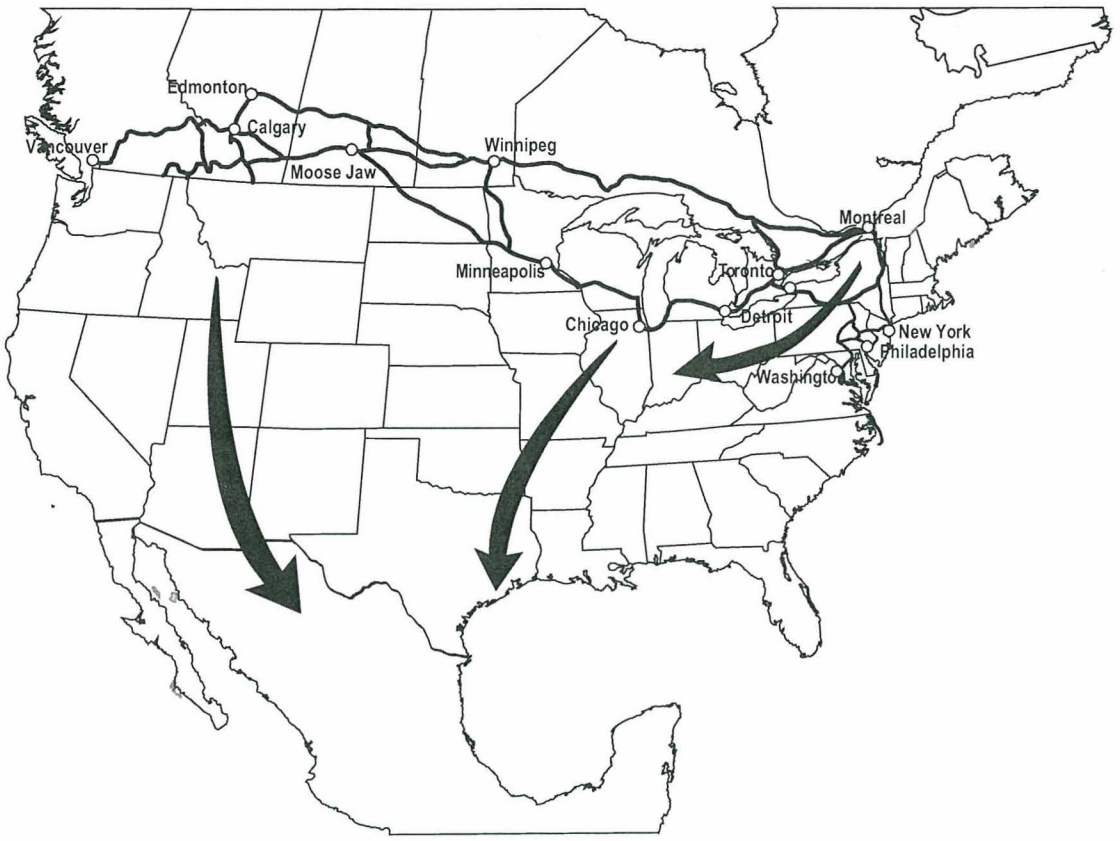


**Figure 1: This Canadian Pacific Railway (CPR) system map shows some of the 4,200 locations CPR serves. Because railways interconnect, much of CPR's traffic moves to and from other railways in the US and Mexico.**

but if the railway cannot fill enough railcars, it cancels or delays the train. In using this approach, CPR tried to minimize the total number of trains it operated by maximizing their size, which, in theory, minimizes crew costs and maximizes track capacity. However, tonnage-based train planning has serious drawbacks:

(1) The yards cannot fine-tune their operations based on a repetitive schedule, and they require more railcars and greater storage capacity to cope with the traffic variability.

(2) Demands for crew and locomotive resources may increase along with the costs for repositioning crews and equipment.

(3) Most important, customers suffer from unreliable service because the railroad gives train-operation economics priority over customer needs.

The alternative to the tonnage-based approach is a more disciplined, schedule-based approach. Scheduled railway strategies are gaining favor in North America as railways use new management science tools, particularly MultiRail, to craft cost-effective and customer-effective operating plans. CPR, Norfolk Southern, and Canadian National have made the boldest moves in this direction. In 1997, CPR began exploring the concept of running a scheduled railway, and it was one of the first railways to adopt a true schedule-based approach that allows it to adjust quickly to changing traffic demands. CPR has become rigorously disciplined in its scheduling.

The schedule-based approach forces trains to run on time, as scheduled, even if they travel with light loads. Until recently, the railway industry shunned scheduled strategies for several reasons:

(1) They require operating trains with low tonnage when customer demand is below expectations.

(2) They depend on railways' systematically forecasting traffic levels by the day of the week, and quickly adjusting the plan.

(3) They require a granular, actionable understanding of each customer's requirements in each corridor.

(4) The needed schedule-based models require sophisticated operations research software to conduct comprehensive and timely analyses of different alternatives.

However, a well-crafted operating plan for a scheduled railway can actually lead to increased train sizes.

Train size becomes a design criterion, and as long as the railway refines its operating plan as traffic patterns change, it will continue to operate large trains.

To address some of these issues, CPR turned to MultiModal Applied Systems and its MultiRail software. MultiRail was first employed by the Saint Lawrence and Hudson division of CPR in 1995 and 1996, which encompassed most of the eastern operations of the railway. This division was able to produce dramatic improvements in its costs and service levels through the careful crafting of a new operating plan using MultiRail, catching the attention of Rob Ritchie, CPR's current CEO. Under Mr. Ritchie's leadership, a joint team of CPR and MultiModal employees was formed in 1997 to explore the creation of a new operating strategy for CPR. While many people were involved with this effort, day-to-day technical leadership of the team was provided by John Fallis of CPR and Jason Kuehn of MultiModal. After overcoming a variety of technical and organizational issues, the team implemented a scheduled railway in late 1999. CPR calls the resulting plan the Integrated Operating Plan (IOP).

## The Integrated Operating Plan

In 1997, CPR wanted to replace the tonnage business model to improve customer service, operating efficiency and effectiveness, profits and to reduce operating costs. With customers focusing on total supply-chain logistic costs, it had to provide reliable and competitive transit times. CPR found that adding operational capacity did not improve its effectiveness. It launched a number of capital renewal projects to replace the aging locomotive fleet and made selective investments in replacing infrastructure and renewing computer hardware and software. CPR needed to integrate these investments into its operating plan.

Shifting to a schedule-based model from a tonnage approach was a huge challenge for CPR, which had run for 125 years on the old model. It had to change its operations and culture, integrate its capital investments, and improve its financial performance and customer service. This required a massive paradigm shift for the operations team. The objectives included faster railcar velocity, improved locomotive utilization, reduced train starts, and improved customer service (Figure 2).

CPR's customers want it to transport carloads, but CPR needs to move entire trainloads. For example, on an average day, of the 650 cars customers release to go to Chicago, only 45 of those cars are to move from the entire province of Alberta to Chicago proper. The railway must aggregate these low volumes of traffic in its operating plan.

A railway operating plan describes how railcars should move (the car routings and train plan) and

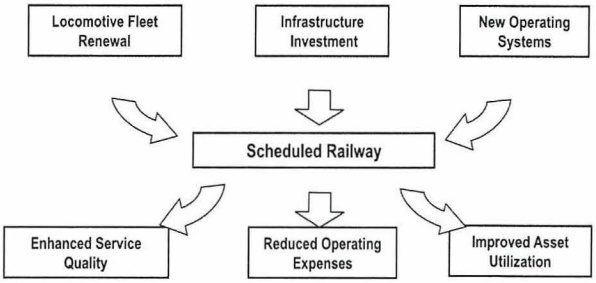


**Figure 2: The planning process for the scheduled railway is the focal point for leveraging investments in physical asset, operations, and management science to improve performance in terms of costs, asset utilization, and customer service.**

often includes the major assets needed to move the railcars (such as train crews, locomotives, yards, and tracks). Launched in mid-1999, the IOP was designed to improve service and to reduce the number of trains, which are often competing goals.

Fundamental to the railway operating plan is routing cars across the network, through the rail yards, and on the trains. Railways do this with blocking plans, which are made up of elements called blocks.

A *block* is a group of railcars that move together for some portion of their journeys. For example, in a simple blocking plan, a block between A and C can carry traffic destined to all other locations. But a block from C to D can deliver traffic to D only for furtherance to E or F (Figure 3). Often a car is routed on multiple blocks over the network. The blocking plan defines the set of permissible blocks to use for car routing (Table 1).

CPR builds the train plan on top of the blocking plan. The railway aggregates these blocks into trains to move as a single unit. The train designer wants to maximize train size, reduce the complexity of the blocking on the train, eliminate work at intermediate yards, calculate running times between yards, determine block connections, and minimize consumption of fuel.

How train movements are scheduled affects block-connection times between trains at CPR's yards and, hence, transit times for customers. Spacing the train arrivals and departures at the yards and terminals affects the efficient use of yard resources.

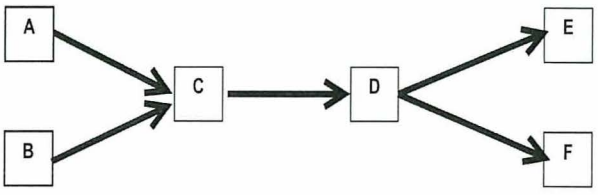


**Figure 3: A blocking plan can be represented as a network, in which each link or edge represents a group of cars being moved from one yard to the next.**

| Blocking Location | Block Destination | Traffic Destinations |
|---|---|---|
| A | C | B, C, D, E, F |
| C | D | D, E, F |
| D | F | F |

**Table 1: This sample blocking plan shows where each block is formed, where the block will be broken up to form new blocks, and the composition by destination of traffic assigned to each block. When such plans are expanded to cover the 2,500 to 10,000 locations found on a large railroad and the special rules that apply to specific car types, customers, commodities, and other attributes, they can easily grow to one million entries or more.**

Putting this together, CPR develops its IOP based on its traffic and network information and creates a feasible subset of the routing possibilities defined in the blocking plan. It then aggregates these blocks to create the train plans. Once it determines all the train plans, CPR can generate shipment trip plans. A *trip plan* specifies the specific blocks and trains required to move a shipment from origin to destination.

A group of experienced CPR service designers creates the operating plans under the leadership of the authors from CPR, with technical support from MultiModal. Input on the plan design is gathered from a variety of other groups, including both marketing and field operations. Marketing's focus is on the satisfaction of customer-service requirements, while field operations focuses on the ability to execute the plan.

By creating intelligent blocking and train plans, CPR can use its assets efficiently, minimizing crew and locomotive deadheads, routing railcars effectively, and maximizing the use of CPR's track, yards, and terminals.

Our simple blocking example illustrates the blocking concept, but practical problems are much larger. CPR has over 65,000 railcars. In any month, these railcars can take over 10,000 different potential paths, each unique origin-destination combination including a wide variety of traffic types. By refining the blocking plan, CPR gains an opportunity to improve its profitability and operations in the following ways:

(1) It can cut shipment transit times by reducing switching of railcars. Handling and holding railcars in yards often represents over 50 percent of the total transit time. By optimizing the blocking plan, CPR can reduce the number of handlings, thus reducing total transit time.

(2) It can use the time saved by reducing handlings to slow train speeds to reduce fuel consumption, while still maintaining promised transit times. CPR reduced its fuel consumption by 16 percent to 1.25 US gallons per 1,000 gross ton-miles, making it among the best in the industry despite CPR's moving much of its traffic over the Rocky Mountains.

(3) It can balance workloads among yards. By making seasonal adjustments to the blocking plan, CPR can increase the capacity of the system by moving processing demand from yards near their railcar-processing limit to yards with available capacity.

(4) It can reduce railcar dwell time in yards by rerouting cars to build large enough departing volumes to support more than one departing train per day between processing yards. In addition to the time saved by reducing handlings, increased departure frequencies reduce waiting time in yards, further reducing overall transit times and improving reliability. CPR's railcar velocity at 160 miles per day is among the highest in the industry and has improved by 41.6 percent since 1998.

An intelligent design of the blocking plan is the foundation for producing efficient operating plans.

Routing railcars and moving trains effectively improves operational fluidity, increasing capacity within the nearly fixed plant, and reducing operating and capital costs. Through these improvements, CPR gains opportunities to increase revenue and profitability.

The problem of designing a railway operating plan is to satisfy a set of customer requirements expressed in terms of origin-destination traffic movements, using a blocking plan and a train plan. Thus, the primary variables are the blocks and trains. The constraints are the capacities of the lines and yards, the customer-service requirements, and the availability of various assets, such as crews and locomotives. The objective function in an abstract sense is to maximize profits. However, because of the complex nature of the problem, we focused on various cost metrics, such as car-miles, ton-miles, trains operated, and cars switched between blocks.

## The Solution

To develop the operating plan, CPR and MultiModal decomposed the problem into a series of subproblems that are solved sequentially in five steps:

(1) Develop a traffic forecast reflecting each market segment's requirements.

(2) Use these requirements to design the blocking plan.

(3) Design trains based on the blocking plan.

(4) Use simulation to analyze yard and train workloads by the day of week and time of day.

(5) Finally, pass the train schedule on to the planning tools that develop the crew and locomotive cycle plans.

This five-step process is performed in an iterative fashion, both within each step and between steps (Figure 4). Each iteration adjusts the blocks and trains to improve the overall use of yard and train capacity and to improve the routing of the cars. Then customer-service standards are verified for compliance during the simulation step and changes made in the plan when it doesn't meet these standards.

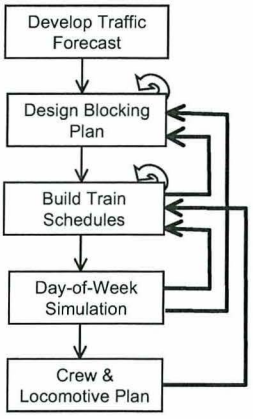


**Figure 4: The process of designing the operation plan is decomposed into a series of discrete steps. Feedback loops result in iterative processes within individual steps and between steps.**

In over 20 years working on computer applications for railway design, we have found that no single algorithm or model can capture the full complexity of the problem of designing railway operating plans. Our solution works by tackling the entire problem through the use of many separate algorithms within a holistic framework. We know of no other solution in ongoing use that approaches the completeness of our solution.

There are a number of papers that discuss using algorithms to create operating plans, including Assad (1980a, b), Keaton (1989, 1992), Gorman (1998a, b), and Huntley et al. (1995). There have also been survey papers that review railway optimization models (Crainic 2003, Newman et al. 2002), and there is a good Web-site that lists other literature (Kraft 2003). Most prior work focuses on solving subproblems of the overall railway-service-design problem, with few, if any, examples of holistic, integrated solutions. Furthermore, none of these prior efforts have resulted in production solutions employed on an ongoing basis within the railway industry.

## Forecasting Traffic

Planning railway operations requires a detailed forecast of car volumes, tonnages, and lengths for each origin-destination pair, and the information must be specific in terms of volume by day of week, type of traffic, load or empty status, and which other railways interchange traffic with CPR.

CPR's service-design department developed an automated forecasting system that combines last year's traffic, last month's traffic, and a high-level revenue forecast produced by CPR's marketing and sales department, called REVPLAN. The forecasting system provides MultiRail direct access to detailed CPR traffic volumes reflecting both marketing's projections and the effects of seasonality. This data drives the entire process of designing operating plans.

## Developing the Blocking Plan

The blocking plan is the foundation for the operating plan, determining the car routings, yard workloads, and contributing to customer service.

We design the blocking plan in an iterative, MultiRail-based process (Figure 5). We begin by creating an initial plan. Next, we evaluate the plan and identify potential improvements and test them. The initial plan can be either the one currently used or one algorithmically generated.

Starting with this initial plan and the traffic data, we use an algorithm to generate a block sequence for each traffic movement. We then use these sequences to estimate the expected block volumes and yard workloads and to identify possible improvements. We generally measure a plan's quality in terms of the number of cars switched and total car-miles, subject to the capacity of the yards. Because there are many trade-offs among the improvement opportunities and many constraints we cannot capture in the computer model, a service-design expert reviews changes to the blocking plan. We repeat this process until we can identify no further major improvements.

Improvements to the blocking plan are primarily found through what we call bypass and circuity analysis, both of which are supported through MultiRail algorithms.

A bypass is a direct block that eliminates intermediate switching. For example, if cars traveling from A to D are currently switched at C, a bypass block from A to D would eliminate this intermediate handling (Figure 6). We consider various criteria in identifying bypass blocks to ensure that they meet minimum volume requirements and to take into account any interactions with other blocks.

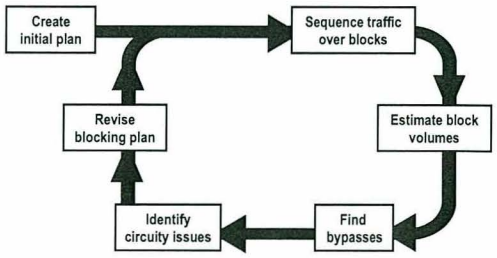


**Figure 5: The process of designing the blocking plan is highly iterative once planners create the initial plan. The traffic-sequencing process drives the evaluation process, with the experts in service design acting as gatekeepers determining which changes to include in each iteration. Design criteria include reducing railcar switching, minimizing car miles, and respecting yard capacity.**

For example, an A to D bypass block might make the A to C block too small to justify or it might conflict with a C to E bypass. We rely on an expert to assess such complications.

*Circuity* is a measure of the difference between the shortest distance a car can travel from its origin to its destination and its actual travel distance as given by its block sequence. MultiRail identifies circuitous movements based on a number of criteria, such as the circuity percentage and the total number of excess car-miles. In validating a plan, we use circuity to identify missing blocks and potential improvements to the blocking plan.

The shortest physical path is a function of network factors, such as clearance and traffic type. In the bypass and circuity analyses, we focus on adding new blocks to the plan. MultiRail also contains algorithms and reports to identify blocks to be eliminated. The full design process takes these removals into account in its iterations.

The ability to rapidly generate block sequences for every traffic movement is central to the process of designing blocking plans. A *block sequence* is a path from the origin to the destination of the traffic over a directed graph composed of the blocks in the blocking plan. Various user-controlled block attributes determine whether we can consider a particular block when finding the shortest path. The cost for each sequence represents the weighted mileage of the block sequence plus mileage-based penalties for each switching activity. We make further cost adjustments based on traffic type and other factors. We consider some constraints only during the solution process, so that we must run the shortest-path algorithm iteratively, restructuring the network between iterations to reflect violated constraints.

MultiModal's block-sequencing algorithm is critical to its effective use and to the overall planning process. To execute the iterative process for designing blocking plans, we must make rapid, large-scale changes to the blocking plan. Current industry practice is to use tables to specify which traffic goes in which block at each yard. Such tables can be huge, containing millions of entries. Making large-scale changes rapidly is impossible. The algorithmic approach used in MultiRail reduces the number of rules by two orders of magnitude and thus enables the solution strategy we employed.

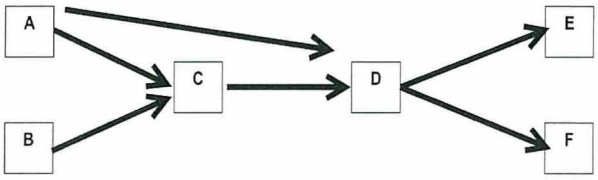


**Figure 6: The service designer has a bypass opportunity from A to D. Introducing an A-to-D block would clearly change the volumes on the A-to-C and C-to-D blocks and on any other new blocks under consideration, such as a C-to-E bypass. Making these design trade-offs is the responsibility of the service designer using the software.**

For example, a yard closure based on a table-based blocking plan would require changes to tens of thousands of entries at each yard that sends blocks to the targeted yard. It would also require changes to tables for a variety of other upstream and downstream locations. In MultiRail, simply raising the cost of the yard to be closed and adding and dropping a few high-level block definitions would be sufficient to complete the yard-closure analysis.

There are other approaches to the optimization of blocking plans, such as large-scale mathematical-programming techniques (Bodin et al. 1980, Barnhart et al. 1998, 2000) and heuristic methods (Ahuja et al. 2003). The concept of a dynamic blocking plan, along with routing algorithms, is described by Kraft (2000). Kraft (2002) gives an excellent overview of the importance of yards and therefore of blocking plans.

## Train Plan

The blocking plan lays the foundation for the train plan (Figure 7). Each train's schedule lists departure and arrival times, the blocks of cars it picks up or sets out at each location, crew change points, and locomotive requirements, among other details.

To develop a train plan, we use MultiRail's heuristic algorithms to identify large-volume blocks and to create trains around those blocks. The train size might be smaller than capacity, so we use MultiRail to identify other blocks that can be picked up en route until we estimate the train size is close to capacity. We iterate this process until we have assigned all blocks to at least one train.

Next, we use MultiRail to reestimate the train sizes and refine the day-of-week frequency to further improve capacity utilization. MultiRail's algorithms can accurately calculate the intermediate arrival and departure times of the trains as they travel across the network, but the planner needs to establish the original departure time for each train. Given the departure times, MultiRail employs several algorithms and reports to show the effects of the train plan on connection times and inventory of cars in the yards. The planner uses these calculations to adjust the train times and sometimes the day-of-week frequency to properly balance yard workloads.

Finally, the planner determines crew and locomotive requirements based on the train plan. These requirements are used in subsequent planning steps to develop specific deployment plans for locomotives and crews.

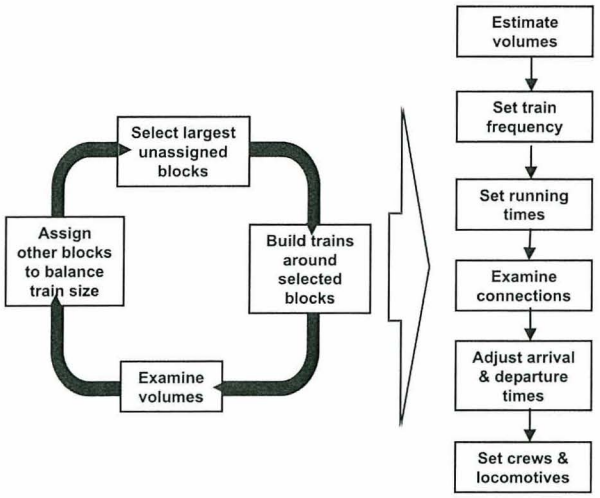


**Figure 7: The train designer starts by focusing on assigning all of the blocks to trains. The designer creates trains around the largest anchor blocks first, using the remaining blocks as filler to achieve size goals. Once the designer defines basic trains, he or she must make many refinements to fix their frequencies, their departure and arrival times, their timing at yards, the crew requirements, and the locomotive needs.**

What are the characteristics of a good train plan? From a high-level view, a train plan must provide frequent service to meet customers' needs but contain a minimum of trains to reduce costs. A train should be fast to maximize track capacity and improve service, but slow to save fuel. A good train plan must not overburden yards by sending too many trains through them at once. Yet, bunching trains may reduce the connection times of cars at the yards. The train planners must resolve these somewhat contradictory design criteria. MultiRail provides rapid, interactive feedback on all of these criteria, allowing the planners to focus on perfecting the plans.

## Day-of-Week Simulation

To speed the design process, we use average-day analysis in the initial block- and train-plan development work. Ultimately, we must take day-of-week and time-of-day factors into account. To do this, we use MultiRail's SuperSim tool.

SuperSim calculates the detailed trip plan or itinerary of each origin-destination movement, including the blocks and trains used and the yards where the cars are switched. Because we use the time-of-day and day-of-week car releases, we must typically generate 500,000 to one million trip plans. This simulation can be a bottleneck, inhibiting rapid and thorough analysis.

However, in SuperSim, we use a variety of techniques to speed this process so that we can obtain a solution in a few minutes, rather than in hours or days. Outputs from SuperSim focus on yard workload and car inventory, train size, and compliance with customer-service requirements. We use these results to fine-tune the operating plan by

—smoothing workloads at yards,

—making schedule adjustments to improve car connections,

—changing the days trains operate to account for ebbs and flows in car volumes, and

—ensuring that the plan meets customer-service requirements.

How does SuperSim solve the performance problem? Conventional railway trip-planning tools compute trip plans individually. However, the natural aggregation process of building blocks and trains means that we can advance many cars from one location to the next in a single calculation. For example, we may have various flows going from A, B, and C to D, E, and F. If all of these flows travel on the same block from C to D, we can use a single processing step to advance these cars between these two locations, greatly reducing simulation run time (Figure 8).

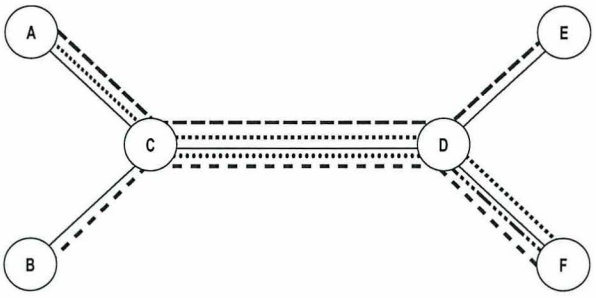


**Figure 8: Each nonsolid line in the figure represents a traffic movement. In a blocking plan that assigns all traffic going from C to D to the same block and train, these separate traffic movements will share common trip-plan attributes between C and D and can be processed as a group during the simulation.**

## Other Algorithms

MultiRail includes many additional algorithms and analysis techniques, including

—an interactive trip planner that allows planners to create individual what-if trip plans,

—numerous diagnostics to evaluate and identify plan defects,

—the ability to generate time-distance diagrams to examine line-capacity impacts,

—various reports on workload requirements, and

—the ability to feed the MultiRail data to a variety of CPR real-time and planning systems.

The last major step in the planning process is developing a locomotive cycle plan. MultiRail estimates the tonnage for each train, which an internal CPR

system uses to assign minimum locomotive requirements. These requirements result in an imbalanced, and therefore infeasible, locomotive cycle plan. CPR's locomotive-planning system devises a feasible plan by deadheading locomotives on existing trains to achieve balance. The algorithm employs a time-space network covering four weeks of train events over the railway's 250-yard network and uses a depth-first search technique to identify deadhead opportunities. Ahuja et al. (2002) and Luo and Meketon (1997) also did work in developing locomotive plans.

To execute the plan, we use an empty-car distribution model to suggest the routing of empty cars to customers for loading. Several times a day, the model solves a two-week, 250-yard, 30-car type problem to find the least-cost routing for empty cars. The model is based on work initially undertaken by Mark Turnquist (Turnquist and Jordan 1983, Turnquist 1994) of Cornell University, which CSX Transportation subsequently redesigned and reprogrammed.

## Results and Conclusions

CPR's senior managers believe that the company's adoption of management science tools and operations research techniques has transformed CPR into a more agile, profitable, highly cost-effective, and competitive railway. To quote CPR CEO Rob Ritchie, "CPR's operations team and its Integrated Operating Plan exceeded its objectives. Today, Canadian Pacific Railway schedules virtually everything it does under its Integrated Operating Plan. It schedules the movement of empty cars to fill customer orders and the movement of the loaded cars to their destinations. It schedules trains in all track corridors and integrates these schedules into those for the yards and terminals. It then schedules track and locomotive maintenance around the operating activities."

The benefits of successfully implementing scheduled operations have been very significant (all financial figures are in Canadian dollars). One year after the 1999 implementation, CPR performed an audit of the benefits. This audit showed that scheduled operations reduced CPR's cost base by $300 million. Since the audit, CPR has analyzed two of its larger expense categories: crew wages and fuel. This analysis showed that

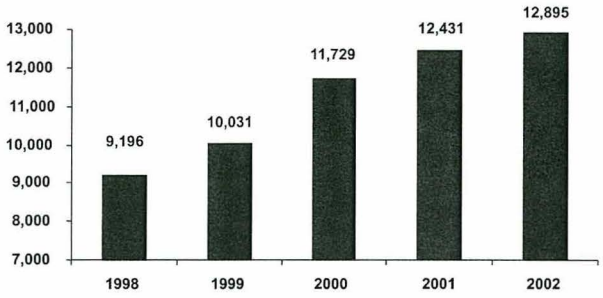


**Figure 9: Labor productivity measured as gross-ton-miles per active employee has improved by 40 percent, reflecting an 18.8 percent workforce reduction and a 13.8 percent increase in gross-ton-miles since 1998.**

an additional $210-million savings was attributable to the change in operating practices in 2001 and 2002 (Table 2). Total documented cost savings through the end of 2002 have exceeded half a billion dollars. These savings do not include the benefits from reducing the number of railcars and locomotives owned over the 1999 through 2002 period.

CPR transformed the way it runs its operations and serves its customers by using the algorithms and decision-support tools of MultiRail, as well as traffic forecasting, and locomotive and empty-car planning algorithms. These tools gave CPR an opportunity to leverage new computer systems and capitalize on investments in infrastructure and locomotives.

The new strategies for routing railcars increase train weights and thus decrease train starts, enabling CPR to reduce its workforce by 18.8 percent despite an increase in gross-ton-miles (GTM) of 13.8 percent (Figure 9). These efforts have resulted in an increase in carload train size of over 10 percent. More reliable train schedules facilitate scheduling time for track maintenance and reducing variance in the system and nonproductive time. Aggressive yard bypass blocking reduces railcar processing in yards, which effectively increases yard capacity and reduces yard crew wages and yard fuel consumed.

Reduced horsepower per ton (HP/ton) ratios on trains combined with selective speed reductions enabled by increased car velocity makes the reduction

| Category/Year | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|---|---|---|---|---|
| Fuel ($) | 0 | −22,732,441 | −62,957,504 | −74,823,239 | −68,031,806 |
| Road-crew wages ($) | 0 | −13,316,997 | −31,480,392 | −40,564,550 | −35,184,042 |

**Table 2: Two sources of the additional Can$200 million Canadian Pacific Railway saved in 2001 and 2002 were fuel and road-crew wages. We computed the savings using the 1998 fuel and labor-productivity rates to estimate what the railway's costs would have been in each year had it made no changes in operations. We assumed current costs for labor and fuel and did not include wages for yard crews.**

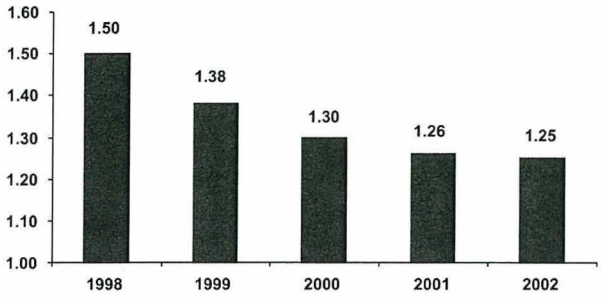


**Figure 10: Canadian Pacific Railway has reduced its fuel consumption (US gallons per 1,000 gross-ton-miles) by 17 percent, and it now leads the industry.**

in transit times transparent to customers. CPR has also improved fuel consumption by introducing AC powered locomotives (Figure 10).

Aggressive block bypassing and improved connections between trains at yards reduces dwell time in yards, improving railcar velocity. CPR's railcar velocity increased from 113 miles per day in 1998 to 160 miles per day in 2002 (41 percent) (Figure 11). CPR has reduced the fleet it owns or leases from 51,900 in 1998 to 44,300 in 2002 (15 percent) while GTM increased 14 percent. In addition to ownership costs, car fleet size also drives maintenance expense.

Reducing train HP/ton ratios and matching train weight to the pulling capacity of locomotives results in locomotives using their most efficient throttle position and maximum pulling capacity, thereby optimizing their utilization (Figure 12). Locomotive trip plans cycle individual locomotives between scheduled trains and are adjusted to reduce locomotive idle time. CPR plans deadhead moves to balance locomotive supply, adjusting train schedules to improve locomotive productivity.

The IOP succeeds partly because of its flexibility and agility. The plan must be able to accommodate variations in traffic levels and resource availability. The network can be affected by a variety of controllable and uncontrollable events, such as extreme weather conditions, derailments, mechanical failures, and fluctuations in freight volumes. Such events harm resource availability because they cause delays, which means that assets tend to sit in queues. This was the case during the last quarter of 2002 when CPR's grain business dropped by about 15 percent and its coal business by about seven percent.

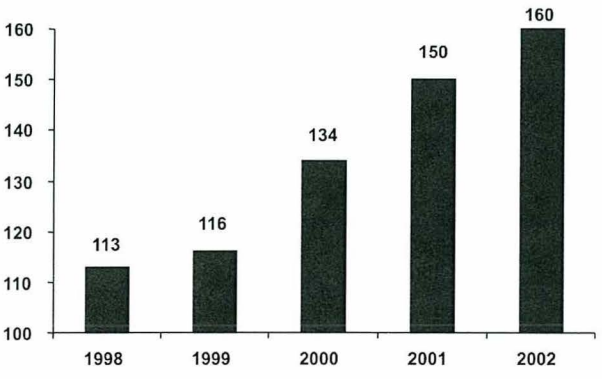


**Figure 11: Canadian Pacific Railway's car velocity (car miles per car day) improved by 41 percent between 1998 and 2002.**

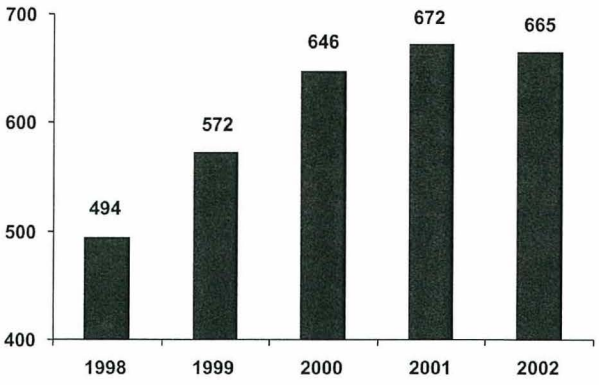


**Figure 12: Canadian Pacific Railway's locomotive productivity in terms of thousands of gross-ton-miles per locomotive improved by 35 percent between 1998 and 2002.**

Fortunately, a growth opportunity was developing in the containerized-freight and automotive business sectors. CPR quickly adjusted the IOP to reallocate capacity and resources to these growing markets. As a result, it reported record earnings for 2002 in a challenging North American economy. Looking forward, CPR plans to increase its industrial products—or carload—business faster than the economy. To achieve this growth, it will rely on the IOP to make the railway even more competitive with trucks than it is now.

CPR has improved the reliability of its service and its ability to shift resources quickly to meet customers' needs. It has made these gains while building an outstanding record as the safest major railway in North America for train handling. CPR has been recognized by many customers and shipping organizations for its service excellence and safe product handling, including General Motors, Sears, Shell Oil, Toyota, and Daimler Chrysler.

CPR's adoption of a scheduled strategy went against a long-standing tradition of railway operations based on the tonnage model. This major cultural change within CPR's organization continues to this day. To support this ongoing evolution, CPR is recruiting and training employees with operations research skills and exchanging employees with other railways.

The methods CPR and Multimodal developed are portable to other railways. The success of CPR's

approach to operations planning has captured the attention of railroads in the US, Mexico, Europe, and Brazil. At least two other major North American railways have begun using similar approaches and tool sets to improve their own operating plans.

The tools, techniques, and strategies employed in this effort are a work in progress. The job is never finished in an ever-changing environment. CPR continually searches for and finds areas for improvement. It is using MultiRail and the other tools we described to refine and improve its operating plan as part of an institutionalized, ongoing process. We believe our work on the problem of designing railway operating plans is an example of operations research being applied to a number of key functions in a broad business process. It is this breadth of application that is particularly noteworthy.

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Robert Ritchie, President and CEO, Canadian Pacific Railway, stated the following during the presentation of this work for the Edelman Prize: "In the mid-'90s, we were struggling with relatively high costs and low profitability, all in the face of rising customer service requirements. We were not at all sure that our traditional operating strategies were up to the challenge of dealing with these issues. It was apparent to me that we needed a new game plan.

"To meet rising customer expectations and to earn the money to generate a return on the required capital investment, we needed to make a wholesale change in our operating philosophy.

"Canadian Pacific Railway turned to MultiModal and its MultiRail application. Working together, we developed what we believe is the best schedule-based model in the rail industry. We call it our Integrated Operating Plan.

"The wholesale paradigm shift to management science tools and operations research techniques has transformed Canadian Pacific Railway into a more agile, profitable, highly cost-effective and competitive railway.

"The benefits of successfully implementing scheduled operations have been huge. One short year after implementation, we performed an audit of the benefits. This audit showed scheduled operations was responsible for a $300-million (Canadian) reduction in our cost base. Since the audit, we have analyzed two of the larger expense categories: crew wages and fuel. This analysis showed an additional $200-million (Canadian) savings was attributable to the change in operating practices. Our total cost savings have exceeded half a billion dollars (Canadian)."

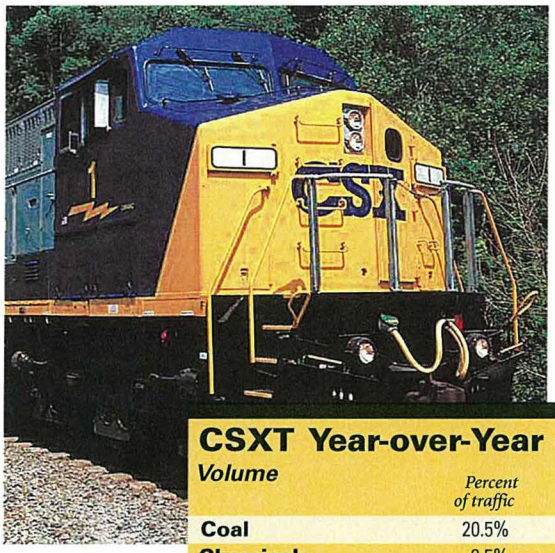
# Getting on Schedule

BY JOHN GALLAGHER

**CSX sees tighter operating plan as lynchpin to service recovery, says service to improve in fourth quarter**

The peak season for shippers at CSX already is here. For the first time in years, the railroad has no equipment to spare within its carload base and shippers can expect to pay more for the current level of service until at least the fourth quarter.

"At this point, we usually have tons of cars in storage," said Cary Helton, vice president of service planning at CSX, "but we're already maxed-out on merchandise cars — there's nothing there. So from that standpoint, the peak is already here."



However, Helton said, "we're hoping that customers will begin seeing improvements in operations sometime in the fourth quarter." To get there, the railroad with North America's worst operating ratio is taking a page from one with the best to jump-start its network: scheduled service.

CSX, whose operating ratio is currently running at over 90 percent and is struggling almost as much as Union Pacific Railroad, has a ways to go to get to achieve an operating ratio even close to Canadian National Railway's 72 percent. But that isn't stopping it from implementing a system similar to CN's that will allow it to adhere more tightly to its operating plan to more accurately schedule shipments and improve service.

"We're certainly trying to schedule more precisely our network," said CSX spokesman Gary Sease, "so that day in and day out we can run to plan."

The new operating system, which uses software created by MultiModal Applied Systems, was used to develop rival Norfolk Southern's Thoroughbred Operating Plan, as well as scheduled operations at CN and Canadian Pacific Railway.

CSX insists, however, that its new system, tagged "One Plan" and which will be rolled out at the end of the month, was not brought over by Tony Ingram, who came from NS in March as CSX's new chief operating officer. "Tony did not bring scheduled operations over from NS," said Helton. "We started planning this in February. What Tony is doing is validating what we're trying to do, because he went through this at NS and knows the improvements that we can get out of it."

Besides giving CSX the ability to build the proper blocks of cars on which entire trains can be built according to current volume levels — versus building them based on historical levels — the One Plan will allow CSX to eliminate almost an entire tier from its yard operations structure used to classify cars within its merchandise network. That equates to reducing the number of times a car is handled from seven to five, meaning cycle times can be reduced by 48 hours.

Wall Street is watching the situation closely to see if CSX can pull it off, particularly after recently completing a management cut of 950 employees in April. "The

## CSXT Year-over-Year change

| *Volume* | *Percent of traffic* | *Q1* | *Q2TD* | *YTD* | *4 week trend* | *week 21* |
|---|---|---|---|---|---|---|
| **Coal** | 20.5% | 2.5% | 1.1% | 2.0% | 2.1% | –2.2% |
| **Chemicals** | 8.5% | –1.0% | 7.3% | 2.1% | 12.1% | 22.4% |
| **Motor Vehicles** | 7.2% | –5.1% | –0.7% | –3.5% | –0.7% | 7.7% |
| **Total CSXT commodity carloads** | 70.3% | 3.9% | 3.9% | 3.9% | 4.4% | 9.2% |
| **Total CSXT intermodal** | 29.7% | 5.4% | 8.0% | 6.4% | 10.1% | 22.8% |
| **Total CSX volume** | 100.0% | 4.3% | 5.1% | 4.6% | 6.1% | 13.1% |

| *Average Terminal Dwell** | *1Q* | *2QTD* | *YTD* | *Past 4 Weeks* | *Week 21* |
|---|---|---|---|---|---|
| **Kansas City Southern** | 3.1% | –3.0% | 1.4% | –1.6% | –11.2% |
| **Norfolk Southern** | 0.1% | 4.5% | 0.3% | 1.8% | 6.1% |
| **Canadian Pacific** | 17.1% | –3.8% | 13.2% | 9.3% | 13.6% |
| **Burlington Northern Santa Fe** | 1.2% | 0.9% | 2.9% | 11.0% | 10.7% |
| **Union Pacific** | 17.7% | 28.2% | 18.2% | 15.6% | 10.8% |
| **CSX Transportation** | 8.6% | 19.3% | 13.7% | 26.5% | 32.5% |
| **Canadian National** | –1.8% | 4.9% | 3.5% | 28.8% | 40.0% |
| **Weighted Average Dwell time** | 8.0% | 13.6% | 9.8% | 14.7% | 15.5% |

**Decreases in terminal dwell implies better asset utilization and lower per unit expenses.*

Source: Association of American Railroads

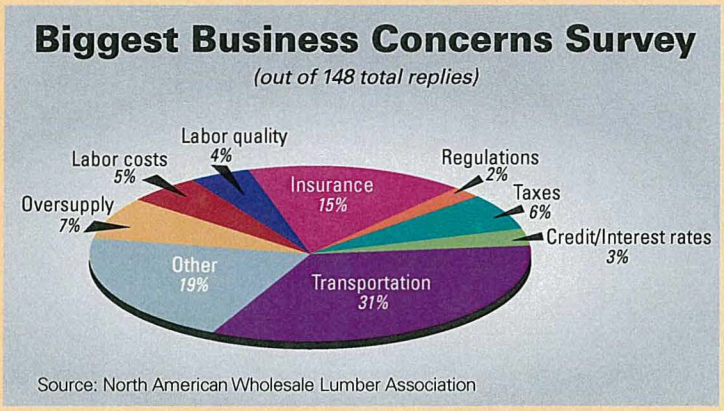
Photo by Larry Smith/Trans Pixs

# Lumber shippers 'concerned' with rail

In a sign of growing impatience with rail service, a building materials group says it may revive its transportation committee to address problems with rail delivery.

Transportation ranked as the biggest "business concern" in a recent quarterly survey conducted by the North American Wholesale Lumber Association, whose 650 members have combined annual sales of more than $30 billion. The results indicate how rail service problems have started to infiltrate key rail shipping sectors.

"I've been here four years and it's the first time transportation has been such a big issue," said NAWLA information director Ben Stephens.



Source: North American Wholesale Lumber Association

Transportation concerns made up 31 percent of the 148 responses received by the association, the biggest single category listed by members. Insurance (15 percent), inflation (8 percent) and oversupply (7 percent) were the next largest areas of concern.

Truck and rail are the predominant modes of shipping forest products. Stephens said the survey was started 18 months ago. It has only been during the last quarter that respondents became more specific with regard to its business concerns, he said, with several taking note of the railroad's poor service. None were willing to name names, however. "That's most troublesome," Stephens said. "They didn't want to risk their relationship with carriers."

The survey results are important enough that the association may revitalize its mostly dormant transportation committee. "What's more likely is that we'll come up with a member task force to see how we can keep our members better informed of service issues," he said.

*— by John Gallagher*

key issue will be management's ability to execute this plan in an environment where, though demand is solid, service is mixed and inconsistent," said Smith Barney transportation analyst Scott Flower

Jennifer Cooke Ritter, a transportation analyst with Lehman Brothers, said that Multimodal has been able to shave 2-3 points of operating ratio in the 6-9 months following implementation of scheduled systems for other railroads. "This gets us extremely excited about the prospects for CSX," Ritter said.

For $6.2 billion Nucor Steel, the largest steel producer in the United States and whose products go into making everything from washing machines to air conditioners, CSX improvements can make a big difference. "If CSX can improve their cycle times, it would definitely have an influence on my opinion of rail," said Tom O'Malley, a shipping supervisor at Nucor's plant in Decatur, Ala.

Two months ago O'Malley had to leave 140 loads of steel coil on the ground for lack of timely empty rail equipment — from both NS and CSX. "If push comes to shove, I can always offer a truck driver a deal he can't refuse to move my freight," O'Malley said. "But if I need to move a load from California to Alabama within a certain amount of time, all the money in the world's not going to get it there."

CSX is banking on its One Plan to reduce the railroad's terminal dwell time — currently one of the worst in the industry — and thus improve network fluidity. That not only will affect merchandise traffic, which makes up half of the company's nearly $8 billion in operating revenue, but should have an indirect impact on its intermodal and unit train network as well.

"We're running 100 more coal unit trains on our network than we should be, a factor of increased volumes both on the domestic side and on the export side," said Helton. "Any improvements that we can make on the carload side will help relieve some of the pain." ●

## Briefs

**Burlington Northern Santa Fe Railway's** group vice president for coal Thomas G. Kraemer was elected chairman of The National Coal Council, a Federal Advisory Committee to the U.S. Secretary of Energy. Kraemer, who has been vice-chairman of the NCC, was appointed to the council in April 2000 by then Secretary of Energy Bill Richardson and reappointed in January 2004 by Secretary Spencer F. Abraham. He succeeds Wes M. Taylor, vice president/generation, TXU Energy, Dallas, Texas, who completed a two-year term as chairman. Council members are appointed by the Secretary of Energy and serve at no compensation.

**"Can Growth Continue?** - Managing Peak Season Demand" will be the subject of a town-hall-style session at IANA's 2004 Intermodal Operations & Maintenance Seminar June 14 in Chicago. The open-mike format is designed for intermodal managers who oversee operations and maintenance issues on a day-to-day basis. Seminar attendees will have the opportunity to discuss 2004 peak season operating strategies with their peers and experts from all intermodal disciplines, IANA said. Additional educational programming includes looking at the impact of hours of service regulations on intermodal operations, intermodal equipment roadability, interminal equipment damage, achieving drayage efficiencies, and the future of intermodal trailers. More information is available at www.intermodal.org. ●

COVER STORY

# UPSIDE

## New operating plan, process changes put UNION PACIFIC in a better position to provide reliable service and realize income potential, UP execs believe

BY JEFF STAGL, MANAGING EDITOR

In early 2005, more than 320,000 rail cars flooded Union Pacific Railroad's 32,400-mile network. Many cars were stalled in yards or taking extra days to reach their destination. Why? Because North America's largest Class I didn't have enough crews and locomotives to accommodate mushrooming traffic. Also, several severe storms in southern California and the Sierra Nevada region had washed out parts of key mainlines and the railroad had difficulty getting cars moving after weather-related setbacks while handling unprecedented volumes.

As a result, first-quarter 2005 net income fell 22 percent to $128 million, operating expenses rose 10 percent to $2.8 billion and the railroad's operating ratio worsened 1 point to 90.1 compared with first-quarter 2004.

Customers grew frustrated with the Class I's transit times, as well. Seventy-one percent of the respondents to Smith Barney/Citigroup's first-quarter 2005 survey of 1,400 rail shippers said UP's service had deteriorated. In a fourth-quarter 2004 survey, 45 percent of the respondents said service had worsened.

The railroad's network wasn't fluid — a problem that snowballed through 2004 — because UP was taking on traffic that didn't necessarily match what mainlines or yards could handle and operations weren't adjusting quickly enough to seasonal demands, senior execs say.

UP's top brass knew they needed to resist the temptation of a quick fix, such as adding more trains and more cars to an already congested system. Instead, they spent late 2004 and early 2005 making changes to several operational processes. Ones that will take time — perhaps years — to put in place, but

Photo of UP locomotive by Howard Ande; background photo courtesy of Union Pacific Railroad

pay off by improving service reliability, generating more income and reducing costs for the long haul.

The changes include the Unified Plan, a new operating blueprint UP began to implement in second-quarter 2005 that's designed to reduce intermediate switches, create more direct origin-to-destination trains and quickly restore traffic flows after severe weather strikes; a new car-handling process introduced earlier this year at shippers' facilities to control traffic flows; a car inventory management system that will be rolled out later this year to reduce cars on line; and ongoing "lean" and Six Sigma initiatives to speed up tasks, such as locomotive repairs.

**"We keep hearing there's a softening in the economy, but we're not seeing it."**

**— Robert Knight Jr., CFO**

The changes have different purposes but a common motto: never be satisfied with performance and strive to improve every operational aspect. And it will take time for that motto to sink in, execs say.

"If we were in a baseball game, we'd be in the second or third inning, so there's a lot of game left to be played," says UP Executive Vice President of Finance and Chief Financial Officer Robert Knight Jr. "It's a continuous-improvement game and it likely will go into extra innings, or never end."

## GAME-CHANGING EVENTS

There are several factors that favor UP's chances in the game. The Unified Plan is taking hold; the railroad is in the midst of hiring 5,000 train and engine-service workers, and acquiring 200 road and 102 low-emission yard locomotives, and 2,700 freight cars; and UP is adding capacity, such as another 50 miles of double track in New Mexico along the core Sunset Route.

Bringing on more crews and power, and changing work processes helped UP get back on the right financial track in the first quarter. The railroad registered best-ever earnings of $1.15 per diluted share — more than double first-quarter 2005's earnings — net income of $311 million nearly tripled, operating revenue of $3.7 billion and commodity revenue of $3.5 billion set quarterly records, and operating income of $605 million increased 93 percent and the operating ratio of 83.7 improved 6.4 points on a year-over-year basis.

Plus, UP's stock price reached $93.35 per share on March 31 compared with $69.70 per share on March 31, 2005.

The operational changes made so far also have helped the network become more fluid than it's been in two years. Average system velocity is up 0.5 mph to 21.5 mph and average terminal dwell time is down about an hour to 29 hours compared with 2005 data.

And UP is meeting car connection commitments 79 percent of the time and industry spot/pulls 87 percent of the time compared with 77 percent each a year ago.

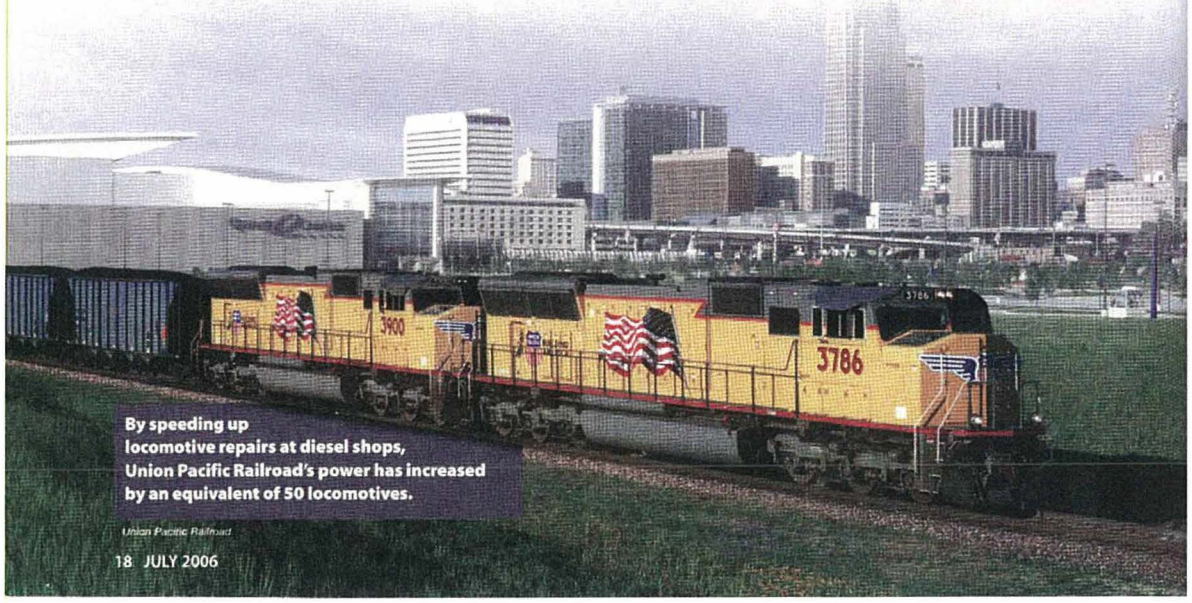
The network is beginning to flow because the railroad is only taking on traffic where UP has the mainlines and facilities to accommodate the freight, says Knight.

"We have caps so we're not flooded with traffic," he says. "We will turn down business that doesn't fit our capacity or bring a sufficient level of return."

## THE JURY'S STILL OUT

But UP can't afford to turn away a lot of business. To increase revenue and income, execs will need to provide shippers, short-line partners and investors more evidence that the railroad is gaining operating discipline.

"They're getting right-sized with




**By speeding up locomotive repairs at diesel shops, Union Pacific Railroad's power has increased by an equivalent of 50 locomotives.**

*Union Pacific Railroad*

labor and locomotives, and going to a more scheduled operating plan that's starting to take," says UBS Investment Research analyst Rick Paterson. "But it's a slow process to get out of the operational doghouse, and it takes time for simple blocking and tackling to take hold."

**"We know we're not where customers want us to be."**

**— Jack Koraleski, EVP of sales & marketing**

First-quarter results didn't show much cost-control discipline. UP's operating expenses rose 9 percent to $3.1 billion primarily because the average quarterly fuel price increased 29 percent compared with the same 2005 period.

"I think the next one or two quarters will show if they're gaining operating discipline and taking costs out," says Paterson.

UBS analysts believe safety metrics are the best indicator of operating discipline. After falling each month between September 2005 and February 2006 from 2.5 to 1.5, UP's reportable injuries per 200,000 manhours increased to 2.1 in March, according to a recent UBS report.

Coinciding with the safety metric's rise, velocity and terminal dwell times were flat in March. The service metrics remained that way through May, the report states

A majority of short lines aren't convinced UP's service performance is improving much, either.

In a recent UBS survey of 31 small roads that interchange with UP, 58 percent of the respondents said they expected the Class I's service to remain the same or worsen. Thirty-nine percent believed service would improve slightly and 3 percent said it would improve a lot.

## THE 'SHOW ME' STATE

Some shippers also haven't seen a noticeable difference at UP. Several shippers — who asked they not be identified — said the railroad's service hasn't gotten any worse, but it hasn't necessarily gotten better, either.

And although the rail industry's largest intermodal shipper wouldn't specifically take UP to task for its performance, United Parcel Service spokesman Norman Black said the company continues to experience service reliability issues in the West.

"We have not seen any level of change this year compared to last year," he says.

However, UP's own customer satisfaction survey of 200 shippers — which the railroad has conducted monthly since 1987 — tells a different story. During the first quarter, the railroad averaged a 70 score compared with the 50s

in parts of 2004 and 2005.

Based on a 1 to 5 scale, with 5 being the best, shippers rate UP's performance in 35 categories. If a rating is 3 or lower, a sales or marketing staffer calls the shipper to find out why that rating was given.

"We survey the same shippers each May and the same ones each June, and so on, so we can get a good year-over-year comparison," says EVP of Sales and Marketing Jack Koraleski. "By the end of 2006, we want to get into the upper 70s, and then get into the 80s next year."

UP also conducts a local customer satisfaction survey through which shippers are asked to answer six questions about how well the railroad spotted cars and if cars were picked up on time.

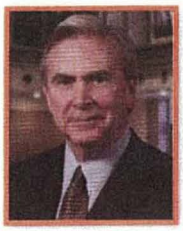
"Customers say that we've improved. Intermodal shippers say our Blue Streak service is as good as it's ever been," says Koraleski. "But we know we're not where customers want us to be."

To get there, UP execs are counting on the Unified Plan. Launched in April 2005, the plan maps out an operating strategy for automotive, manifest and intermodal traffic to reduce terminal handlings and dwell time, and increase velocity. For example, transportation managers changed carload collection points so destination-direct trains operate several times a week instead of daily to free up mainlines.

So far, the plan has helped the railroad reduce intermediate terminal switches by 12 percent and the rate of en route work events by 16 percent.

Currently, UP is implementing the plan in its complex southern region. The railroad plans to improve interchanges with Mexican railroads at six U.S./Mexico border crossings. In March, the Class I and Kansas City Southern de México S.A. de C.V. began capping cars en route to the border at 4,000.

"We're now at about 3,500 cars en route and haven't hit 4,000 since we started," says EVP of Operations Dennis Duffy.



**"We want to maximize origin-to-destination trains and minimize individual events and handlings."**

**— Dennis Duffy, EVP of operations**

## A PLAN FOR ALL SEASONS

UP managers also are working with representatives from MultiModal Applied Systems Inc., which helped develop the Unified Plan's operation planning software, to create software that adjusts operations for seasonal demands.

"We'll be able to determine 'what-if' scenarios," says Duffy.

The Unified Plan's biggest benefit to date: an increase in origin-to-destination trains. The railroad is operating

25 percent more direct trains than it has in previous years, says Duffy.

"It's like a non-stop flight for an airline, and we have an opportunity to create many more of those," he says. "We want to maximize origin-to-destination trains and minimize individual events and handlings."

UP execs also want to implement a new car-handling process at more shipper locations. Launched last year in Phoenix, the Customer Inventory Management System (CIMS) calls for transportation managers to work with shippers to fill manifest traffic spots and limit car inventories to three days to match traffic flows to track capacity, reduce dwell time and improve throughput.

For example, managers convinced a shipper to load and unload cars on Saturdays and Sundays in addition to weekdays so UP could operate seven-day train service.

"It's like the auto industry — they only want to ship cars on weekdays, but they'll do it on Saturdays and Sundays when the market is hot," says Duffy.

UP has implemented CIMS for 60 percent of its industrial customers and expects to reach 70 percent — including those in Houston and Fort Worth, Texas — by year's end. Since rolling out the system in Phoenix, Las Vegas and East Los Angeles, dwell time and switches have been reduced between 20 percent and 50 percent, says Duffy.

## SCIENTIFIC SLANT

The Class I also is registering benefits from various lean and Six Sigma initiatives, which rely on science-based analyses to improve work processes. For example, the railroad is operating the equivalent of 50 additional locomotives on its network because diesel shops have sped up locomotive repairs, says Duffy.

"We mapped out every step needed to service a locomotive, determined which steps were value-added and took out the non-value-added ones," he says.

A 25-person staff is dedicated to developing and implementing lean and Six Sigma initiatives, which this year will focus on intermodal ramps and run-through tracks.

UP also expects to derive operational benefits from a car inventory

management system that will be rolled out at the railroad's Omaha, Neb., Harriman Dispatch Center this year. Comprising a network management system and software, the system is designed to determine optimal train flows to reduce cars on line.

"We'll standardize response mechanisms to recover quickly from events, like storms," says Duffy.

By 2009, the railroad also plans to have the third generation of its Computer-Aided Dispatch or CAD System up and running to better integrate road dispatching and yard operations.

"We'll get 25 percent more capacity by integrating those," says Duffy.

## TRACKING GROWTH

UP plans to spend $485 million this year to ensure its network and facilities have additional capacity, too. The budget is part of the railroad's $1.5 billion track improvement program and overall $2.75 billion capital spending plan.

By year's end, UP will have double-tracked half of the 760-mile Los Angeles-to-El Paso, Texas, Sunset Route, as well as built a second mainline between two San Antonio, Texas, yards, a third mainline at its North Platte, Neb., yard, and new intermodal and auto ramps in Salt Lake City.


**Union Pacific Railroad's attrition rate has averaged about 8 percent the past few years. So, the Class I will hire 5,000 train and engine-service workers this year and next. Since 2003, the railroad has hired about 20,000 train crew employees.**

Next year, the Class I plans to complete a signaling project on its Omaha-to-Chicago double mainline that calls for installing Centralized Traffic Control and universal crossovers, placed every 15 to 20 miles. The project will improve throughput by enabling faster trains, such as intermodal, to pass slower coal trains.

And UP expects to operate many coal trains, especially out of the Powder River Basin (PRB). To accommodate the traffic, UP and BNSF Railway Co. plan to spend $100 million during the next two years to build more than 40 miles of third and fourth mainlines along their joint PRB line.

Coal and intermodal loads are driving UP's traffic surge of late. Through June's first 10 days, the railroad's second-quarter traffic volume was up 5 percent compared with the same 2005 period. Energy volume was up 8 percent; intermodal, 7 percent; automotive, 5 percent; and agricultural products, 3 percent.

Burgeoning low-sulfur coal demand, eastern U.S. mine issues and "carryover business" from last year, when severe weather damaged the joint line, are driving coal traffic, while increasing Asian imports to West Coast ports continue to propel intermodal moves, says Koraleski.

UP also is registering growth in industrial products traffic and ethanol carloads are up 50 percent.

"We're moving ethanol east for the first time and in unit trains for the first time," says Koraleski.

By year's end, UP's traffic should be up 3-plus percent compared with 2005, says CFO Knight.

"We keep hearing that there's a softening in the economy, but we're not seeing it," he says. "Lumber traffic is a little soft, but that's about it."

The projected traffic growth should boost full-year commodity revenue by 12 percent or more compared with 2005.

Knight says. He also anticipates full-year earnings per share to fall between $5 and $5.20 (compared with $3.85 in 2005) and the annual operating ratio to improve by 4-plus points (from 86.8).

"Our overall goal is to get the operating ratio into the mid-70s," says Knight.

## RATES UP, EXPENSES DOWN

To do so, UP will need to reduce operating costs, especially fuel expenses. The railroad, which is recovering 90 percent of diesel costs through fuel surcharges, needs to get to 100 percent, says Knight.

UP also will have to continue raising rates. In the first quarter, the railroad obtained a core increase of 6 percent — the highest core hike in the Class I's history, Knight says.

"But it all ties back to our service offering," he says. "We need to make it clear to shippers that our service is a value proposition."

Unfortunately, that proposition isn't entirely clear as yet to shippers. UP execs know customers' patience is wearing thin. But execs believe they're on the right path.

"We're going to continue bringing on the right volumes to improve returns and providing the service to attract volumes — it's all inter-related," says Knight. "I'm confident we're moving in the right direction." PR

*Email questions or comments to jeff.stagl@tradepress.com.*

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TUESDAY, JANUARY 4, 2005 

# CSX Moves to Cut Delays On Tangled Rail Network

BY DANIEL MACHALABA
STAFF REPORTER OF THE WALL STREET JOURNAL

For much of last year, CSX Corp. was a chief contributor to the freight backups and delays that have bedeviled railroad customers across the country.

But lately CSX seems to have discovered the means to untie its tangled freight network. The changes, part of a makeover of its 23,000-mile railroad, are helping CSX show improvements. Still, the full benefits to its operations may take months to unfold.

CSX's results so far could be welcome news to customers frustrated by railroads. Some railroads were surprised by the surge of traffic as the economy recovered and were caught short of locomotives, equipment and staffing to handle the extra freight. Some manufacturers curtailed production or switched to more expensive truck transportation.

Wal-Mart Stores Inc., fed up with delays, says it is opening more warehouse space at Gulf and East Coast ports to lessen its dependence on the ports of Los Angeles and Long Beach and the rail lines that serve them. Gap Inc. began shifting some shipments to other West Coast ports with less-congested railroads and through the Panama Canal.

In a program called One Plan, CSX is revamping operations to cut the number of times freight cars are handled -- a measure of railroad efficiency -- by 600,000 a year, or 5%, and reduce the miles freight travels by 1% to 2%. So far, the effort has resulted in tighter schedules and more direct routes.

The changes are starting to pay off. The average speed of CSX freight trains improved to 20.7 miles per hour for the fourth quarter by mid-December compared with 19.5 mph in last year's second quarter. Freight trains are leaving freight yards on time 53.7% of the time for most of the fourth quarter, up from 39.3% in the second quarter.

Shipments of new automobiles, an important business for CSX, now take 83 hours to Florida from Michigan, compared with 108 hours last spring. The improved delivery times reflect the fact that the shipments are now handled at Louisville, Ky., rather than at both Cincinnati and Jacksonville, Fla.

Thomas Stroud, general manager of Evans Enterprises LLC, a wholesaler of agricultural chemicals in Spring Hill, Kan., and a CSX customer, says congestion at a major CSX freight yard in Indianapolis badly delayed Evans shipments early last year. "It was ghastly," Mr. Stroud says. But he says that the delays have subsided and he has seen "significant improvement" at CSX.

Investors have responded to both the turnaround plan and a retreat in energy prices. Shares of CSX surged to a 52-week high last week of $40.46 a share. Yesterday the shares fell 26 cents to $39.82 in 4 p.m. New York Stock Exchange composite trading.

Unprecedented freight growth strained trucks, trains and seaports for much of last year. Two of the nation's four largest railroads, Union Pacific Corp. and CSX, have had some of the worst service woes. Union Pacific, based in Omaha, Neb., operates in the western two-thirds of the U.S. CSX, Jacksonville, Fla., operates east of the Mississippi River.

Every major railroad is considering a range of options to deal with the current capacity crunch from laying new tracks to planning new yards. But the companies say they don't earn enough profit to do much more than maintain their current networks, and Wall Street has discouraged costly expansions.

So, some railroads have turned to process improvements like the ones at CSX. With the help of Multimodal Applied Systems Inc., a railroad consulting company in Princeton, N.J., Norfolk Southern Corp. and Canadian National Railway Co. have redesigned their networks in recent years and started operating their freight trains on more precise schedules. That requires a high degree of discipline, but there is a payoff in more consistent service, better use of locomotives, reduced costs and improved profits.

CSX is pursuing similar goals, retaining Multimodal to develop a new plan to operate the railroad and then vowing to adhere to it. "We want to do the same thing every day and make it a boring railroad," says Michael Ward, CSX's chairman and chief executive officer.

But CSX may be harder to fix. Ever since it was created in 1980 from the carcasses of two dying U.S. railroads, the company has been struggling against the inherent inefficiencies of an amalgamation of rail networks designed to compete with each other rather than work together. Partly as a result, CSX has in recent years been the least efficient of the six largest North American railroads.

CSX is "the most complex and hard to manage of any railroad in North America," says Carl Van Dyke, president of Multimodal Applied Systems.

The CSX network includes redundant routes, a complicated system of freight yards along with "significant capacity constraints," Mr. Van Dyke adds. Some CSX facilities, such as its Atlanta yard, are too small. That forces CSX to send shipments miles out of their way to other yards that have more space, creating extra handling, delays and expenses. And the system has bottlenecks such as a tunnel in Baltimore too low for some modern freight shipments.

The problems contributed to a drop in profitability. CSX's net income for 2003 fell 42% to $246 million, or $1.14 a share, from 2002 earnings. Results in both years included accounting adjustments.

Such weaknesses have fed takeover speculation, such as a rumor that Canadian National wants to buy CSX. Canadian National Chief Executive E. Hunter Harrison denied the merger rumors to analysts in October.

Mr. Ward, the CSX chief executive, says CSX is "on the right path to improving the railroad and we don't need anyone else to come in and help us."

**MultiModal Freight Edition**

# MultiRail®

## Users and applications

MultiRail®'s users include all of the North American Class I freight railroads. Licensees include railroads such as BNSF, Canadian National, Canadian Pacific, CSX, Kansas City Southern, Norfolk Southern, Transportacion Ferroviaria Mexicana (TFM), Wisconsin Central, FerroMex, Union Pacific, Spoornet in South Africa, Green Cargo (Sweden), and CVRD and ALL in Brazil.

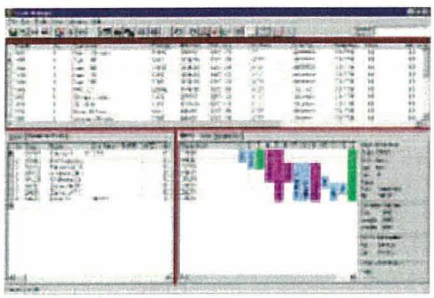
Industry applications have varied from railroad to railroad. MultiRail® has been used to examine most of the largest railroad restructuring efforts of the decade. For example, the Union Pacific/Southern Pacific, Norfolk Southern/CSX/Conrail, and Canadian National/Illinois Central merger efforts all used the system for the development of the merged railroad operating plan that was submitted to the U.S. regulatory authority (Surface Transportation Board) for approval. It was used by more than one carrier to examine the privatization and restructuring of the nationalized Mexican railroad system, and is currently used by both TFM and FerroMex for operating plan development and maintenance.

At a number of railroads, the design and analysis of train schedules has been a significant application. Norfolk Southern has taken this one step further and used MultiRail® for the generation of publication-ready reports of its intermodal schedules. Examining current and projected traffic patterns and their impact on schedules, facilities, blocks, and trains has been another ongoing effort at a number of carriers. Canadian National, BC Rail, CP Rail, Norfolk Southern, Spoornet, and CSX Transportation have all used MultiRail® as part of complete overhauls of their respective operating plans.

## Overview

MultiRail® provides a complete and integrated environment for railroad operating plan design. Its decision management structure supports the user from the inception of designing a railroad-operating plan to evaluating the impacts of changes to such a plan. MultiRail® provides a rich set of capabilities for interactive service design, including the import, data entry, and maintenance of train schedules, classification plans, traffic, and railroad networks. Its scenario management capabilities let the analyst rapidly evaluate what-ifs on plan

MultiRail® Train Manager



MultiRail® supports a host of capabilities to validate the impacts of modifications to a plan, including impacts on transit and arrival times, car schedules, arrival commitments, train sizes, yard workloads, traffic routings, and many system-level statistics. It incorporates a complete graphical and analysis toolbox, multi-carrier support capabilities, and date and time specific service design features.

MultiRail®'s "smart" schedule design tools compute the intermediate train locations and times, allowing for minimal data entry. Time-distance (string-line) diagrams let the user view the feasibility of a train plan at the touch of a button, without cumbersome data transfer to other systems. FE goes one step further than version 2.5 in allowing the train schedules to be graphically edited directly in the time-distance graphic environment. Generation of formatted schedule

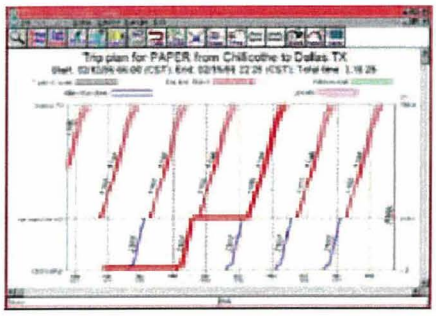
reports or timetables is built into the system, allowing for easy preparation of publication-ready outputs. All report and schedule data can be output to ASCII-based text files or spreadsheet-formatted files.

Extensive analytic and simulation capabilities, such as computation and display of traffic volumes over a railroad network are included. Of primary importance is its ability to generate system-wide statistics, such as estimates of car-miles, tonnage hauled, trains, yard throughput and other factors. MultiRail®'s reports and graphics include approximately 200 different types of outputs, all prepared from a structured relational database. The ability to import and export data between MultiRail® and other systems provides a built-in integration mechanism.

Of particular note is MultiRail®'s multi-user database support. MultiRail® utilizes an underlying structured database that captures the information in the train schedules, network, and operating plan in a commercial database. MultiRail®'s use of database-independent drivers allows us to support client-server and desktop database engines, including Paradox, Oracle, and Microsoft SQL Server.

## MultiRail® Freight Edition

Train service for a car movement




**Some of the key features of MultiRail® Freight Edition:**

- SuperSim – high speed generation of trip plans and seven-day analyses
- Macros – Will allow the user to set up complex commands for loading of data
- Very fast loading and processing times
- Greatly enhanced rail network design and display capabilities
- Interactive graphics-based editing of train schedules through our VISTAS time-distance environment
- Multi-user, local area network (LAN) support
- Improved ability to import/export data to/from other systems
- Full 32-bit Windows 95/98 and Windows NT support
- Improved user interface and ease of use
- Improved capabilities to support use of customized reports
- Support for multiple language libraries
- Another first for FE is the availability of Spanish and German language editions of the software.

**MultiRail® users report that the system has helped them achieve savings in:**

- Reduction in car-hire cost
- Reduction in car cycle time
- Reduced number of locomotives
- Reduced train annulments and "extras"
- Reduction in crew costs
- Reduction in intermediate car handlings

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## Comprehensive support and maintenance plan

Mercer-MultiModal offers a comprehensive support and maintenance plan for MultiRail® Freight Edition. The maintenance plan is bundled with either the MultiRail® Freight Edition license or FE lease package. As part of the maintenance package, we will provide our clients with a fixed amount of telephone and general product support each month.

**This support allocation can be applied to the following:**

- Priority telephone product support
- Support by Mercer-MultiModal development personnel for custom integration of systems and import/export of data
- Support by Mercer-MultiModal staff for the design and delivery of customized MultiRail® reports
- On-site support by our consulting staff to assist railroads in the use of MultiRail® for the planning and implementation of operating
- Extension of the product warranty for the entire period of the maintenance
- Participation in all FE upgrades and feature improvements

## Customization and support

Mercer-MultiModal regularly customizes and enhances MultiRail® to meet specific client requirements, and finds this to be an effective way of growing the product and ensuring that it meets our client's needs. Our staff has extensive knowledge in relational database design and implementation as applied to transportation problems. Mercer-MultiModal combines custom development with commercial software components to provide powerful, easy-to-use transportation software in minimum time and with maximum flexibility to adapt to the latest customer requirements.

G200 / 11/06


## MultiRail® Enterprise Edition

Developed in 1992 by MultiModal Applied Systems, the first generation of MultiRail presented the railway community with a first: an easy-to-use, fully integrated set of PC-based tools to manage the very complex problems of designing and evaluating a railway operating strategy.

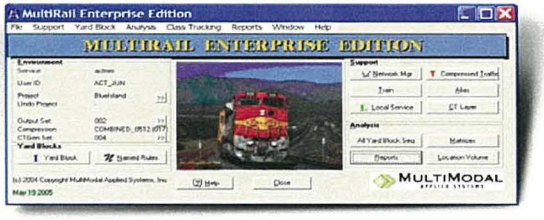
Over the past several years, MultiRail has become the industry standard for service planning and network analysis and is employed by most of the large North American freight railways. Furthermore, it is increasingly being used by major freight railways throughout the world. In short, MultiRail contains the most complete range of graphical, analytical, and decision support tools for freight rail planning; all in a single system.

With the introduction of the MultiRail Enterprise Edition (MultiRail-EE), we now have an even more robust platform that can support both the planning functions MultiRail has traditionally performed, as well as support real-time maintenance of the classification and control tables used by a railway's production software systems. An exceptional strength of MultiRail-EE is it's advanced, the multi-user, collaborative design capabilities, which allows multiple projects or studies to be managed in a single environment.

### MultiRail Users and Applications

MultiRail-Freight Edition's users include BNSF, Canadian National, Canadian Pacific, CSX, Kansas City Southern, Norfolk Southern, Deutsche Bahn, SNCF (France), Transportacion Ferroviaria Mexicana (TFM), FerroMex, Union Pacific, Spoornet (South Africa), and CVRD and ALL in Brazil. CSX Transportation and SNCF (France) are acting as launch customers for MultiRail-EE.

Industry applications have varied from railway to railway. MultiRail has been used to examine most of the largest railway restructuring efforts of the past decade, such as the Union Pacific & Southern Pacific and Canadian National & Illinois Central mergers. It was used to examine the privatization and restructuring of the nationalized Mexican railway system, and is currently used by both TFM and FerroMex for operating plan development and maintenance. The major use of MultiRail in recent years has been to use the tool to assist in the redesign of the operating plans at railways such as Canadian Pacific, Norfolk Southern, CSX Transportation, Union Pacific, SNCF (France), and Trenitalia (Italy). It is in these complex situations where the power of MultiRail truly stands out.




*MultiRail Enterprise Edition Main Menu*

MultiRail users report that the system has helped them achieve savings through:

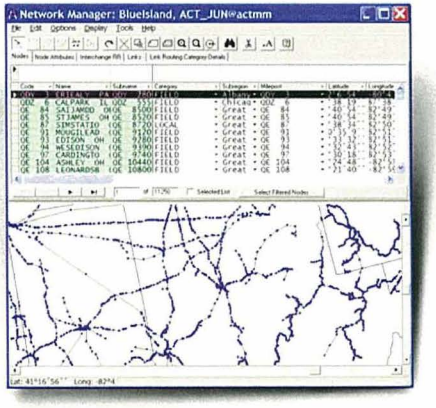
- ⊗ Increased railcar velocity, resulting in reduced fleet requirements and car-hire costs
- ⊗ Reduced number of locomotives
- ⊗ Reduced train annulments and "extras"
- ⊗ Reduced crew costs
- ⊗ Reduced intermediate railcar handlings and railcar-miles or kilometers
- ⊗ Increased average train sizes, and reduced train-starts, train-hours, and train-miles or kilometers

### MultiRail Overview

MultiRail provides a complete and integrated environment for planning freight rail operations. Its decision management structure supports the user from the inception of designing a railway-operating plan, to evaluating the impacts of changes to such a plan. MultiRail provides a rich set of capabilities for interactive service design, including the import, data entry, and maintenance of: train schedules, classification or marshalling plans, traffic, and railway networks. Its scenario or project management capabilities let the analyst rapidly evaluate what-ifs on plan alternatives, including seeing how separate proposed changes will interact with each other.

Throughout the design process, MultiRail provides reports and other tools to help identify the strengths and weaknesses of a particular plan, and suggest ways to improve the plan. For example, by-pass, circuity, and excessive handlings reports focus on ways to improve the classification or marshalling plan. Yard and train volume reports highlight capacity considerations, and trip plan compliance and transit time dwell reports focus on customer service and asset velocity. Users can also

generate system-wide statistics, such as estimates of car-miles, tonnage hauled, trains, yard throughput and other factors.




*MultiRail Multi-User Network Manager*

MultiRail's train schedule design tools compute the intermediate train locations and times, allowing for minimal data entry and the time-distance (string-line) diagrams let the user view the feasibility of a train plan at the touch of a button, without cumbersome data transfer to other systems. The generation of formatted schedule reports or timetables is built into the system, allowing for easy publication to HTML, Microsoft Word & Excel, and various data formats.

MultiRail's reports and graphics include a myriad of outputs, all prepared from a structured relational database. MultiRail-EE utilizes an underlying Oracle database that captures the information in the train schedules, network, and operating plan in a structured and disciplined manner. All of the robust multi-user, security and data integrity benefits of Oracle are thus realized by the system. In addition, our clients often allow external tools such as Microsoft Access to link to selected tables in the Oracle environment, providing a mechanism to support ad hoc analysis, and in some cases, external data loading and manipulation capabilities.

## MultiRail Enterprise Edition Features

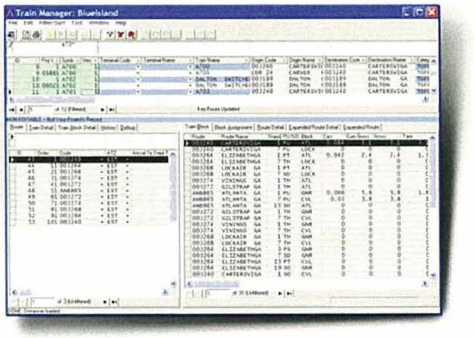
Some of the long standing key features of MultiRail that are preserved in the Enterprise Edition are listed below:

- ⊗ Highly efficient simulation of an operating strategy on a day-of-week basis
- ⊗ Powerful algorithms for the design of railway blocking plans including tools to suggest improvements
- ⊗ Advanced train design tools focused around the key business issues that are most important to freight railway operations
- ⊗ Very fast loading and processing times when analyzing large quantities of traffic data
- ⊗ Integrated, graphics-based rail network design and display capabilities
- ⊗ Ability to integrate the MultiRail Enterprise Edition platform with other systems
- ⊗ Full support for the latest versions of Windows
- ⊗ Advanced user interface with excellent ease of use
- ⊗ Support for the use of customized reports
- ⊗ Support for multiple language libraries (English and French versions currently available)

In addition to the above, MultiRail Enterprise Edition, brings a number of benefits relative to the current MultiRail Freight Edition. These include support for highly detailed blocking rules, advanced algorithms, an extensive multi-user support environment, use of Oracle production databases, and optional support for real-time blocking systems.

Some of the features of the MultiRail Enterprise Edition include:

- ⊗ The handling of full waybills with all associated attributes, thus supporting a wide variety of blocking attributes (such as numerous geographic codes, commodity codes, car types, customer codes, load/empty status), and equipment attributes (such as height, width, length, and weight);
- ⊗ An extremely sophisticated, improved version of the MultiRail blocking algorithm, supporting use of any combination of blocking attributes to specify which traffic can use a block, including support for both "include rules" and "exclude rules."
- ⊗ Support of "absolute rules" that override the above mentioned algorithm, allowing many options for setting the costs associated with the various rules and blocks. This also permits a library of "general rules" to be constructed and then reused on many different blocks.



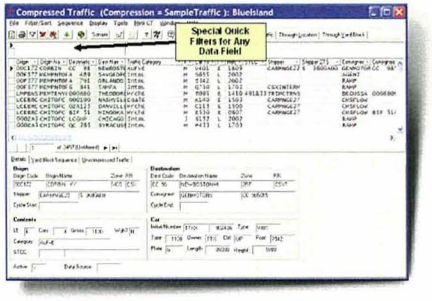

*Train Manager with Train Block Details*

- ⊗ Supports for processing of very large, highly detailed traffic samples in a short timeframe. The system is capable of processing 300,000 to 500,000 waybill records for blocking analysis purposes in between 10 and 30 minutes, depending on the freight operator's system hardware and data configuration.
- ⊗ The MultiRail Enterprise Edition platform can be fully integrated with existing databases through automated download and data loading processes so that waybills, station masters, and other critical business data can be kept current and accurate.
- ⊗ New diagnostics have been created to allow the user to determine why traffic is routed in a particular manner, and determine the alternative routings that are available and the changes in costs and block

## MultiRail® Enterprise Edition (continued)

attributes that would be required to use these new routes (the "tree view").

- Sophisticated tools are provided to address issues related to local service and interchanges that are not directly reflected in the blocking plan. In addition, traffic can be remapped from one location to another based on the same criteria that are available for blocking decisions.

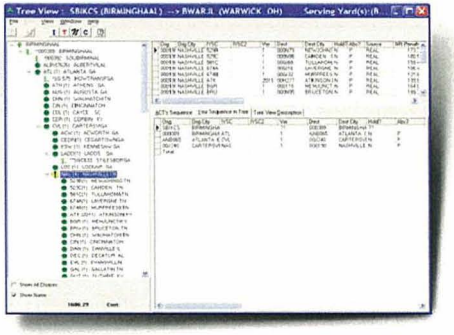



*Compressed Traffic View with Filters*

- Train design tools that provide interactive estimates of train running times and train sizes as the trains are created. Also included are on-demand terminal clocks showing all trains in and out of a location, multiple ways to identify candidate block to train assignments, and the ability to support yard blocks separately from train blocks.
- Full storage of day-of-week simulation results in the primary database, so that this information is available through queries and data grids built into the user interface, in addition to the traditional simulation analysis reports. For example, day-of-week train size estimates are now available while editing the trains, based on the most recently run simulation.

MultiModal has been able to take advantage of recent technological innovations to build a superior user interface and data environment. For example:

- The MultiRail Enterprise Edition was fully designed and architected to use Oracle, providing a very complete, robust database model for any sized freight railway operator.
- The underlying algorithms can take advantage of multi-processor computers in order to achieve maximal performance.
- MultiRail Enterprise Edition is fully multi-user by design, supporting many simultaneous users with these users working either on the same database or on different databases, as set by the client.
- An advanced collaborative data model and interface allows multiple variations of the same plan to exist in the same database. Complete audit trails also provide information on which user made each change to which database.
- The re-engineered user interface contains sophisticated filtering and sorting processes that greatly increase the efficiency of the entire MultiRail Enterprise Edition platform. These processes permit each user to view and manipulate the data in numerous different ways.
- A re-engineered "Reports" module supports a wide variety of reports, allowing the user much greater flexibility in terms of filtering report contents and creating customized reports.



*Tree View – Allows the User to Explore Additional Block Sequence Options*

### MultiRail Customization and Support

MultiModal regularly customizes and enhances MultiRail to meet specific client requirements, and finds this to be an effective way of growing the product and ensuring that it meets our client's needs. Our staff has extensive knowledge in relational database design and implementation as applied to transportation problems. MultiModal combines custom development with commercial software components to provide powerful, easy-to-use transportation software in minimum time and with maximum flexibility to adapt to the latest customer requirements.

# FEATURE COMPARISON OF MULTIRAIL FREIGHT EDITION WITH MULTIRAIL ENTERPRISE EDITION

| MultiRail Freight Edition | MultiRail Enterprise Edition |
|---|---|
| **Waybill data elements** - Ability to handle a fixed set of traffic attributes, requiring the use of traffic categories to represent groups of attributes of interest to the user. | **Waybill data elements** - Handling of full waybill data with all associated elements which allows the MultiRail Enterprise Edition to process multiple blocking attributes, including geographic codes, commodity codes, wagon types, customer codes, equipment attributes, etc. Built-in repository to record many months of waybill data and sophisticated compression and selection tools. |
| **Network definition** - Detailed graphical representation of the railway network, including link and node attributes such as node category, link speeds and distances, routing preferences, etc. | **Network definition** - Same graphical representation, plus extensions that allow link restrictions to be specified, including limits on wagon height and length, and plate or profile code. Also supports the ability to specify more complex rules that prohibit specific traffic from using specific nodes and links. |
| **Blocking Algorithm -** Proven algorithm largely focused on block and traffic categories, and use of final destinations. Limited support for other attributes such as customers, commodities, and load/empty status. Support for a number of algorithm costing options. | **Blocking Algorithm -** Very sophisticated implementation of the blocking algorithm with full flexibility to specify which traffic uses a block, including support for "include rules" and "exclude rules." Can process up to 500,000 waybills in less than one hour. Very flexible costing formulas, allowing a wide range of costing strategies and differentiation of costs by sub-groups of traffic on the same block. |
| **Support of mainframe classification and control systems** - MultiRail Freight Edition has not been used to populate real-time, mainframe-based blocking or classifications systems due to its lack of sufficient support for waybill and blocking data attributes. | **Support of mainframe classification and control systems** - Can be configured to support the railway's real-time system through a data bridge, either to support customized population of the carrier's classification tables or to use the MultiRail Enterprise three-tier architecture to sequence mainframe supplied waybill information in real time (optional). |
| **Train information support** - Full support of train databases and the block to train assignment process is provided. MultiRail Freight Edition also contains timetabling and "stringline" features with sophisticated filtering, editing, and display functions. | **Train information support** - Full train support including all of the functionality found today in MultiRail Freight Edition. Additionally it provides the ability to map multiple "yard blocks" to each "train block," thus supporting the industry standard practice of having a many-to-one relationship between the yard blocks and train blocks. MultiRail-EE also provides standing order support for defining the order of the blocks in the train relative to the train's head end. |
| **Trip Plans & SuperSim** - Support of traffic simulation from seven to 35 days, and the related car trip plans, with both tabular and graphical output. Uses a special database. | **Trip Plans & SuperSim** - No special database required to generate trip plans. Impact of changes can be assessed immediately and simulation results are stored in main Oracle database. Simulation results can be viewed interactively and through reports. Trip plans are visible in traffic window along with block sequences; day-of-week train volumes are visible in train manager. |
| **User defined rules** - Blocking attributes can be set for block categories at the "category level." These can subsequently be used as is or be refined or overridden at the block level. | **User defined rules** - "Named rules" allows the user to develop blocking rules independently of the individual blocks. Rules from this library can then be assigned to the appropriate blocks. "Absolute rules" supersede "named rules" and "force" the specified traffic to the indicated block. User-defined rules can be composed and implemented from over 20 different blocking attributes. Users will soon be able to build ad hoc named rules at the block level. |

# EXHIBIT 6

NS Brief Exhibit 6: NS's Pier Designs Are Appropriate and Reasonable to Bear the Imposed Loads.

This exhibit uses excerpts from NS's Reply Evidence workpapers to demonstrate that DuPont's Rebuttal claim, that NS has "over-designed" bridge pier strength, is erroneous. *See* DuPont Rebuttal WP "Examples of NS Over-designed Piers.pdf." Both this exhibit and the DuPont Rebuttal WP are based on excerpts from NS Reply WPs "NS Type III Bridge.pdf" and "NS Type IV Bridge.pdf", with comments and highlights added to expound on the calculations.

DuPont comments as originally included in the DuPont Rebuttal WP are in red text
NS comments added in response within this exhibit are in red text and yellow shading

**INDEX**



1/ - DuPont cites this example in its Rebuttal at III-F-96 when alleging that NS over-designed piers by a factor of 38

NS Reply Workpaper "NS Type III Bridge.pdf" Page 23.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier<br>2 span 92.5 ft H=11' | DATE | DATE | REVISION | SHEET NO.<br>1 |

**Design Assumption**

**1. design the pier for 2 cases:**
**(a) Pure bending without considering the axial load**
**(b) the axial load with bi-axial flexural loads**

Type III 11 foot high pier must support loads for BOTH of the above cases

## DESIGN INPUT PARAMETERS - Geometry

| | | |
|---|---|---|
| Pier No. = | 2 | |
| Concrete Compressive Strength, f'c = | 4000 | (psi) |
| Reinforcment Yield Strength, fy = | 60000 | (psi) |
| Depth, D = | 5 | (ft) |
| Width, W = | 20 | (ft) |
| Clear Cover to Reinforcement bend about XX, c1 = | 3 | (in) |
| Clear Cover to Reinforcement bend about YY, c1 = | 3 | (in) |
| Shear Reinforcement Bar Size = | 5 | (#) |
| compression reduction factor,ϕ = | 0.7 | |
| βενδινγ reduction factor,ϕ = | 0.9 | |

## Biaxial Loading Calculation

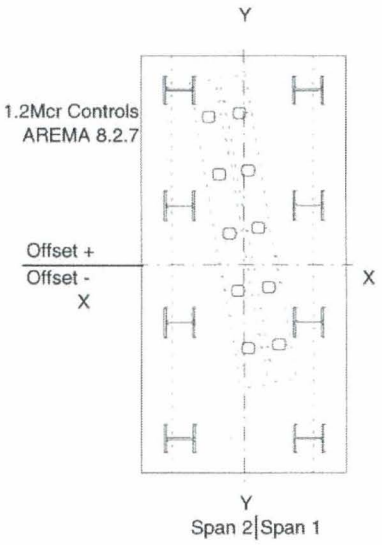
| | | | | |
|---|---|---|---|---|
| GROUP I | Axial: | $P_u$ = | 4003.05 | (k) |
| | Lateral Moment: | $M_{uy}$ = | 0.00 | (k-ft) |
| | Longitudinal Moment | $M_{ux}$ = | 0.00 | (k-ft) |
| | | $\beta_D$ = | 0.00 | |
| | | 0.1f'cAg= | 5760.00 | (k) |
| | | $P_u$ | < | 0.1f'cAg |
| | | use Ch8 EQ2-42 | | |
| | | β1 = | 0.85 | |

**Reinforcing about X**

| | | |
|---|---|---|
| Number of Bar = | 4 | |
| Size of Bar = | 11 | |
| Area = | 6.25 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 236 | (in) |

**Reinforcing about Y**

| | | |
|---|---|---|
| Number of Bar = | 18 | |
| Size of Bar = | 11 | |
| Area = | 28.13 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 56 | (in) |




p8-2-54
p8-2-54

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

NS Reply e-workpaper "NS Type III Bridge.PDF" Page 24

**Slenderness Effects**

| | | |
|---|---|---|
| Column Height (Along Bent), $L_y$ = | 9.0 | (ft) |
| Column Height (Perp. to Bent), $L_x$ = | 9.0 | (ft) |
| Eq. Length Coeff. (Along Bent), $k_y$ = | 1.2 | **Normally set at 1.2** |
| Eq. Length Coeff. (Perp. to Bent), $k_x$ = | 1.2 | **1.2 if No Expansion Devices**<br>**2.0 with Exp. Devices** |
| Pier Section Area= | 14400.0 | ($in^2$) |
| Equivalent Moment of Inertia, Iy = | 4320000.0 | ($in^4$) |
| Equivalent Radius of Gyration, ry= | 17.32 | (in) |
| Column Slenderness (Along Bent), kL/r = | 7.48 | **Ignore Slenderness Effects** |
| Equivalent Moment of Inertia, Ix = | 69120000.0 | ($in^4$) |
| rx= | 69.28 | (in) |
| Column Slenderness (Perp. to Bent), kL/r = | 1.87 | **Ignore Slenderness Effects** |

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 6229434008319 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 3660482 | (k) |
| $\delta_{sy}$ = | 1.00 | |

**Buckling Along Bent**

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 99670944133102 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 58567720 | (k) |
| $\delta_{sz}$ = | 1.00 | |

**Magnified Moments**

| | | |
|---|---|---|
| Min. Ecc. X axis = | 2.40 | (in) |
| Min. Moment, My= | 800.61 | (k-ft) |
| Min. Ecc. Y axis= | 7.80 | (in) |
| Min. Moment, Mx = | 2601.98 | (k-ft) |
| $\delta_{sy}M_{uy}$ = | 800.61 | (k-ft) |
| $\delta_{sz}M_{ux}$ = | 2601.98 | (k-ft) |

**pure Bend about Y - Y - LFD**

| | | | |
|---|---|---|---|
| Depth to Neutral Axis, c = (As)(fy)/(0.85)(f'c)(β1)(W) = | 2.43 | (in) | p8-2-54 |
| Depth of Comp. Block, a = β1c = | 2.07 | (in) | p8-2-54 |
| Nominal Resistance, Mn = (As)(fy)(d-a/2) = | 7712 | (k-ft) | p8-2-55 |
| Factored Resistance, Mr = ϕMn = | 6941 | (k-ft) | p8-2-55 |

6941 > 801 Therefore OK

Selected Reinforcement is good for pure bending

NS Reply Workpaper "NS Type III Bridge.pdf" Page 30.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

**Axial capacity with bia-axial flexural loads**

$\phi P_o$= 29201 (k) ← Allowable Pier Load (Capacity)

$\phi P_{nxy}=1/(1/\phi P_{nx}+1/\phi P_{ny}-1/\phi P_o)$= 27616 (k) ← Calculated Pier Load

OK

This shows final load for Type III 11 foot high pier is within 6% of its capacity: 29,201 / 27,616 = 106%

NS Reply Workpaper "NS Type III Bridge.pdf" Page 214.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| 2 spa | 2 span 92.5 ft H=20+2' | | | | 1 |

**Design Assumption**

1. design the pier for 2 cases:
   (a) Pure bending without considering the axial load
   (b) the axial load with bi-axial flexural loads

Type III 20 foot high pier must support loads for BOTH of the above cases

**DESIGN INPUT PARAMETERS - Geometry**

| | | |
|---|---|---|
| Pier No. = | 2 | |
| Concrete Compressive Strength, f'c = | 4000 | (psi) |
| Reinforcment Yield Strength, fy = | 60000 | (psi) |
| Depth, D = | 5 | (ft) |
| Width, W = | 20 | (ft) |
| Clear Cover to Reinforcement bend about XX, c1 = | 3 | (in) |
| Clear Cover to Reinforcement bend about YY, c1 = | 3 | (in) |
| Shear Reinforcement Bar Size = | 5 | (#) |
| compression reduction factor,ϕ = | 0.7 | |
| βενδινγ reduction factor,ϕ = | 0.9 | |

**Biaxial Loading Calculation**

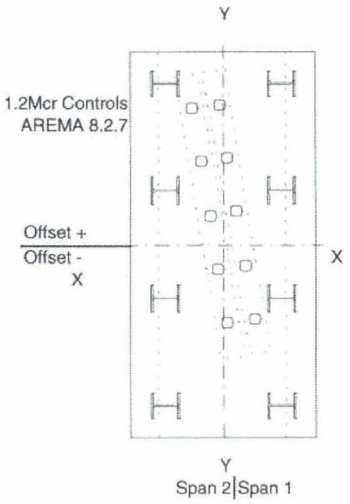
| | | | | |
|---|---|---|---|---|
| GROUP I | Axial: | $P_u$ = | 4192.05 | (k) |
| | Lateral Moment: | $M_{uy}$ = | 0.00 | (k-ft) |
| | Longitudinal Moment | $M_{ux}$ = | 0.00 | (k-ft) |
| | | $\beta_D$ = | 0.00 | |
| | | 0.1f'cAg= | 5760.00 | (k) |
| | | $P_u$ | < | 0.1f'cAg |
| | | | use Ch8 EQ2-42 | |
| | | β1 = | 0.85 | |

**Reinforcing about X**

| | | |
|---|---|---|
| Number of Bar = | 4 | |
| Size of Bar = | 11 | |
| Area = | 6.25 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 236 | (in) |

**Reinforcing about Y**

| | | |
|---|---|---|
| Number of Bar = | 24 | |
| Size of Bar = | 11 | |
| Area = | 37.50 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 56 | (in) |




p8-2-54
p8-2-54

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

NS Reply e-workpaper "NS Type III Bridge.PDF" Page 215

**Slenderness Effects**

| | | |
|---|---|---|
| Column Height (Along Bent), $L_y$ = | 18.0 | (ft) |
| Column Height (Perp. to Bent), $L_x$ = | 18.0 | (ft) |
| Eq. Length Coeff. (Along Bent), $k_y$ = | 1.2 | **Normally set at 1.2** |
| Eq. Length Coeff. (Perp. to Bent), $k_x$ = | 1.2 | **1.2 if No Expansion Devices**<br>**2.0 with Exp. Devices** |
| Pier Section Area= | 14400.0 | ($in^2$) |
| Equivalent Moment of Inertia, Iy = | 4320000.0 | ($in^4$) |
| Equivalent Radius of Gyration, ry= | 17.32 | (in) |
| Column Slenderness (Along Bent), kL/r = | 14.96 | **Ignore Slenderness Effects** |
| Equivalent Moment of Inertia, Ix = | 69120000.0 | ($in^4$) |
| rx= | 69.28 | (in) |
| Column Slenderness (Perp. to Bent), kL/r = | 3.74 | **Ignore Slenderness Effects** |

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 6229434008319 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 915121 | (k) |
| $\delta_{sy}$ = | 1.00 | |

**Buckling Along Bent**

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 99670944133102 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 14641930 | (k) |
| $\delta_{sz}$ = | 1.00 | |

**Magnified Moments**

| | | |
|---|---|---|
| Min. Ecc. X axis = | 2.40 | (in) |
| Min. Moment, My= | 838.41 | (k-ft) |
| Min. Ecc. Y axis= | 7.80 | (in) |
| Min. Moment, Mx = | 2724.83 | (k-ft) |
| $\delta_{sy}M_{uy}$ = | 838.41 | (k-ft) |
| $\delta_{sz}M_{ux}$ = | 2724.83 | (k-ft) |

**pure Bend about Y - Y - LFD**

| | | | |
|---|---|---|---|
| Depth to Neutral Axis, c = (As)(fy)/(0.85)(f'c)(β1)(W) = | 3.24 | (in) | p8-2-54 |
| Depth of Comp. Block, a = β1c = | 2.76 | (in) | p8-2-54 |
| Nominal Resistance, Mn = (As)(fy)(d-a/2) = | 10148 | (k-ft) | p8-2-55 |
| Factored Resistance, Mr = ϕMn = | 9133 | (k-ft) | p8-2-55 |

| | | | | |
|---|---|---|---|---|
| 9133 | > | 838 | Therefore | OK |

Selected Reinforcement is good for pure bending

NS Reply Workpaper "NS Type III Bridge.pdf" Page 221.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

**Axial capacity with bia-axial flexural loads**

$\phi P_o$= 29795 (k) ← Allowable Pier Load (Capacity)

$\phi P_{nxy}=1/(1/\phi P_{nx}+1/\phi P_{ny}-1/\phi P_o)$= 27616 (k) ← Calculated Pier Load

OK

This shows final load for Type III 20 foot high pier is within 8% of its capacity: 29,795 / 27,616 = 108%

NS Reply Workpaper "NS Type III Bridge.pdf" Page 308.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier<br>5 Span of 92.5 ft H=45+2 | DATE | DATE | REVISION | SHEET NO.<br>1 |

**Design Assumption**

**1. design the pier for 2 cases:**
**(a) Pure bending without considering the axial load**
**(b) the axial load with bi-axial flexural loads**

Type III 45 foot high pier must support loads for BOTH of the above cases

## DESIGN INPUT PARAMETERS - Geometry

| | | |
|---|---|---|
| Pier No | 2 | |
| Concrete Compressive Strength, f'c = | 4000 | (psi) |
| Reinforcment Yield Strength, fy = | 60000 | (psi) |
| Depth, D = | 8 | (ft) |
| Width, W = | 24 | (ft) |
| Clear Cover to Reinforcement bend about XX, c1 = | 3 | (in) |
| Clear Cover to Reinforcement bend about YY, c1 = | 3 | (in) |
| Shear Reinforcement Bar Size = | 5 | (#) |
| compression reduction factor,ϕ = | 0.7 | |
| βενδινγ reduction factor,ϕ = | 0.9 | |

**Biaxial Loading Calculation**

| | | P | |
|---|---|---|---|
| GROUP I | Axial: $P_u$ = | 5769.57 | (k) |
| | Lateral Moment: $M_{uy}$ = | 0.00 | (k-ft) |
| | Longitudinal Moment $M_{ux}$ = | 0.00 | (k-ft) |
| | $\beta_D$ = | 0.00 | |
| | 0.1f'cAg= | 11059.20 | (k) |
| | $P_u$ | < | 0.1f'cAg |

use Ch8 EQ2-42

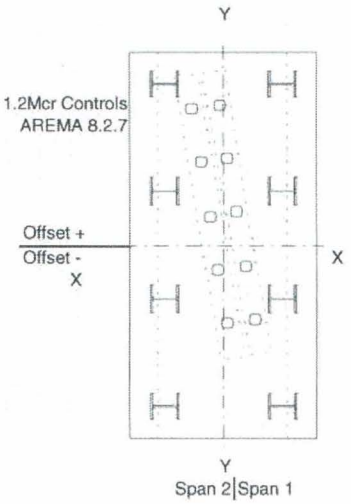
$\beta 1$ = 0.85

**Reinforcing about X**

| | | |
|---|---|---|
| Number of Bar = | 8 | |
| Size of Bar = | 11 | |
| Area = | 12.50 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 284 | (in) |

**Reinforcing about Y**

| | | |
|---|---|---|
| Number of Bar = | 32 | |
| Size of Bar = | 11 | |
| Area = | 50.00 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 91 | (in) |




p8-2-54
p8-2-54

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

NS Reply e-workpaper "NS Type III Bridge.PDF" Page 309

**Slenderness Effects**

| | | |
|---|---|---|
| Column Height (Along Bent), $L_y$ = | 41.0 | (ft) |
| Column Height (Perp. to Bent), $L_x$ = | 41.0 | (ft) |
| Eq. Length Coeff. (Along Bent), $k_y$ = | 1.2 | **Normally set at 1.2** |
| Eq. Length Coeff. (Perp. to Bent), $k_x$ = | 1.2 | **1.2 if No Expansion Devices**<br>**2.0 with Exp. Devices** |
| Pier Section Area= | 27648.0 | ($in^2$) |
| Equivalent Moment of Inertia, Iy = | 21233664.0 | ($in^4$) |
| Equivalent Radius of Gyration, ry= | 27.71 | (in) |
| Column Slenderness (Along Bent), kL/r = | 21.30 | **Ignore Slenderness Effects** |
| Equivalent Moment of Inertia, Ix = | 191102976.0 | ($in^4$) |
| rx= | 83.14 | (in) |
| Column Slenderness (Perp. to Bent), kL/r = | 7.10 | **Ignore Slenderness Effects** |

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 3.06189E+13 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 866956 | (k) |
| $\delta_{sy}$ = | 1.00 | |

**Buckling Along Bent**

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 2.7557E+14 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 7802600 | (k) |
| $\delta_{sz}$ = | 1.00 | |

**Magnified Moments**

| | | |
|---|---|---|
| Min. Ecc. X axis = | 3.48 | (in) |
| Min. Moment, My= | 1673.17 | (k-ft) |
| Min. Ecc. Y axis= | 9.24 | (in) |
| Min. Moment, Mx = | 4442.57 | (k-ft) |
| $\delta_{sy}M_{uy}$ = | 1673.17 | (k-ft) |
| $\delta_{sz}M_{ux}$ = | 4442.57 | (k-ft) |

**pure Bend about Y - Y - LFD**

| | | | |
|---|---|---|---|
| epth to Neutral Axis, c = (As)(fy)/(0.85)(f'c)(β1)(W) = | 3.60 | (in) | p8-2-54 |
| Depth of Comp. Block, a = β1c = | 3.06 | (in) | p8-2-54 |
| Nominal Resistance, Mn = (As)(fy)(d-a/2) = | 70695 | (k-ft) | p8-2-55 |
| Factored Resistance, Mr = ϕMn = | 63626 | (k-ft) | p8-2-55 |

63626 > 1673 Therefore OK

Selected Reinforcement is good for pure bending

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

NS Reply e-workpaper "NS Type III Bridge.PDF" Page 313

**Bend about X - X - LFD**

| | | | |
|---|---|---|---|
| epth to Neutral Axis, c = (As)(fy)/(0.85)(f'c)(β1)(W) = | 2.70 | (in) | p8-2-54 |
| Depth of Comp. Block, a = β1c = | 2.43 | (in) | p8-2-54 |
| Nominal Resistance, Mn = (As)(fy)(d-a/2) = | 17694 | (k-ft) | p8-2-55 |
| Factored Resistance, Mr = ϕMn = | 15924 | (k-ft) | p8-2-55 |

15924 > 4443 Therefore OK

Selected Reinforcement is good for pure bending

**Reinforcement - Service Limit State**

| | | | |
|---|---|---|---|
| Exposure - Moderate (M), Severe (S), Buried (B) = | M | | p8-2-71 |
| Max. Negative Moment - Service Limit State, Mns = | 2716.4 | (k-ft) | LARSA Output |
| Modular Ratio, n = | 8 | | |
| Distance to Neutral Axis from Top Fiber, X = | 23.32 | (in) | |
| $B X^2/2-nA_s(d-X)$= | 0 | | |
| Cracked Moment of Inertia, Icr = | 6.939E+06 | ($in^4$) | |
| Stress at Service, fs = | 1.23 | (ksi) | |
| Crack Width Parameter, Z = | 170 | (k/in) | AREMA CH8.2.39 |
| xtreme Tension Fiber to Center of Closest Bar, $d_c$ = | 2.69 | (in) | AREMA CH8.2.39 |
| Area of Concrete at Reinf. Centroid per Bar, A = | 64.50 | ($in^2$) | AREMA CH8.2.39 |
| Max. All. Tensile Stress, $f_{sa} = Z/(d_cA)^{1/3}$ <= 0.5fy | 30.00 | (ksi) | AREMA CH8.2.39 |

1 <= 30 Therefore OK

Use Selected Reinforcement in Top of Pier Beam

NS Reply Workpaper "NS Type III Bridge.pdf" Page 315.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

**Axial capacity with bia-axial flexural loads**

$\phi P_o$= 55811 (k) ← Allowable Pier Load (Capacity)

$\phi P_{nxy}=1/(1/\phi P_{nx}+1/\phi P_{ny}-1/\phi P_o)$= 53038 (k) ← Calculated Pier Load

OK

This shows final load for Type III 45 foot high pier is within 5% of its capacity: 55,811 / 53,038 = 105%

NS Reply Workpaper "NS Type IV Bridge.pdf" Page 19.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |

**Design Assumption**

**1. design the pier for 2 cases:**
**(a) Pure bending without considering the axial load**
**(b) the axial load with bi-axial flexural loads**

Type IV 64 foot high pier must support loads for BOTH of the above cases

**DESIGN INPUT PARAMETERS - Geometry**

| | | |
|---|---|---|
| Pier No. = | 2 | |
| Concrete Compressive Strength, f'c = | 4000 | (psi) |
| Reinforcment Yield Strength, fy = | 60000 | (psi) |
| Depth, D = | 6 | (ft) |
| Width, W = | 20 | (ft) |
| Clear Cover to Reinforcement bend about XX, c1 = | 3 | (in) |
| Clear Cover to Reinforcement bend about YY, c1 = | 3 | (in) |
| Shear Reinforcement Bar Size = | 5 | (#) |
| compression reduction factor,ϕ = | 0.7 | |
| βενδινγ reduction factor,ϕ = | 0.9 | |

**Biaxial Loading Calculation**

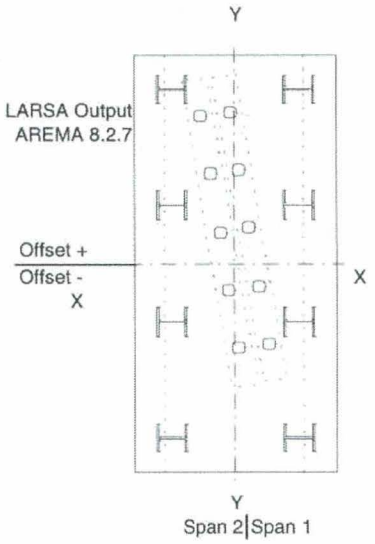
| | | | | |
|---|---|---|---|---|
| GROUP I | Axial: | $P_u$ = | 7131.24 | (k) |
| | Lateral Moment: | $M_{uy}$ = | 0.00 | (k-ft) |
| | Longitudinal Moment | $M_{ux}$ = | 0.00 | (k-ft) |
| | | $\beta_D$ = | 0.00 | |
| | | 0.1f'cAg= | 6912.00 | (k) |
| | | $P_u$ | > | 0.1f'cAg |
| | | | use Ch8 EQ2-41 | |
| | | β1 = | 0.85 | |

**Reinforcing about X**

| | | |
|---|---|---|
| Number of Bar = | 4 | |
| Size of Bar = | 11 | |
| Area = | 6.25 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 236 | (in) |

**Reinforcing about Y**

| | | |
|---|---|---|
| Number of Bar = | 24 | |
| Size of Bar = | 11 | |
| Area = | 37.50 | ($in^2$) |
| Extreme Comp. Fiber to Centroid of Ten. Reinf., d = | 68 | (in) |




p8-2-54
p8-2-54

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

NS Reply e-workpaper "NS Type IV Bridge.PDF" Page 20

**Slenderness Effects**

| | | |
|---|---|---|
| Column Height (Along Bent), $L_y$ = | 56.0 | (ft) |
| Column Height (Perp. to Bent), $L_x$ = | 56.0 | (ft) |
| Eq. Length Coeff. (Along Bent), $k_y$ = | 1.2 | **Normally set at 1.2** |
| Eq. Length Coeff. (Perp. to Bent), $k_x$ = | 1.2 | **1.2 if No Expansion Devices**<br>**2.0 with Exp. Devices** |
| Pier Section Area= | 17280.0 | ($in^2$) |
| Equivalent Moment of Inertia, Iy = | 7464960.0 | ($in^4$) |
| Equivalent Radius of Gyration, ry= | 20.78 | (in) |
| Column Slenderness (Along Bent), kL/r = | 38.80 | **Use Moment Magnifier Method** |
| Equivalent Moment of Inertia, Ix = | 82944000.0 | ($in^4$) |
| rx= | 69.28 | (in) |
| Column Slenderness (Perp. to Bent), kL/r = | 11.64 | **Ignore Slenderness Effects** |

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | 10764461966375 | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 163377 | (k) |
| $\delta_{sy}$ = | 1.07 | |

**Buckling Along Bent**

| | | |
|---|---|---|
| $C_m$ = | 1.00 | |
| EI = | ############### | ($lb\text{-}in^2$) |
| Euler Buckling Load, $P_c$ = | 1815300 | (k) |
| $\delta_{sz}$ = | 1.00 | |

**Magnified Moments**

| | | |
|---|---|---|
| Min. Ecc. X axis = | 2.76 | (in) |
| Min. Moment, My= | 1640.18 | (k-ft) |
| Min. Ecc. Y axis= | 7.80 | (in) |
| Min. Moment, Mx = | 4635.30 | (k-ft) |
| $\delta_{sy}M_{uy}$ = | 1749.26 | (k-ft) |
| $\delta_{sz}M_{ux}$ = | 4635.30 | (k-ft) |

**pure Bend about Y - Y - LFD**

| | | | |
|---|---|---|---|
| Depth to Neutral Axis, c = (As)(fy)/(0.85)(f'c)(β1)(W) = | 3.24 | (in) | p8-2-54 |
| Depth of Comp. Block, a = β1c = | 2.76 | (in) | p8-2-54 |
| Nominal Resistance, Mn = (As)(fy)(d-a/2) = | 12398 | (k-ft) | p8-2-55 |
| Factored Resistance, Mr = ϕMn = | 11158 | (k-ft) | p8-2-55 |

11158 > 1749 Therefore OK

Selected Reinforcement is good for pure bending

NS Reply Workpaper "NS Type IV Bridge.pdf" Page 26.

STV

| CLIENT | | MADE BY | CHECKED BY | PROJECT NO. | |
|---|---|---|---|---|---|
| PROJECT | | | | | |
| SUBJECT | Pier | DATE | DATE | REVISION | SHEET NO. |
| | | | | | 1 |

**Axial capacity with bia-axial flexural loads**

$\phi P_o$= 35278 (k)

$\phi P_{nxy}=1/(1/\phi P_{nx}+1/\phi P_{ny}-1/\phi P_o)$= 33099 (k)

OK

Allowable Pier Load (Capacity)

Calculated Pier Load

This shows final load for Type IV 64 foot high pier is within 7% of its capacity: 35,278 / 33,099 = 107%

# EXHIBIT 7

## NS Brief Exhibit 7 - Demonstration That RS Means Uses Swell When Building Earthwork Unit Costs

This exhibit shows how RS Means develops "system component" unit costs in a way that treats swell of excavated earth identically to how NS derived swell when developing unit costs used in its reply evidence. *See* NS Reply WP "RS Means Site Prep Worksheet-swell and shrinkage factor.pdf" and NS Reply at III-F-86. DuPont claims in rebuttal that RS Means does not make adjustments for swell. *See* DuPont Rebuttal III-F-50. As there has been confusion in past cases regarding the treatment of swell, NS presents this exhibit to confirm that its swell adjustments are consistent with the swell adjustments in RS Means.

**Contents of Following Pages:**

Page 2 – Copy of NS Reply WP "RS Means Site Prep Worksheet-swell and shrinkage factor.pdf" that includes highlights of a line item unit cost that is applied to "swelled" volumes
Page 3 – RS Means page confirming that the base cost for this line-item is lower because swell has not yet been accounted for

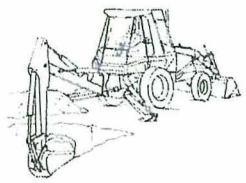
**Guide to References/Calculations on pp. 2-3:**

(1) $4.14 is the cost for 1.28 loose cubic yard (Page 2)
(2) $4.14 is included in a "system component" cost per cubic yard (Page 2)
(3) This "system component" cost is for 1.0 excavated bank cubic yard, which includes hauling costs for the equivalent 1.28 loose cubic yards (Page 2)
(4) $3.24 is the cost for 1 loose cubic yard (Page 3)
(5) $3.24 x 1.28 swell factor = $4.14 (Page 3)

Therefore the base unit cost of $3.24 is "swelled" by 1.28 times to account for the bank cubic yards "swelling" to loose cubic yards. NS applied the exact same conversion methodology to develop its reply earthwork unit costs.

Copy of NS Reply WP "RS Means Site Prep Worksheet-swell and shrinkage factor.pdf"- Exhibit mark-up





The Excavation of Common Earth System balances the productivity of the excavating equipment to the hauling equipment. It is assumed that the hauling equipment will encounter light traffic and will move up no considerable grades on the haul route. No mobilization cost is included. All costs given in these systems include a swell factor of 25% for hauling.

The Expanded System Listing shows Excavation systems using backhoes ranging from 1/2 Cubic Yard capacity to 3-1/2 Cubic Yards. Power shovels indicated range from 1/2 Cubic Yard to 3 Cubic Yards. Dragline bucket rigs range from 1/2 Cubic Yard to 3 Cubic Yards. Truck capacities range from 8 Cubic Yards to 20 Cubic Yards. Each system lists the number of trucks involved and the distance (round trip) that each must travel.

| System Components | QUANTITY | UNIT | COST PER C.Y. EQUIP. | LABOR | TOTAL |
|---|---|---|---|---|---|
| SYSTEM G1030 120 1000 | | | | | |
| EXCAVATE COMMON EARTH, 1/2 CY BACKHOE, TWO 8 CY DUMP TRUCKS, 1 MRT | (3) | | | | |
| Excavating, bulk hyd. backhoe wheel mtd., 1/2 C.Y. | 1.000 | B.C.Y. | .86 | 1.78 | 2.64 |
| Hauling, 8 CY truck, cycle 0.5 mile, 20 MPH, 15 min. wait/Ld./Uld. | 1.280 | L.C.Y. | 1.98 | 2.16 | 4.14 |
| Spotter at earth fill dump or in cut | .020 | Hr. | | .78 | .78 |
| TOTAL | | | 2.84 | 4.72 | 7.56 |

(1)

| G1030 120 | Excavate Common Earth | COST PER C.Y. EQUIP. | LABOR | TOTAL |
|---|---|---|---|---|
| 1000 | Excavate common earth, 1/2 C.Y. backhoe,two 8 C.Y. dump trucks, 1MRT | 2.84 | 4.72 | 7.56 |
| 1200 | Three 8 C.Y. dump trucks, 3 mile round trip | 5.70 | 7.95 | 13.65 |
| 1400 | Two 12 C.Y. dump trucks, 4 mile round trip | 6.10 | 6.10 | 12.20 |
| 1600 | 3/4 C.Y. backhoe, three 8 C.Y. dump trucks, 1 mile round trip | 2.85 | 3.89 | 6.74 |
| 1700 | Five 8 C.Y. dump trucks, 3 mile round trip | 5.60 | 7.35 | 12.95 |
| 1800 | Two 12 C.Y. dump trucks, 2 mile round trip | 5.15 | 4.72 | 9.87 |
| 1900 | Two 16 C.Y. dump trailers, 3 mile round trip | 4.96 | 4.01 | 8.97 |
| 2000 | Two 20 C.Y. dump trailers, 4 mile round trip | 4.75 | 3.96 | 8.71 |
| 2200 | 1-1/2 C.Y. backhoe, eight 8 C.Y. dump trucks, 3 mile round trip | 5.50 | 6.50 | 12 |
| 2300 | Four 12 C.Y. dump trucks, 2 mile round trip | 4.84 | 4.02 | 8.86 |
| 2400 | Six 12 C.Y. dump trucks, 4 mile round trip | 5.85 | 4.61 | 10.46 |
| 2500 | Three 16 C.Y. dump trailers, 2 mile round trip | 4.07 | 2.98 | 7.05 |
| 2600 | Two 20 C.Y. dump trailers, 1 mile round trip | 3.23 | 2.45 | 5.68 |
| 2700 | Three 20 C.Y. dump trailer, 3 mile round trip | 4.27 | 3.05 | 7.32 |
| 2800 | 2-1/2 C.Y. excavator, six 12 C.Y. dump trucks, 1 mile round trip | 3.58 | 2.71 | 6.29 |
| 2900 | Eight 12 C.Y. dump trucks, 3 mile round trip | 5.10 | 3.79 | 8.89 |
| 3000 | Four 16 C.Y. dump trailers, 1 mile round trip | 3.66 | 2.47 | 6.13 |
| 3100 | Six 16 C.Y. dump trailers, 3 mile round trip | 4.88 | 3.35 | 8.23 |
| 3200 | Six 20 C.Y. dump trailers, 4 mile round trip | 4.54 | 3.08 | 7.62 |
| 3400 | 3-1/2 C.Y. backhoe, six 16 C.Y. dump trailers, 1 mile round trip | 3.81 | 2.35 | 6.16 |
| 3600 | Ten 16 C.Y. dump trailers, 4 mile round trip | 5.40 | 3.32 | 8.72 |
| 3800 | Eight 20 C.Y. dump trailers, 3 mile round trip | 4.36 | 2.65 | 7.01 |
| 4000 | 1/2 C.Y. pwr. shovel, four 8 C.Y. dump trucks, 2 mile round trip | 4.83 | 5.90 | 10.73 |
| 4100 | Two 12 C.Y. dump trucks, 1 mile round trip | 3.95 | 3.67 | 7.62 |
| 4200 | Four 12 C.Y. dump trucks, 4 mile round trip | 6.05 | 4.88 | 10.93 |
| 4300 | Two 16 C.Y. dump trailers, 2 mile round trip | 4.29 | 3.60 | 7.89 |
| 4400 | Two 20 C.Y. dump trailers, 4 mile round trip | 4.95 | 4.13 | 9.08 |
| 4800 | 3/4 C.Y. pwr. shovel, six 8 C.Y. dump trucks, 2 mile round trip | 4.74 | 5.75 | 10.49 |
| 4900 | Three 12 C.Y. dump trucks, 1 mile round trip | 3.86 | 3.15 | 7.01 |
| 5000 | Five 12 C.Y. dump trucks, 4 mile round trip | 6.10 | 4.69 | 10.79 |
| 5100 | Three 16 C.Y. dump trailers, 3 mile round trip | 5.20 | 3.82 | 9.02 |
| 5200 | Three 20 C.Y. dump trailers, 4 mile round trip | 4.84 | 3.56 | 8.40 |
| 5400 | 1-1/2 C.Y. pwr. shovel, six 12 C.Y. dump trucks, 1 mile round trip | 3.54 | 2.70 | 6.24 |
| 5500 | Ten 12 C.Y. dump trucks, 4 mile round trip | 5.80 | 4.25 | 10.05 |

(2)





| G1030 120 | Excavate Common Earth | COST PER C.Y. EQUIP. | LABOR | TOTAL |
|---|---|---|---|---|
| 5600 | Six 16 C.Y. dump trailers, 3 mile round trip | 4.83 | 3.34 | 8.17 |
| 5700 | Four 20 C.Y. dump trailers, 2 mile round trip | 3.53 | 2.57 | 6.10 |
| 5800 | Six 20 C.Y. dump trailers, 4 mile round trip | 4.50 | 3.07 | 7.57 |
| 6000 | 3 C.Y. pwr. shovel, ten 12 C.Y. dump trucks, 1 mile round trip | 3.49 | 2.46 | 5.95 |
| 6200 | Twelve 16 C.Y. dump trailers, 4 mile round trip | 5.10 | 3.23 | 8.33 |
| 6400 | Eight 20 C.Y. dump trailers, 2 mile round trip | 3.36 | 2.14 | 5.50 |
| 6600 | 1/2 C.Y. dragline bucket, three 8 C.Y. dump trucks, 2 mile round trip | 6.80 | 7.85 | 14.65 |
| 6700 | Two 12 C.Y. dump trucks, 3 mile round trip | 7.55 | 6.80 | 14.35 |
| 6800 | Three 12 C.Y. dump trucks, 4 mile round trip | 7.65 | 6.50 | 14.15 |
| 7000 | Two 16 C.Y. dump trailers, 4 mile round trip | 7.20 | 6 | 13.20 |
| 7200 | 3/4 C.Y. dragline bucket, four 8 C.Y. dump trucks, 1 mile round trip | 3.74 | 4.34 | 8.08 |
| 7300 | Six 8 C.Y. dump trucks, 3 mile round trip | 6.60 | 7.90 | 14.50 |
| 7400 | Two 12 C.Y. dump trucks, 1 mile round trip | 5.15 | 4.67 | 9.82 |
| 7500 | Four 12 C.Y. dump trucks, 4 mile round trip | 7.05 | 5.70 | 12.75 |
| 7600 | Two 16 C.Y. dump trailers, 2 mile round trip | 5.40 | 4.53 | 9.93 |
| 7800 | 1-1/2 C.Y. dragline bucket, four 12 C.Y. dump trucks, 1 mile round trip | 4.42 | 3.34 | 7.76 |
| 7900 | Six 12 C.Y. dump trucks, 3 mile round trip | 5.75 | 4.41 | 10.16 |
| 8000 | Four 16 C.Y. dump trucks, 2 mile round trip | 4.73 | 3.31 | 8.04 |
| 8200 | Five 16 C.Y. dump trucks, 4 mile round trip | 6 | 4.08 | 10.08 |
| 8400 | 3 C.Y. dragline bucket, eight 12 C.Y. dump trucks, 2 mile round trip | 5.45 | 3.75 | 9.20 |
| 8500 | Twelve 12 C.Y. dump trucks, 4 mile round trip | 6.35 | 4.35 | 10.70 |
| 8600 | Eight 16 C.Y. dump trailers, 3 mile round trip | 5.35 | 3.39 | 8.74 |
| 8700 | Six 20 C.Y. dump trailers, 2 mile round trip | 3.96 | 2.52 | 6.48 |

"RSMeans Site Work & Landscape Cost Data" 28th Annual Ed. 2009

*Means page excerpt to confirm swell instructions on previous page*



| 31 23 23.20 Hauling | | Crew | Daily Output | Labor-Hours | Unit | Material | 2009 Bare Costs Labor | Equipment | Total | Total Incl O&P |
|---|---|---|---|---|---|---|---|---|---|---|
| 0018 | cycle 2 miles | B-34A | 208 | .038 | L.C.Y. | | 1.23 | 1.57 | 2.80 | 3.62 |
| 0020 | cycle 4 miles | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |
| 0022 | cycle 6 miles | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0024 | cycle 8 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0026 | 20 MPH ave,cycle 0.5 mile | | 336 | .024 | | | .76 | .97 | 1.73 | 2.24 |
| 0028 | cycle 1 mile | | 296 | .027 | | | .86 | 1.10 | 1.96 | 2.54 |
| 0030 | cycle 2 miles | | 240 | .033 | | | 1.06 | 1.36 | 2.42 | 3.14 |
| 0032 | cycle 4 miles | | 176 | .045 | | | 1.45 | 1.85 | 3.30 | 4.27 |
| 0034 | cycle 6 miles | | 136 | .059 | | | 1.88 | 2.40 | 4.28 | 5.55 |
| 0036 | cycle 8 miles | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0044 | 25 MPH ave, cycle 4 miles | | 192 | .042 | | | 1.33 | 1.70 | 3.03 | 3.92 |
| 0046 | cycle 6 miles | | 160 | .050 | | | 1.60 | 2.04 | 3.64 | 4.70 |
| 0048 | cycle 8 miles | | 128 | .063 | | | 2 | 2.55 | 4.55 | 5.90 |
| 0050 | 30 MPH ave, cycle 4 miles | | 216 | .037 | | | 1.18 | 1.51 | 2.69 | 3.48 |
| 0052 | cycle 6 miles | | 176 | .045 | | | 1.45 | 1.85 | 3.30 | 4.27 |
| 0054 | cycle 8 miles | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |
| 0114 | 15 MPH ave, cycle 0.5 mile, 15 min. wait/Ld./Uld. | | 224 | .036 | | | 1.14 | 1.46 | 2.60 | 3.36 |
| 0116 | cycle 1 mile | | 200 | .040 | | | 1.28 | 1.63 | 2.91 | 3.77 |
| 0118 | cycle 2 miles | | 168 | .048 | | | 1.52 | 1.94 | 3.46 | 4.48 |
| 0120 | cycle 4 miles | | 120 | .067 | | | 2.13 | 2.72 | 4.85 | 6.25 |
| 0122 | cycle 6 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0124 | cycle 8 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0126 | 20 MPH ave, cycle 0.5 mile | | 232 | .034 | | | 1.10 | 1.41 | 2.51 | 3.24 |
| 0128 | cycle 1 mile | | 208 | .038 | | | 1.23 | 1.57 | 2.80 | 3.62 |
| 0130 | cycle 2 miles | | 184 | .043 | | | 1.39 | 1.77 | 3.16 | 4.09 |
| 0132 | cycle 4 miles | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |
| 0134 | cycle 6 miles | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0136 | cycle 8 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0144 | 25 MPH ave, cycle 4 miles | | 152 | .053 | | | 1.68 | 2.15 | 3.83 | 4.95 |
| 0146 | cycle 6 miles | | 128 | .063 | | | 2 | 2.55 | 4.55 | 5.90 |
| 0148 | cycle 8 miles | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0150 | 30 MPH ave, cycle 4 miles | | 168 | .048 | | | 1.52 | 1.94 | 3.46 | 4.48 |
| 0152 | cycle 6 miles | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |
| 0154 | cycle 8 miles | | 120 | .067 | | | 2.13 | 2.72 | 4.85 | 6.25 |
| 0214 | 15 MPH ave, cycle 0.5 mile, 20 min wait/Ld./Uld. | | 176 | .045 | | | 1.45 | 1.85 | 3.30 | 4.27 |
| 0216 | cycle 1 mile | | 160 | .050 | | | 1.60 | 2.04 | 3.64 | 4.70 |
| 0218 | cycle 2 miles | | 136 | .059 | | | 1.88 | 2.40 | 4.28 | 5.55 |
| 0220 | cycle 4 miles | | 104 | .077 | | | 2.46 | 3.14 | 5.60 | 7.25 |
| 0222 | cycle 6 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0224 | cycle 8 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |
| 0226 | 20 MPH ave, cycle 0.5 mile | | 176 | .045 | | | 1.45 | 1.85 | 3.30 | 4.27 |
| 0228 | cycle 1 mile | | 168 | .048 | | | 1.52 | 1.94 | 3.46 | 4.48 |
| 0230 | cycle 2 miles | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |
| 0232 | cycle 4 miles | | 120 | .067 | | | 2.13 | 2.72 | 4.85 | 6.25 |
| 0234 | cycle 6 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0236 | cycle 8 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0244 | 25 MPH ave, cycle 4 miles | | 128 | .063 | | | 2 | 2.55 | 4.55 | 5.90 |
| 0246 | cycle 6 miles | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0248 | cycle 8 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0250 | 30 MPH ave, cycle 4 miles | | 136 | .059 | | | 1.88 | 2.40 | 4.28 | 5.55 |
| 0252 | cycle 6 miles | | 120 | .067 | | | 2.13 | 2.72 | 4.85 | 6.25 |
| 0254 | cycle 8 miles | | 104 | .077 | | | 2.46 | 3.14 | 5.60 | 7.25 |
| 0314 | 15 MPH ave, cycle 0.5 mile, 25 min wait/Ld./Uld. | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |

(4)





| 31 23 23.20 Hauling | | Crew | Daily Output | Labor-Hours | Unit | Material | 2009 Bare Costs Labor | Equipment | Total | Total Incl O&P |
|---|---|---|---|---|---|---|---|---|---|---|
| 0316 | cycle 1 mile | B-34A | 128 | .063 | L.C.Y. | | 2 | 2.55 | 4.55 | 5.90 |
| 0318 | cycle 2 miles | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0320 | cycle 4 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0322 | cycle 6 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0324 | cycle 8 miles | | 64 | .125 | | | 3.99 | 5.10 | 9.09 | 11.75 |
| 0326 | 20 MPH ave, cycle 0.5 mile | | 144 | .056 | | | 1.78 | 2.27 | 4.05 | 5.20 |
| 0 | | | | | | | | | | 5.55 |
| 0 | | | | | | | | | | 5 |
| 0 | | | | | | | | | | 5 |
| 0 | | | | | | | | | | 5 |
| 0 | | | | | | | | | | 0 |
| 0 | | | | | | | | | | 0 |
| 0 | | | | | | | | | | 5 |
| 0 | | | | | | | | | | 5 |
| 0 | | | | | | | | | | 0 |
| 0 | | | | | | | | | | 5 |
| 0 | | | | | | | | | | 5 |
| 0414 | 15 MPH ave, cycle 0.5 mile, 30 min wait/Ld./Uld. | | 120 | .067 | | | 2.13 | 2.72 | 4.85 | 6.25 |
| 0416 | cycle 1 mile | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0418 | cycle 2 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0420 | cycle 4 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0422 | cycle 6 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |
| 0424 | cycle 8 miles | | 64 | .125 | | | 3.99 | 5.10 | 9.09 | 11.75 |
| 0426 | 20 MPH ave, cycle 0.5 mile | | 120 | .067 | | | 2.13 | 2.72 | 4.85 | 6.25 |
| 0428 | cycle 1 mile | | 112 | .071 | | | 2.28 | 2.91 | 5.19 | 6.70 |
| 0430 | cycle 2 miles | | 104 | .077 | | | 2.46 | 3.14 | 5.60 | 7.25 |
| 0432 | cycle 4 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0434 | cycle 6 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0436 | cycle 8 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |
| 0444 | 25 MPH ave, cycle 4 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0446 | cycle 6 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0448 | cycle 8 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0450 | 30 MPH ave, cycle 4 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0452 | cycle 6 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0454 | cycle 8 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0514 | 15 MPH ave, cycle 0.5 mile, 35 min wait/Ld./Uld. | | 104 | .077 | | | 2.46 | 3.14 | 5.60 | 7.25 |
| 0516 | cycle 1 mile | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0518 | cycle 2 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0520 | cycle 4 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |
| 0522 | cycle 6 miles | | 64 | .125 | | | 3.99 | 5.10 | 9.09 | 11.75 |
| 0524 | cycle 8 miles | | 56 | .143 | | | 4.56 | 5.85 | 10.41 | 13.40 |
| 0526 | 20 MPH ave, cycle 0.5 mile | | 104 | .077 | | | 2.46 | 3.14 | 5.60 | 7.25 |
| 0528 | cycle 1 mile | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0530 | cycle 2 miles | | 96 | .083 | | | 2.66 | 3.40 | 6.06 | 7.85 |
| 0532 | cycle 4 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0534 | cycle 6 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |
| 0536 | cycle 8 miles | | 64 | .125 | | | 3.99 | 5.10 | 9.09 | 11.75 |
| 0544 | 25 MPH ave, cycle 4 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0546 | cycle 6 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0548 | cycle 8 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |
| 0550 | 30 MPH ave, cycle 4 miles | | 88 | .091 | | | 2.90 | 3.71 | 6.61 | 8.55 |
| 0552 | cycle 6 miles | | 80 | .100 | | | 3.20 | 4.08 | 7.28 | 9.40 |
| 0554 | cycle 8 miles | | 72 | .111 | | | 3.55 | 4.53 | 8.08 | 10.45 |

Hauling, 8 CY truck, cycle .5 mile, 20 MPH, 15 min, wait/Ld./Uld

1.0 LCY = $3.24

(5) 1.28 LCY = $3.24 x 1.28 = $4.14

See Site earthwork example on page 532

"RSMeans Site Work & Landscape Cost Data" 28th Annual Ed. 2009

# EXHIBIT 8

Norfolk Southern Corporation
1200 Peachtree Street, N.E. - Box 123
Atlanta, Georgia, 30309

**L. C. Wilson**
Manager ATC Regulatory
Compliance & Training

Mr. Michael Logue
Acting Associate Administrator for
Railroad Safety / Chief Safety Officer
Federal Railroad Administration
1200 New Jersey Avenue, S.E., Mail Stop 25
Washington, DC 20590

April 15, 2013

RE: Norfolk Southern Railway Progress Toward Achieving Its Planned PTC Implementation Annual Reporting 2013 (Docket FRA – 2010- 0060)- Public Redacted

Dear Mr. Logue:

With the attached document, Norfolk Southern Railway Company ("NS") provides its annual report of progress toward achieving its planned PTC Implementation. This report is submitted in accordance with 49 CFR Part 236, Subpart I, §236.1006(b)(2), and in compliance with the Federal Railroad Administration ("FRA") approved NS PTC Implementation Plan (PTCIP) v1.3 of July 2010.

The attached document reports upon the effort toward implementation progress that NS has made in accordance with its approved PTCIP through December 2012 and includes other topics likely of interest to the FRA. In short, NS achieved its 2012 goal of 0% of its total trains operating under PTC control on PTC required territory and fell slightly short of its goal of 1,877 total equipped locomotives by achieving a total of 1,383 locomotives partially equipped by year's end 2012, which represent 40.5% of the anticipated PTC locomotive fleet. NS is confident it will have enough locomotives equipped when line commissioning begins. NS has taken several steps in an effort to meet its PTCIP goals in subsequent years by adding resources, monitoring and managing progress, and working diligently with suppliers to add resources, correct defects, and maintain a demanding supply requirement for quality products for installation.

NS continues to work aggressively toward meeting the requirement to progressively implement PTC on the required network and to meet its Implementation Plan goals. As was reported in the January 18, 2012 Association of American Railroads' report to the FRA on PTC implementation status, titled "PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline," and the following August 5, 2012 Federal Railroad Administration Report to Congress, "Positive Train Control Implementation Status, Issues and Impacts," on PTC implementation status across the nation's railroads, Norfolk Southern's 2012 update follows the

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same trajectory of thousands of resources (people, hours, components and dollars) diligently applied to an enormous technological and physical effort that can neither be rushed nor hastily achieved to meet a well-intended deadline. The regulatory challenge of this integrated interoperable system is a technologically high hurdle but NS is committed to meet the regulatory requirements of PTC.

The entire industry, including Norfolk Southern, is faced with the development of heretofore non-existent hardware and software, design impediments, integration of over 20 components built by a variety of suppliers, incorporation of multiple road's particular operating practices, and security protections, all requiring multiple releases and deployments of interim products on the path to final components. Added to these technological challenges are numerous human factor tasks including the training of 16,000 plus NS employees in addition to a massive geographical physical wayside challenge entailing construction activities on and data generation and validation for thousands of miles of right of way.

Finally, there is the documentation and filing of a safety case for FRA's certification of the system which likely will take anywhere from six months to over a year to achieve. NS will continue to apply resources to complete deployment as soon as is safely possible, and will work with the FRA on modifications and updates to the PTCIP based upon the rule revisions FRA currently has in progress.

Please contact me at Lisa.Wilson@nscorp.com or 404-962-5931 if you have any questions or require additional information. Due to the sensitive nature of the contents of Appendix B 2012 Wayside Equipping, the Annual Report has been designated SSI.

Kindest Regards,

*Lisa C. Wilson*

Lisa Wilson
Manager Advanced Train Control
Regulatory Compliance & Training

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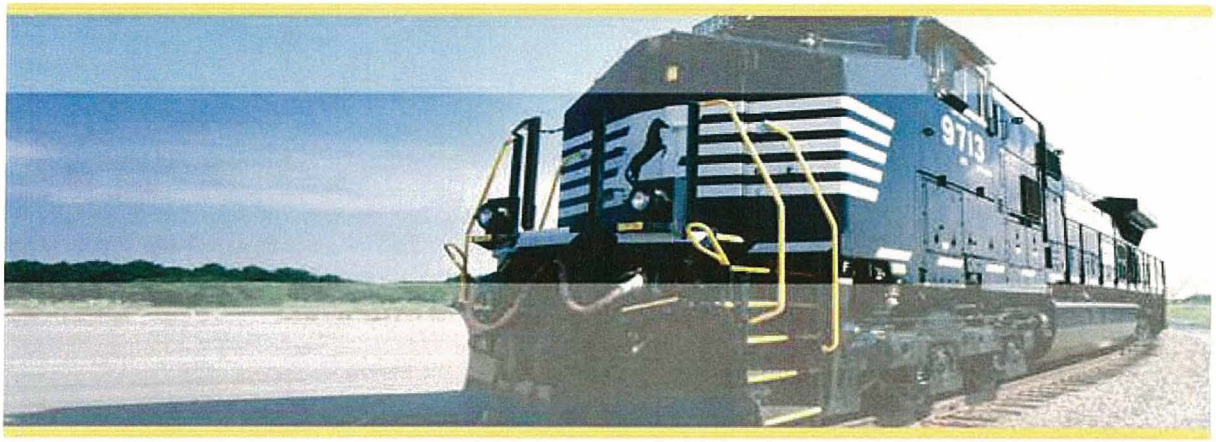


Norfolk Southern Railway Annual Reporting of Progress Toward Achieving NS Planned PTC Locomotive Deployment For Period 2012 (Docket FRA – 2010- 0060)

# 2013

This document as required by 49 CFR Part 236, Subpart I, § 236.1006(b)(2) is Norfolk Southern's Annual Report of its PTCIP specific goals for 2012 for progressive implementation of onboard systems and deployment of PTC-equipped locomotives. These goals are expressed as the percentage of NS trains operating on NS PTC-equipped lines that are equipped with operative onboard PTC apparatus responsive to the wayside, expressed as an annualized (calendar year) percentage for the NS railroad as a whole.

**Submitted in fulfillment of 49 CFR Part 236, Subpart 1, § 236.1006(b)(2)**




## Revision History

| Date | Version | Description | Author |
|---|---|---|---|
| April 15, 2013 | 1 | Initial Version to FRA | Norfolk Southern |
| | | | |

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

## Contents

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

## SPECIFIC GOALS FOR PROGRESSIVE IMPLEMENTATION OF ONBOARD SYSTEMS AND DEPLOYMENT OF PTC-EQUIPPED LOCOMOTIVES [§ 236.1006(b)(2)]

### PTC Trains Operative

As reported in the **NS Positive Train Control Implementation Plan (PTCIP) v1.3, dated July 9, 2010** and approved by the FRA August 24, 2010, in Section 9.2 Schedule & Progressive Implementation and the corresponding Table 9, as per 236.1006(b)(1), **NS met its goal in CY2012 of 0% PTC Trains operated in PTC equipped territories with PTC equipped locomotives.** The PTCIP does not record a change in the metric until 2013 or after the PTC System is certified by the FRA, whichever occurs first. At the time of this filing, it is unlikely 2013 will be the first milestone for this category of PTC success.

As defined in the NS Implementation Plan, NS utilizes the following metric:

$$\frac{\text{\# Trains Operated in Revenue Service on a PTC Line Segment under PTC Control}}{\text{Total \# Trains Operated in Revenue Service on Railroad}}$$

### PTCIP Locomotive Equipping Goals

It is currently estimated that FRA System Certification will be awarded in 2014 or later. As NS' goals for progressive implementation of PTC are predicated on System Certification, future annual reports will amend those goals accordingly as further information is gleaned. **NS installed partial PTC equipment on 483 locomotives during CY2012. NS met 70% of the PTCIP goal of equipping 700 locomotives in CY2012 and brought its total units partially equipped to 1,383 or 40.5% or the total fleet expected to be equipped. Although locomotive installations are slightly behind, NS has confidence it will have enough equipped locomotives to support PTC deployed lines once commissioning begins. None of the tenant railroads operating on NS planned to install PTC equipment on locomotives in CY2012.**

### Steps Taken to Achieve Subsequent Annual Goals

**NS is taking several steps to ensure achievement of subsequent annual goals.** For instance, NS is adding 6 employees per year to increase throughput of PTC equipped locomotives at its shops. At this time, NS can achieve a throughput of 16 PTC equipped locomotives per week. This work is in addition to the regular inspections required for locomotives as well as any repair of units taken out of service for equipment issues. There were 41 employees dedicated to equipping locomotives in 2012; and there are currently 47 in 2013. NS will have 53 employees in 2014 whose main job function is installing PTC equipment on locomotives. Three full time employees dedicated to developing instructions for installation on the variety of locomotive model types were added to headquarters staff, and a General Foreman of ATC was added at each of the eight shops to oversee and manage PTC installations.

NORFOLK SOUTHERN

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

NS is also allocating over a half a million dollars in capital improvement funds to increase PTC installation output at the Enola shop. With respect to the equipment itself, NS is installing the same TMC for LEADER that will be utilized for PTC. As the units are installed, a full installation check out is performed to insure the TMC works properly for road service for LEADER. So while NS' units are partially equipped, the key components to run train control will be ready to put into service when locomotive commissioning occurs at a future date. Insuring that "check out" software is operating without defect also caused the NS Mechanical team some delays in 2012. NS has also worked diligently in the past year to work through quality issues with its vendors with respect to the locomotive equipment. One issue took the better part of 2012 to resolve and for the supply of products to return to normal. The Mechanical Department Staff meets regularly to discuss PTC progress and has also created and instituted several weekly reports to monitor and manage progress of installations.

NS and other roads described the status of the PTC implementation at length in an industry paper to the FRA. On January 18, 2012, the Association of American Railroads (AAR) submitted a status paper to the Federal Railroad Administration (FRA) titled "PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline" ("ISP"). The ISP discussed the challenges faced in developing an interoperable PTC system and provided detailed data showing the progress that had been made. The ISP concluded by stating that a nationwide, interoperable PTC network cannot be completed by the December 31, 2015, statutory deadline. The data was provided by the following eight railroads, which have to install PTC on routes over which TIH or passengers, or both TIH and passengers, are transported: the Alaska Railroad (ARR), BNSF Railway (BNSF), Canadian National (CN), Canadian Pacific (CP), CSX Transportation (CSX), Kansas City Southern (KCS), Norfolk Southern (NS), and Union Pacific (UP).

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

## ADDITIONAL INFORMATION

The following sections provide FRA with an update as to the status of the PTC major segments or activities Norfolk Southern engaged in for 2012. NS representatives engaged in discussions with FRA representatives in 2012 regarding PTC in about a dozen different settings: Joint Rail Safety Team meetings, Functionality Reviews, AAR PTC Policy Committee meetings, an NS Implementation Status meeting, and the AAR/ASLRRA Rail Industry Conference on Positive Train Control, as examples.

## LOCOMOTIVE SEGMENT

Norfolk Southern's primary objective in establishing the plan for equipping locomotives is to ensure a sufficient pool of locomotives for PTC operation on equipped line segments both during PTC deployment and beyond the statutory deadline. NS will continuously evaluate the operational demands of its rail network for the current traffic levels and distribution of car loads to determine the proper level of PTC equipping to meet the regulatory requirements of PTC.

### Locomotive Hardware – Installation

In the PTCIP, NS outlined its goals for equipping its locomotive fleet for PTC. For calendar year 2012, Norfolk Southern's goal was to equip 700 locomotives with PTC equipment to bring the total equipped locomotives to 1,877 by the end of the calendar year. For 2012, NS was able to partially equip 483 locomotives with Train Management Computers (TMC), bringing the total number equipped to 1,383, which represent 40.5% of the anticipated PTC locomotive fleet, and 74% of the 2012 goal.

Installations occurred at 8 Norfolk Southern shop facility locations:

| | | |
|---|---|---|
| Roanoke (2 shops) | Juniata | Bellevue |
| Enola | Chattanooga | |
| Conway | Elkhart | |

The goal for 2012 installations was affected by software releases and a few design improvements. Although locomotive installations are slightly behind, NS has confidence it will have enough equipped locomotives to support PTC deployed lines once commissioning begins.

The TMCs being used by LEADER energy management are the same TMCs that will be utilized by I-ETMS when the PTC software is available. With the TMC units functioning on the NS railroad, NS has been able to provide valuable feedback to internal and external development teams for improvements.

NS intends to recover the shortfall of the 494 installations during a future installation period and continues to plan for completion as soon as practicable. As mentioned above, none of the tenant railroads operating on NS planned to install I-ETMS interoperable PTC equipment on

locomotives in CY2012 because the I-ETMS system was not completed and FRA certification of the system has not yet been achieved.

After appropriate software testing, NS will complete installation and perform PTC commissioning (i.e. radios, messaging and brake connections) on the 1,383 partially equipped locomotives.

See *Appendix A* for an update specific to the fleet models partially equipped thus far.

### Locomotive Software – Development

The onboard software that was released to NS is not fully functional at this time. A functional version of the onboard software is expected to be released in early 2013. A compatible version of BOS software for testing is expected to be released in late 2013. In 2012, the NS PTC team was able to load the early onboard release in the lab and conduct limited testing. This early testing effort allowed the NS PTC onboard resources to grow their knowledgebase of system behavior and develop testing process discipline for the rigor that will be required once the system integration testing does begin. Further discussion can be found in the Testing section.

## WAYSIDE SEGMENT

In 2012, steady progress was made toward equipping the wayside and testing vendor products for safe field implementation.

### Wayside Design

NS continues to work closely with vendors of wayside equipment to address issues of stability, applicability, compatibility and manageability as experiences gained from efforts in 2011 and 2012 are leveraged to improve the quality of wayside deployment. Legacy signaling equipment with different vintage hardware and software combinations has presented some of the most persistent challenges in these areas. Deployment efforts to date have encompassed a broad representation of legacy equipment providing confidence most if not all of the issues have been identified.

NS established a standalone WIU solution in 2012 which was installed and tested and has been approved for design going forward. Relay plant design with this solution will commence in earnest in 2013 and locations not addressed in 2011 or 2012 for lack of a viable solution will be addressed.

Systems management and Interoperable Train Control (ITC) messaging upgrades are predicted for the second half of 2013 for all waysides. These changes are necessary to better manage PTC at the wayside and create a stable production ready environment. NS continues to increase its install base but will be slowed by the need to revisit sites for the required upgrades. NS will need to evaluate release functionality and dates for these upgrades and strategically implement to minimize field rework while still providing an adequate test bed for new releases.

### Wayside Construction

Norfolk Southern's C&S Department utilized construction forces throughout the year to advance the PTC-ready mileage. Many of the first locations in risk priority order are also those with the oldest equipment requiring complete green fielding of the locations for new "standalone" WIU solutions. This means a new design, new bungalow, rewiring, replacing track circuits, signals and control equipment, along with the many other requirements of a signal cut-in.

In 2012, NS had active wayside construction projects on 15 line segments. By year's end, NS was able to cut-in over 500 locations for approximately 850 miles. That took the NS total locations cut in to over 630 and wayside mileage cut-in by end of year 2012 to over 1080 miles, approximately 32% of the 2012 PTCIP goal of 3,380 miles. NS will work to make up to variance between actual route miles and the PTCIP goal in the years to come and took steps in 2012 to make that happen in subsequent years. In 2012, NS worked diligently to craft an agreement with the BRS to allow for contracting out of some of the PTC work. Labor agreements restrict the resources available on certain sections of NS property. The BRS and NS were able to come to mutually agreeable terms to increase the resources available for PTC installations. Additionally, the work performed to date has largely been on older equipment which requires a more time consuming process of green fielding a location. Looking ahead into some of 2013 and 2014, NS expects to increase its throughput and cut-ins as its deployment moves to newer signaling equipment which is not as complex to make PTC-ready. Several more years will be required to fully construct a reliable and safe wayside infrastructure to run PTC.

*Appendix B* contains Sensitive Security Information regarding the equipping of the NS PTC lines for the wayside in 2012.

### Wayside V&V

NS worked toward the end of 2012 to develop a comprehensive Wayside Validation & Verification (V&V) test plan for submittal to the FRA in 2013. Wayside V&V procedures were also developed. Looking ahead, NS expects to begin Validation of the wayside in late 2013 to coincide with FRA test plan approval and onboard subdivision file creation for first deployed segments.

## OFFICE SEGMENT

The Back Office Server (BOS) software in 2012, and at the time of this report, was still under development by the vendor. While several early product releases were provided to the railroads in 2012, the final product has not yet been delivered. The majority of PTC functionality will reside in release 3.2.1, not due for release until late 2013. In 2012, there were four service pack releases for BOS 3.2 that NS installed and tested as fully as was possible given the software's limitations and lack of compatibility with other components (namely onboard and CAD).

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

In May of 2012, NS attended BOS 3.2 Beta training conducted by the developer. The training was a mix of lectures with Q&A sessions followed by hands on practical BOS use. From a high level perspective, the training included presentations on architecture, software installation and configuration, network configuration, and database configuration. The hands on portion of the training allowed the users to configure a BOS and run scripted tests in a controlled environment. This training session provided the NS PTC BOS business users a better understanding of the architecture from both a hardware and network perspective.

Also in 2012, while several design issues were worked through with the supplier's customer railroads, a few major issues were discussed but have not been resolved as of yet:

- The BOS hazard mitigation related to delivery of mandatory directives required further definition. Development is projected for BOS 3.3 release in 2014
- Administration for the BOS was not designed to be sufficiently scaled for implementation across the railroad, with multiple instances of BOS. Development is projected for BOS 3.4 release in 2014.
- Performance and scalability testing for the BOS was not fully addressed.

There were two releases of CAD enhancements delivered in 2012 for PTC and interface compatibility with BOS. A third release is scheduled for 2013 which will be compatible with the BOS 3.2.1 release.

When 3.2.1 is released to the railroads, NS will begin fully testing with the onboard and CAD releases. Iterative integration lab testing is necessary to ensure that performance is acceptable before moving to field testing.

## COMMUNICATIONS SEGMENT

The PTC communication systems made significant progress in 2012 in at least two key areas. First, in early 2012, Meteorcomm (MCC) released software version 1.1, which provided a stable software platform for field testing. This release supported full radio functionality including the capability to remotely load software. Version 1.3 is expected in early 2013. Secondly, MCC finalized the process of qualifying two vendors to provide the first production-grade radio equipment. This was a rigorous process which directly involved MCC test engineers at each respective supplier to ensure compliance in every area. Both suppliers will use the same software platform developed by MCC to insure radio interoperability.

With the arrival of new radio equipment, NS was able to install the communications systems across the pilot corridor. This provided valuable experience in planning the RF network and practical field learning opportunities for the technical teams who were performing the physical installations. Once the Pilot territory communications infrastructure was completed, NS worked on several other line segments, installing approximately 60 base stations around the network.



In addition, the first PTC radio training session was conducted with select technical staff around the system. The training was instructor-led by MCC utilizing real equipment for demonstration and instruction. MCC provided key reference documentation for equipment installation and guides for troubleshooting and support.

Lastly, tools were commissioned to provide assistance in planning complex RF networks, particularly in congested areas. In addition, there was the need to document all PTC radio installations for regulatory compliance with the FCC. A development effort for that documentation was started as well. Efficiently utilizing the spectrum and minimizing interference is going to be a key challenge for RF engineers as equipment is introduced into service.

## PTC TRACK DATA

The PTC system described in the PTCDP which NS intends to deploy requires a comprehensive and highly accurate track database. Throughout 2010 and 2011, NS used FLI-MAP technology to map its entire railroad in order to gather comprehensive location detail. NS extracted the key track features in 2011.

In 2012, NS evaluated the more than 200 operational attributes which must be applied to the track data, as defined by the industry standard PTC Data Model. The data required for attribution was evaluated against the higher standards imposed by PTC of availability, accuracy, ownership and change management.

Small specialized groups began the process of attributing the geospatial track data. Both long term and short term strategies were developed to migrate and structure existing data in new repositories providing better controls and visibility. Subdivision files were created for pilot territories and lab testing. The subdivision files for testing proved the short term strategies developed were successful. The long term strategies for PTC track data will drive changes in both data and data management for CAD, timetables, project tracking and security systems.

Going forward in 2013, NS will be focused on integration of the PTC track data across several subsystems creating an overarching system of automated data extraction, change notification and approval routing, thus providing the required data, processes, and configuration management for subdivision file creation at a production level capable of meeting the needs of PTC.

## TESTING

2012 was a busy year for the NS PTC testing effort. It was largely a foundational year of establishing a fully operational and functional lab and staffing it with the appropriate resources to serve as experts in either the functions of PTC or the processes to support testing. The focus for 2012 was primarily "getting ready for PTC" and validating that the vendors were building the products that meet the specifications and NS quality requirements. Much of the testing

effort was centered on establishing the various environments and configurations of the many PTC components. NS received five releases of onboard software, five releases of BOS software, two releases of CAD and three releases of messaging and radio communication software, along with messaging and wayside software for seven different makes and models of Wayside equipment in the lab. The NS test team utilized both simulators and testing tools to verify components. For example, the Wayside Testing Tool was used to verify WIU beaconing to the locomotive onboard system was occurring as required; the BOS and Onboard simulators were used to conduct early communication/messaging testing between BOS and CAD and BOS and Onboard. This "early" testing with simulators allowed the NS test team to recognize appropriate component behaviors when the "real" components" are made available.

NS wrote and/or executed tests for three levels of testing:

1. Segment – testing a sub-system which involves the inputs to and outputs from each segment via the use of simulators and stimulators.
2. LINN – Laboratory Integration Nearest Neighbor testing of two or more segments in the lab which are adjacent to each other in order to verify pairs of segments function together.
3. LIEE - Laboratory Integration End to End testing of the entire system. It is the highest level of testing in the laboratory environment to verify that the system functions as a whole.

NS wrote over 400 Segment, 60+ LINN and over 1500 LIEE test cases. There were nearly 600 Segment tests executed and 100 LINN test cases executed utilizing NS and vendor test cases. During Segment and LINN tests, 102 defects were closed. No LIEE test cases were executed in 2012.

To minimize the impact of issues experienced in 2012 of software delays and critical software defects identified during testing, NS continued to monitor the vendor schedules via regular status meetings and on-site visits, and requested vendors provide interim releases to test and verify the software prior to the final releases.

NS also performed test audits to ensure its suppliers follow testing best practices to minimize risks. In 2012, the NS test team participated in five quality audits of the Xorail Track Database Subdivision Tool WabtraX in October 2012, the Wabtec Onboard I-ETMS software in June 2012, the Meteorcomm test processes for the Systems Management System, Radio, Messaging and Integration work streams in June 2012, and the ARINC test processes and Back Office Server (BOS) 3.2 segment tests in January with a follow-up in May 2012.

Looking ahead in 2013, NS expects to spend the majority of the year focused on completing the LINN testing and beginning the LIEE test execution phase.

## TENANTS

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

In its Implementation Plan, NS identified the railroads operating as tenants on PTC required track. As described in Section 5.3 of the NS PTCIP, NS plans to amend its operating rules to require every tenant which operates on PTC required track to equip its locomotives with an interoperable PTC system to ensure safety of operations.

There were no substantive changes in tenant status in 2012. NS did engage in discussions with several of its partner railroads throughout the year regarding I-ETMS system status and interoperability. Additionally, NS (and the FRA) participated in the AAR / ASLRRA sponsored Positive Train Control Symposium, held in St. Louis, MO on October 22-24, 2012. This symposium demonstrated the important progress made by the industry and suppliers to develop PTC equipment and technologies for Class I and Short Line railroads. This was the first in a series of forums to provide detailed information related to meeting the PTC Congressional requirement. As a sponsoring AAR railroad, NS requested invitation to the Symposium for its PTC tenant railroads to which a Memorandum of Understanding for five key factors of interoperability was mailed in 2010. NS will participate in a PTC update for the ASLRRA's Centennial Convention in Atlanta, GA in April 2013.

Given the current expectation that I-ETMS will not receive FRA System Certification prior to 2014 or be deployed on NS where tenants are affected in the near future, at this time NS does not foresee any un-resolvable issues. As mentioned in the locomotive segment section above, since the system was not completed and FRA certification of the system had not yet been achieved, none of the tenant railroads operating on NS planned to install PTC equipment on locomotives in CY2012. NS expects to reach out to all tenant roads in 2013 after the PTC Rule is finalized. *See Appendix C* for details regarding tenants' equipping of locomotives.

## PTC DEVELOPMENT PLAN and SAFETY PLAN

In 2012, NS along with CSX and UPRR worked with the FRA to amend the PTCDP Type Approval for revisions which were consistent with proposed changes discussed by UP/NS/CSXT and FRA, and were identified in a letter from the three roads to FRA dated 13 April 2012. Subsequent to that letter, UP/NS/CSXT and FRA discussed additional changes to the Type Approval letter and schedule. A revised Type Approval is expected in 2Q 2013.

The Joint Rail Safety Team (JRST) of Class I railroads of which NS is a participant, submitted two draft versions of the PTC Safety Plan in April and December of 2012. NS with its partner JRST roads worked to clarify the FRA's comments on the two draft documents. NS, through the JRST, met quarterly with the FRA to address the PTCSP and PTC functionality. Additional drafts of the PTCSP are expected in 2013.

NS 2013 Annual Reporting of PTC Progress For 2012- Public Redacted

*Appendix A 2012 Locomotive Hardware Equipping*

| Model Numbers | Horsepower | Total Quantity NS Plans to Equip | Partially Equipped By EoY 2012 |
|---|---|---|---|
| D8-40CW | 4000 | 154 | 46 |
| D9-40CW | 4000 | 1086 | 986 |
| SD70M | 4000 | 68 | 57 |
| SD70M-2 | 4000 | 130 | 116 |
| SD70ACe | 4300 | 75 | 75 |
| SD60E | 3800 | 28 | 28 |
| D8-40C | 4000 | 86 | 0 |
| D9-40C | 4000 | 125 | 0 |
| ES44AC | 4400 | 141 | 43 |
| ES40DC | 4000 | 220 | 2 |
| SD70 | 4000 | 80 | 1 |
| PR43C | 4000 | 12 | 10 |
| SD60I | 3800 | 46 | 6 |
| SD60M | 3800 | 44 | 13 |
| | | | |
| **Total Partially Equipped for PTC by EoY 2012** | | | **1,383** |

*Appendix B 2012 Wayside Equipping (REDACTED)*

| Line ID | Segment Name | # PTC Miles | Total # Wayside Locations | Design Work in Progress | Construction Started | Percent of Locations Cut In* | Base Station Installed |
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NORFOLK SOUTHERN

Annual Reporting of PTC Progress

| Line ID | Segment Name | # PTC Miles | Total # Wayside Locations | Design Work in Progress | Construction Started | Percent of Locations Cut In* | Base Station Installed |
|---|---|---|---|---|---|---|---|
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NORFOLK SOUTHERN

Annual Reporting of PTC Progress

*Appendix C 2012 NS Tenants*

| Tenant Railroad Name | Locomotives To Be Equipped | Schedule For Equipping | Response to Written Request as of 2012 |
|---|---|---|---|
| Alabama & Gulf Coast Railway, LLC | Unknown | Unknown | No response |
| Allegheny Valley Railroad | TBD | TBD | Executed Agreement |
| Buffalo & Pittsburgh RR (G&W) | Unknown | ...Have yet to make such a determination...which shall be no later than December 31, 2015... | Seek to implement PTC technical solutions..."as and if required by applicable Federal laws and regulations" |
| Camp Chase Industrial Railroad | TBD | TBD | Executed Agreement |
| Chattooga & Chickamauga Railway Co. (G&W) | Unknown | ...Have yet to make such a determination...which shall be no later than December 31, 2015... | Seek to implement PTC technical solutions..."as and if required by applicable Federal laws and regulations" |
| Chicago, Fort Wayne & Eastern Railroad (RA) | Unknown | Unable to provide until review of NS PTCIP | Will install "where required by the new regulation" |
| Columbus & Ohio River Railroad | Unknown | Unknown | No response |
| Commonwealth Railway Inc. (G&W) | Unknown | ...Have yet to make such a determination...which shall be no later than December 31, 2015... | Seek to implement PTC technical solutions..."as and if required by applicable Federal laws and regulations" |
| Dubois County Railroad | Unknown | Unknown | No response |
| GA Southern Railroad c/o Pioneer Rail | TBD | TBD | Executed Agreement |
| Georgia & Florida Railroad | Unknown | Unknown | No response |
| Georgia Southwestern Railroad Company, Inc. | Unknown | Unknown | No response |

NORFOLK SOUTHERN

Annual Reporting of PTC Progress

| Tenant Railroad Name | Locomotives To Be Equipped | Schedule For Equipping | Response to Written Request as of 2012 |
|---|---|---|---|
| Grand Elk Railroad | Unknown | Unknown. "Will be determined by individual traffic and train requirements at Grand Elk Railroad locations. | No MOU...."Will use the appropriate approved PTC technology on any of its locomotives that may require such equipment, and will equip all such locomotives by the dates outlined in 49 CFR § 236.1006." |
| Indiana & Ohio Railway (RA) | Unknown | Unable to provide until review of NS PTCIP | Will install "where required by the new regulation" |
| Indiana Harbor Belt Railroad Company | Unknown | Unknown | Only offers to run restricting on ML |
| Indiana Northeastern Railroad Co. | TBD | TBD | Executed Agreement |
| Jackson & Lansing Railroad Company ("JAIL") | TBD | TBD | Executed Agreement |
| Kansas City Terminal Railway Company | 11 units TBD | 12/31/2013 | Executed Agreement |
| L&N RR c/o Regional Rail LLC | Unknown | Unknown | No response |
| Lycoming Valley Railroad | 5 units TBD | Prior to 12/31/2015 | Executed Agreement |
| METRA | TBD | TBD | Executed Agreement |
| New York Susquehanna & Western RY | 9 (EMD SD40-2) | TBD | Executed Agreement |
| North Carolina Department of Transportation | TBD | TBD | Executed Agreement |
| North Shore Railroad Company | 5 units TBD | Prior to 12/31/2015 | Executed Agreement |
| Ohio Central System (G&W) | Unknown | ...Have yet to make such a determination...which shall be no later than December 31, 2015... | Seek to implement PTC technical solutions..."as and if required by applicable Federal laws and regulations" |
| Ozark Valley Railroad Inc. | Unknown | Unknown | Don't have to install PTC for their operation |
| Paducah and Louisville RR | Unknown | Unknown | Desires to renegotiate interchange agreement |

NORFOLK SOUTHERN

# Annual Reporting of PTC Progress

| Tenant Railroad Name | Locomotives To Be Equipped | Schedule For Equipping | Response to Written Request as of 2012 |
|---|---|---|---|
| Reading, Blue Mountain & Northern RR | Unknown | Unknown | "Do not need to install PTC on our locomotives based on the current 49 CFR Part 236 regulations." |
| RJ Corman RR Company | One for Ft Wayne Line | Unknown | Desires to renegotiate interchange agreement for one location; RJCL plans to "install PTC system equipment on one locomotive" for second location |
| Rochester & Southern Railroad | Unknown | Unknown | No response |
| Terminal Railroad Association of St Louis | 17 (SD 40/45 & GP-38) | SD40/45: 20% in 2013, 40% in 2014, 40% in 2015<br>GP38: 20% in 2013, 40% in 2014, 40% in 2015 | Executed Agreement |
| The Kansas City Southern Railway Company | 11 | TBD | Executed Agreement |
| Wabash Central, LLC | Unknown | Unknown | No MOU |
| Western New York & Pennsylvania Railroad, LLC | Unknown | Unknown | Don't have to install PTC for their operation |
| Wheeling and Lake Erie RR | TBD | TBD | Executed Agreement |
| Youngstown and Southeastern Railroad | Unknown | Unknown | No response |