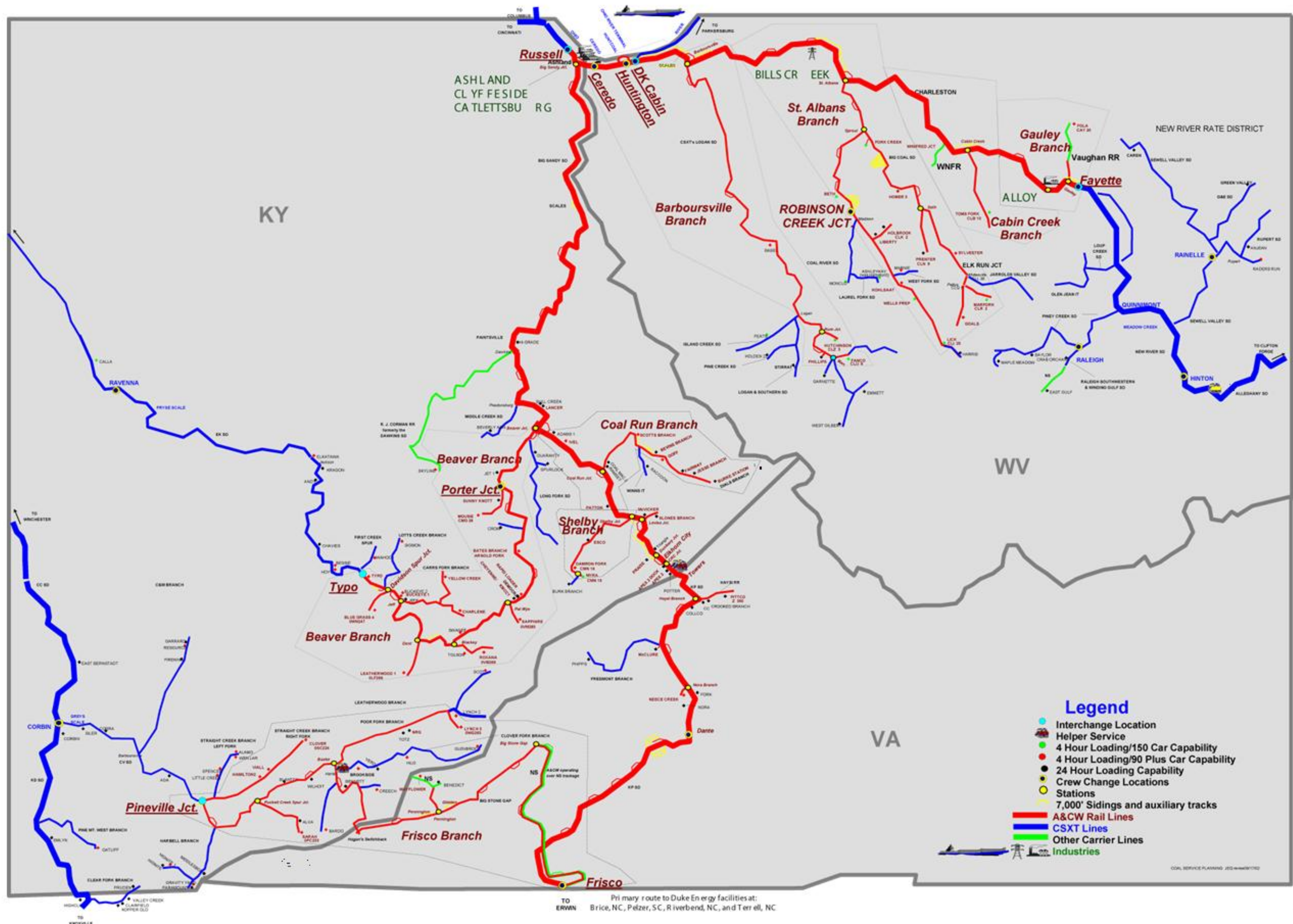


Appalachia & Carolina Western Railroad – Northern Portion



Duke's Modified String Diagram Model (SDM):

- Fails to consider 292 miles (25%) of ACW system
- Produces 72 head-on train collisions
- Results in 141 siding conflicts
- Ignores track speed limits 1,462 times
- Empty trains never decelerate
- Braking and acceleration values often not applied
- Does not account accurately for grade and curvature
- Does not consider mine loading time, random failures, track maintenance or FRA track inspections



After the basic parameters and configuration of the ACW were established, Duke's experts then input them into the string program which was used to verify the ACW's capacity and determine the extent to which specific adjustments were needed – and to produce various operating statistics used to develop SARR capital and operating costs used in the DCF analysis. The string analysis did indicate that some adjustments were needed in the number and placement of passing sidings, etc., and those adjustments were incorporated.

¹ The adjustments to the ACW's configuration made on Rebuttal are discussed in Part III-B, *supra*.

Duke Operating Statistics Dependent on String Diagram Model



Duke's Rebuttal at III-C-8 Note 7

where it can be deployed efficiently. Helper locomotives are used at one location, and the helpers are also AC4400's.⁶ Switch locomotives are needed at the three ACW yards (Coolidge, Ceredo and Bostic). These

⁷ For Duke's calculations, items such as the number of road locomotives, railcars and train crew members required by the ACW are **driven by the string program**. Because they are **dependent on the string analysis**, in its Rebuttal presentation Duke discusses them after the cycle time/string analysis discussion in the next section of this narrative.

configuration) as developed by Duke on the basis of alleged evidence in Duke's analysis, including in particular the operating assumptions developed by Duke's experts that were input into the string model. These criticisms – which are at the heart of CSXT's evidence on the SARR system, operating plan and operating expenses, and which also drive the mileage-related and yard-related portions of its evidence on road property investment – are discussed in Part III-C-2 beginning on page III-C-24, *infra*, which,

⁶ Helpers are manned; DP units on the rear of a train are radio-controlled from the lead locomotive and are not manned.

⁷ For Duke's calculations, items such as the number of road locomotives, railcars and train crew members required by the ACW are driven by the string program. Because they are dependent on the string analysis, in its Rebuttal presentation Duke discusses them after the cycle time/string analysis discussion in the next section of this narrative.

III-C-8

Duke Misrepresents Use of RTC Model

Duke's Brief at 28

operating plan (Id. at III-D). Duke's direct operating evidence is thorough, cohesive, and reasonable. Because the ACW's peak operational year is 2004, it unquestionably has a significant over-capacity for most of its 20-year life.

After Duke's witnesses configured the ACW and developed its operating plan, pertinent data therefrom was run through a computer model (SDM model) "to test the

As just noted, all of CSXT's operating cost positions flow from outputs of its RTC model.

operating costs which are appreciably higher than Duke's (*Id.* at III-D-69).

Putting to one side, for the moment, CSXT's mistaken argument that Duke's operating evidence must fall because it is based upon a defective computer model, CSXT's model-based positions on ACW operating expenses raise the issue as to whether the Board can accord any weight, whatsoever, to CSXT's operating cost evidence. As just noted, all of CSXT's operating cost positions flow from outputs of its RTC model. CSXT's RTC model

³³ CSXT Reply at 1-37; see also id. at 1-38 to 41, III-B-2 to 4, and III-B-18 to 36.

Duke's Rebuttal at III-C-25

²⁷ The other statistics were developed outside the RTC Model; they were based on mathematical spreadsheet calculations.

29 It bears repeating that CSXT used the RTC model only to determine train cycle times. It did not use the model to develop any other parameters such as operating statistics for the ACW. Those statistics were developed by CSXT's Witness Plum, as a mathematical spreadsheet exercise.

mathematical spreadsheet exercise.
Rebuttal Exhibit III-B-7.

²⁰ Duke Rebuttal Exhibit III-C-5 contains the revised ACW operating statistics.

CSX Reply Outlines Errors in String Model Diagram



Reply at III-B-2 through III-B-4

interchange volumes imposed upon the residual CSXT by the ACW's operating plan would create significant congestion on CSXT's lines south of Spartanburg as well.

The infeasibility of the ACW's proposed physical structure stems from two fundamental deficiencies in Duke's Opening Evidence. First, Duke's line capacity analysis is heavily reliant upon a "string diagram model" (see Duke Open. Narr. at III-C-16 and Exh. III-C-3) that is irreparably flawed. As detailed in Section III.B.2.a.ii. below, faulty programming, numerous coding errors and outright failure to account for critical factors affecting rail line capacity cause Duke's string diagram model to produce bizarre operational results. For example:

- Duke does not even purport to model the capacity of 292 miles – nearly a quarter – of the ACW's lines. The Duke model takes no account of grade, curvature or potential train meets on these segments. In generating the ACW's operating statistics, the model simply assigns "generic" miles and assumed speeds to account for movements over the excluded lines.
- Even for those main and branch line segments that it purports to analyze, the model ignores track curvature entirely.
- The model takes no account of the presence of Norfolk Southern (or CSXT) train movements on the 42.9 mile segment of NS track over which the ACW would operate in common with NS and CSXT. Thus, the model fails to demonstrate the capacity of this critical segment, which lies at the heart of the proposed ACW system.
- The model permits as many as five trains to occupy the same single-track siding simultaneously.
- The model's faulty braking and acceleration codes cause it not to apply braking or acceleration at all to some train movements, and to apply braking and/or acceleration based upon incorrect milepost and grade data in many other instances.
- According to Duke's model, a loaded coal train can decelerate from 18 MPH to 10 MPH in less than two-tenths of a second!
- The model contains a programming error that causes the initial speed for every en route to be the maximum authorized speed for that segment,

III-B-2

which the train was traveling at the end of the

ins arriving at intermediate locations after the supposedly arrived at its destination.

s string diagram model are compounded by assumptions that are unsupported by any real

with the operating data and information

by CSXT in discovery. For example:

um time required to place, load and be 6 hours at every "flood load" mine, and loading operations are performed by mine at III-C-15.)¹ As CSXT documents in this string Narrative, the time required to origin mines is, in virtually every an the unrealistic times upon which d.² Moreover, CSXT cannot find any ram model incorporated even the ed" by Duke's operating witnesses.

uld need only 1.25 hours to complete all empty trains for a return movement to the icking locomotives, performing required out bad-order cars, switching in e train for the next loading, changing uired brake tests. (Duke Open. Narr. at is flatly contradicted by the materials

tive to "flood load" mines correspond n the loading operations (which are CSXT demonstrates, that designation II-C-1(video) at 10:10-10:30 See also

III-C-2; CSXT Open Narr. at IV-

d to Duke in discovery, as well as this Reply Narrative (at III-C-elow)

imes that crew changes on the SARR's lines could be hed in no more than 15 minutes, and that the residual CSXT wise complete its own crew changes within the same 15 minute h of the eight proposed ACW/CSXT interchange points (at one exception, CSXT does not conduct any interchange lay). As CSXT demonstrates below (at pp. III-C-19-23), there s reasons why this assumption is not realistic.

's string diagram model nor its operating plan made any ion for FRA-mandated line inspections, line maintenance idom failures. Rather, Duke simply assumed that, because m model (erroneously) indicated that the ACW could l train movements on the "peak traffic day" selected for a fortiori, would have sufficient capacity to handle n movements occurring on any other day, regardless of andom occurrences or maintenance outages. This ensical, particularly for a single-track railroad like the the ability to reroute traffic in response to such

SARR's] train cycle times are the most important figuration, capacity and equipment needs." (Duke tic — and unsupported — assumptions employed e, combined with the inherent defects in the string quacy of the ACW's physical plant, render resentation — including the ACW's track and quirements, crew numbers and costs, and

of the ACW's track and facility alyses, using established industry methods. s described in Section III.B.2.a.iii. below,



TCR 01:16:50.07



TCP 01:09:56.22



TCR 01:39:32:01



TCR 01:01:47:03



ICL 01:39:21:57

Cranes/Excavators

CSX



Opening



CSX

Reply



Rebuttal



Duke's Rebuttal Excavator



Three Tractor Trailers Are Required to Transport Duke's Excavator



Load #1 - under 90,000 lbs (40 823 kg)



Load #2 - under 36,000 lbs (16 329 kg)



Load #3 - under 33,000 lbs (14 968 kg)

Comparison of Loaded and Unloaded Weights



Right-Size



Over-Sized

Pounds
(Thousands)

200

150

100

50

113,000 lbs

CSX

unloaded



219,000 lbs

Duke Energy

unloaded

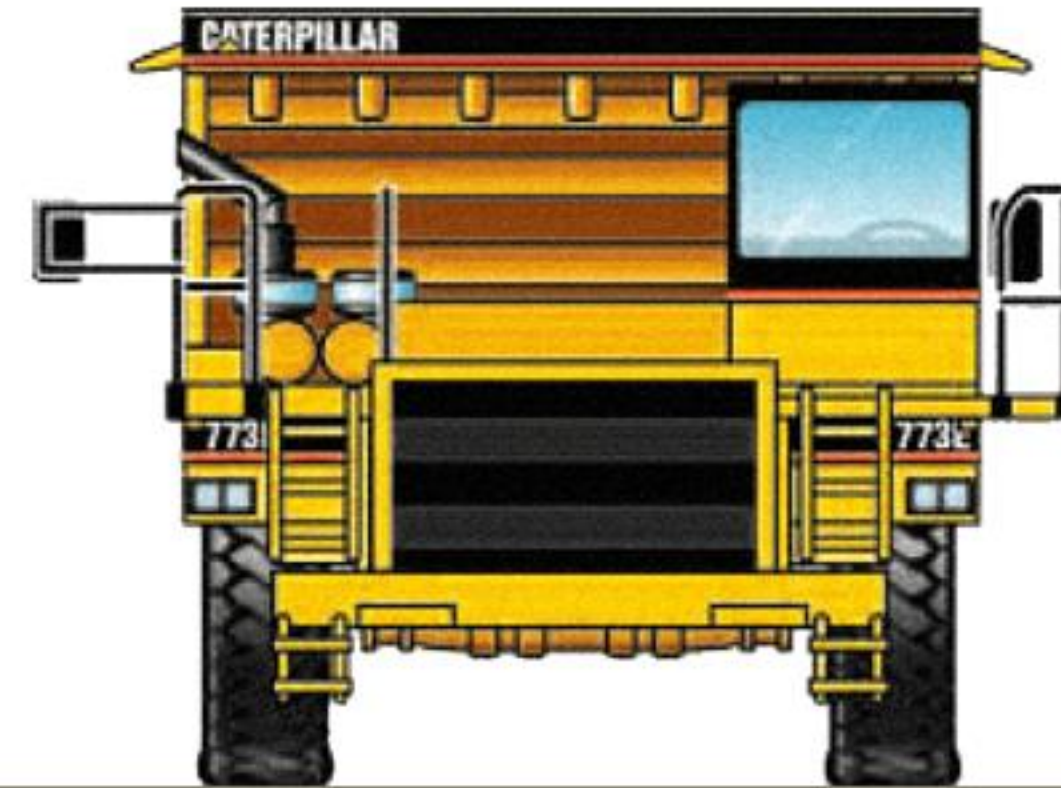


Hauling Equipment



24'

roadbed



24'

roadbed

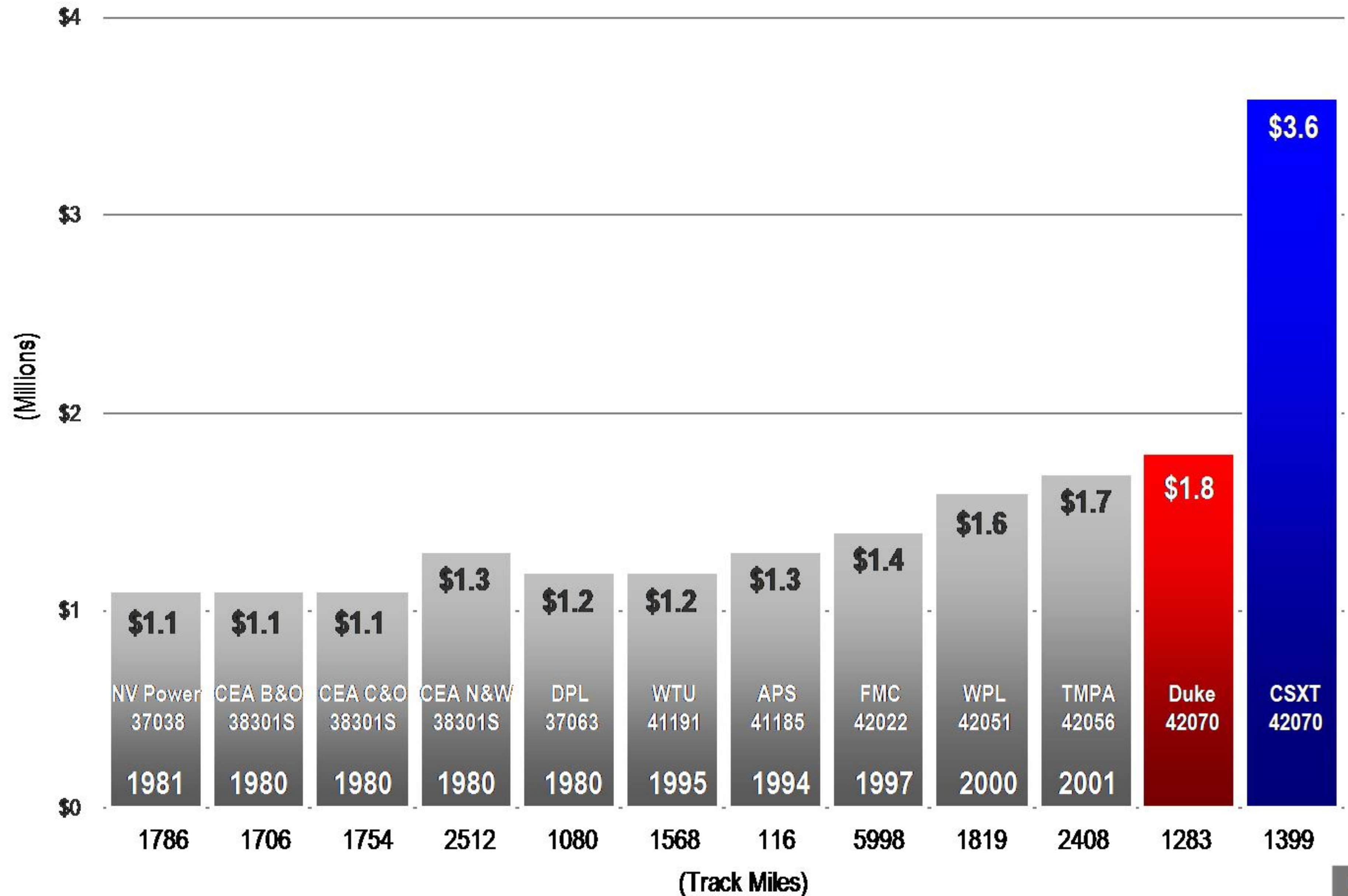
Hauling Equipment

 Over-Sized

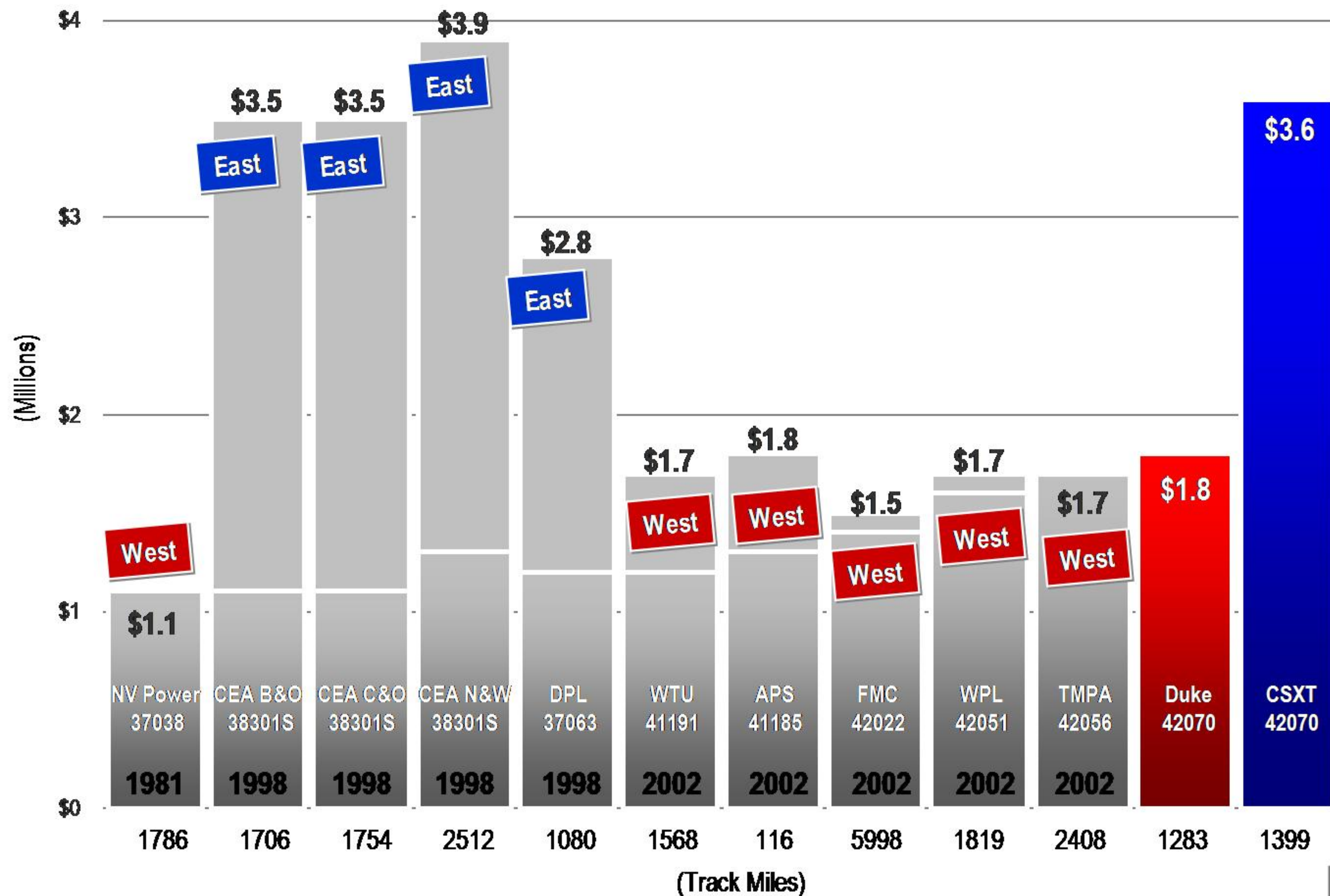


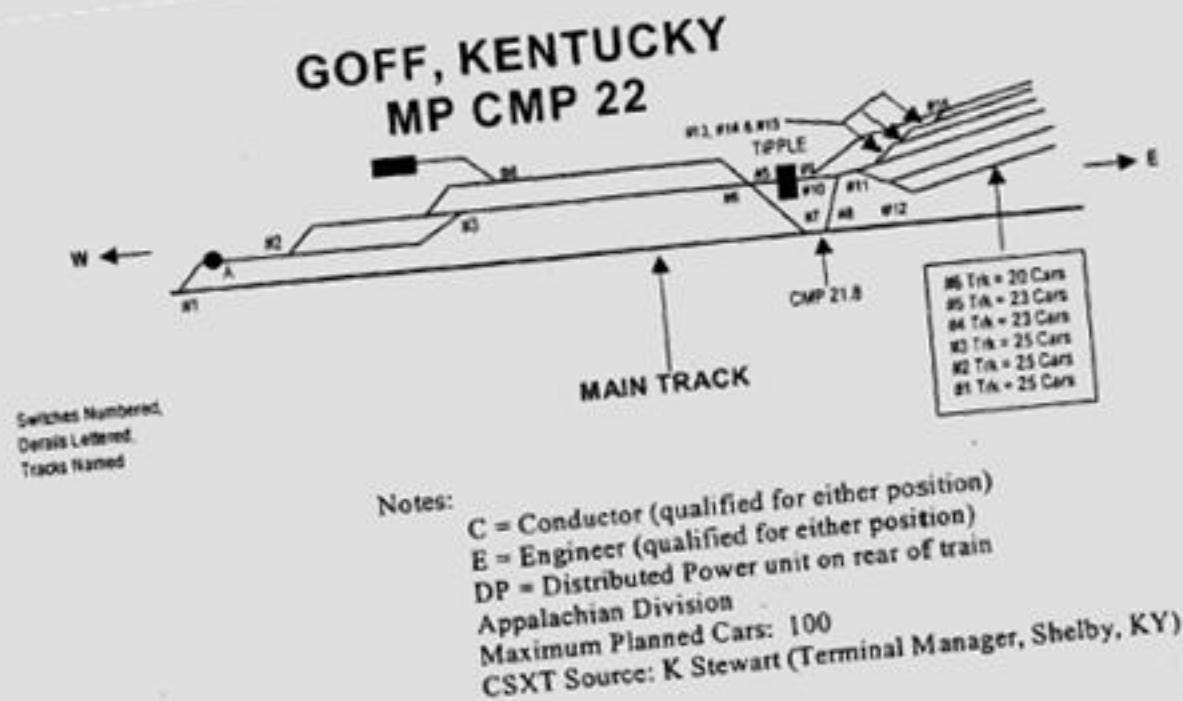
Turning Distance
78'9"

Duke's Misleading Comparison of Cost Per Track Mile



Duke's Misleading Comparison of Cost Per Track Mile





to clear switch 8 and stops.
8, 10, 11 and 12 into #1 track.
into #1 track and couples to 25 empties.
and releases 2 hand brakes and lines #9 & #8 for straight track
spot head car at tippie.
for job briefing with mine personnel.
and 25 cars. Stops when complete.
Rides to clearance point in #1 track, stops movement,
completes shove into clear on #1 track.
setting 5 hand brakes. Cuts off engine and pulls west to
for #2 track and couples locomotive on #2 track.
releases 2 hand brakes.
spots west car for loading.
to tippie for inh...

kes. C walks brake test.
it and stops east of derail.
emission from dispatcher to occupy main line.
derail and lines switch 1 for movement to main line.
out onto main line and stops west of switch 1.
derail and lines switch 1 for main line movement.

16 Hours, 40 Minutes

Step	Mins	Crew position	Description
1	5	E	Stops at switch 1 and dismounts
2	45	C	Pulls east to switch 8 at tippie and takes lead locomotive out
3	15	E	Mounts rear DP locomotive and
4	15	C	Cut off lead locomotives and hand brake and shuts down.
5	15	E/C	C lines switch 8, 10 and 11, track 1 and stops.
6	20	C	Walks back west to clearance
7	5	E	Pulls west to clear switch 12
8	10	E/C	Mounts east car to protect.
9	20	C	Walks back west 25 cars to makes cut.
10	5	E	Pulls west to clear 11 switch
11	10	C	Lines switch 11 and 13 for stop movement when near
12	10	E	Shoves in track #3 until C
13	20	C	Stops movement, walks back
14	10	E	Pulls west to clear switch
15	10	C	Lines switches 13 and 14
16	10	E	Shoves east in track #4
17	20	C	Stops movement, dismounts
18	5	C	Cuts locomotive off.
19	5	E	Pulls west to clear switch
20	10	C	Lines switch 14 and 15
21	10	E	Shoves in track with light
22	20	E/C	E walks over to mainline releases hand brake.



EXH. III-C-2

Duke Incorrectly States CSXT Operating Costs



Flawed Method from Duke Rebuttal at 31

“CSXT’s own operating costs are **13 mills per ton mile...**”



Straightforward Calculation From R-1

Actual CSXT Operating Costs

“total railroad
operating expenses”

Sch. 410, I. 620, Col. H

“total ton-miles”

Sch. 755, I. 114, Col. B

÷

1000

Convert to mills

Actual 2000

27.1 mills

\$5,757,124,000

212,164,745,000

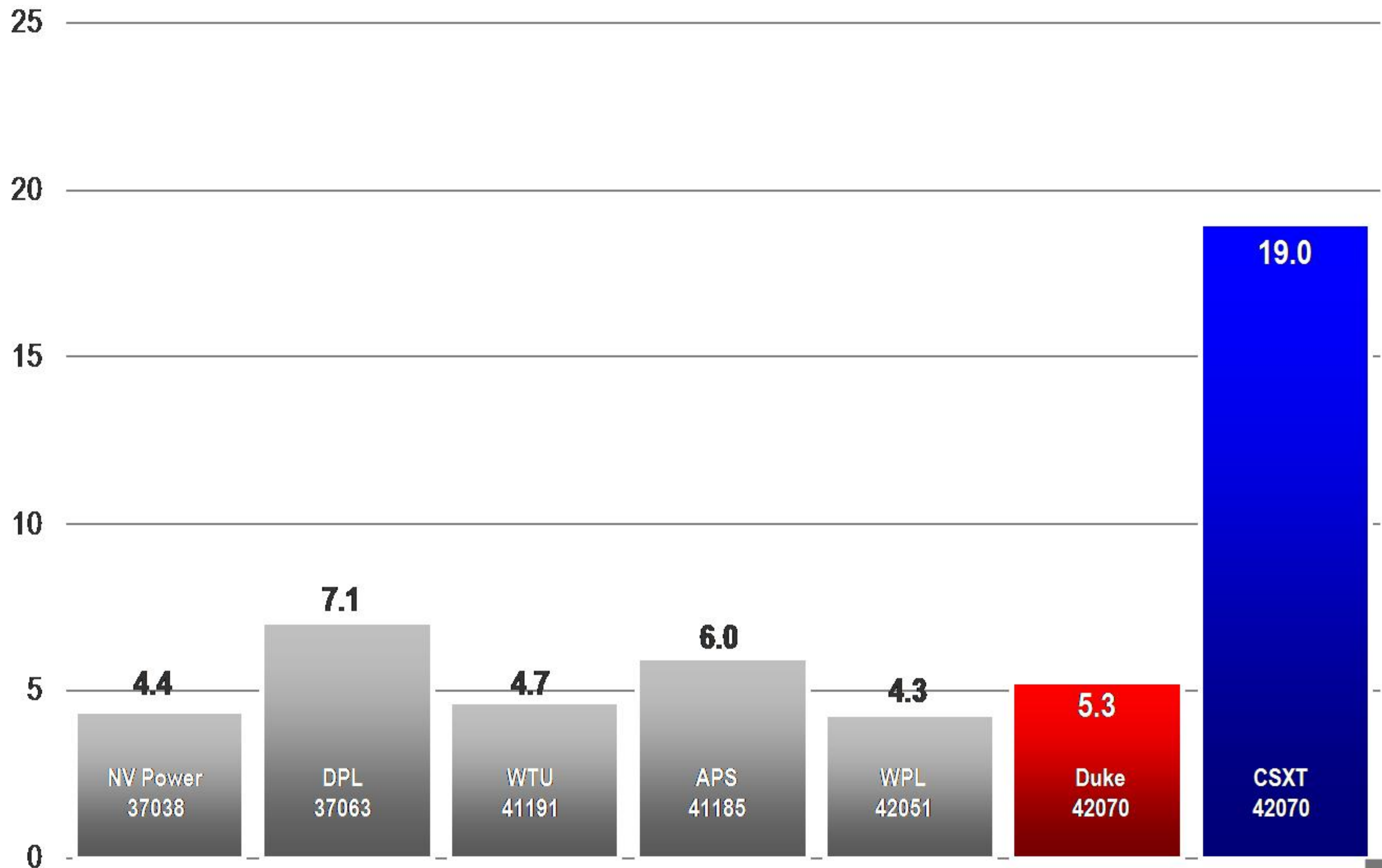
Actual 2001

27.2 mills

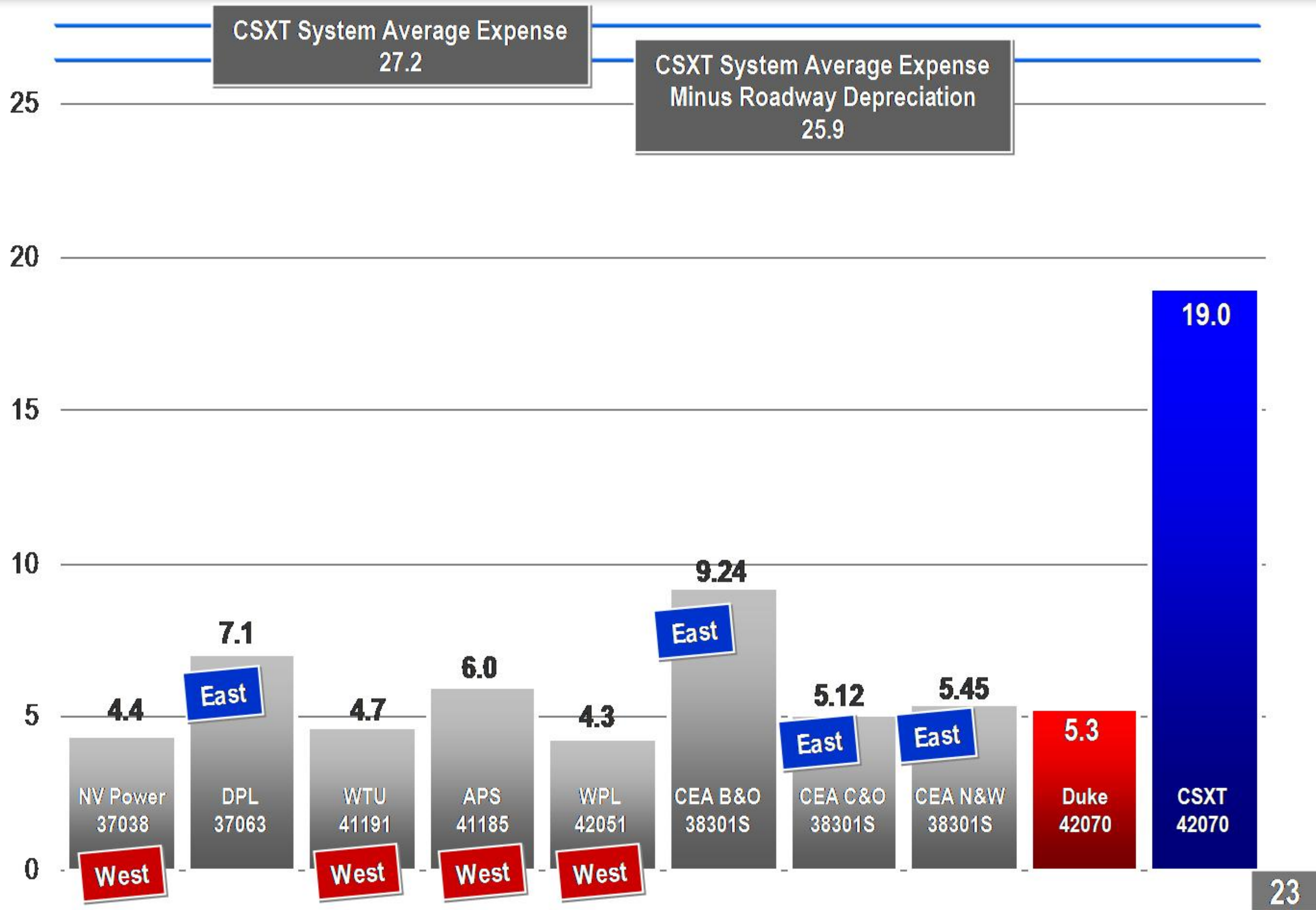
\$5,623,637,000

206,573,262,000

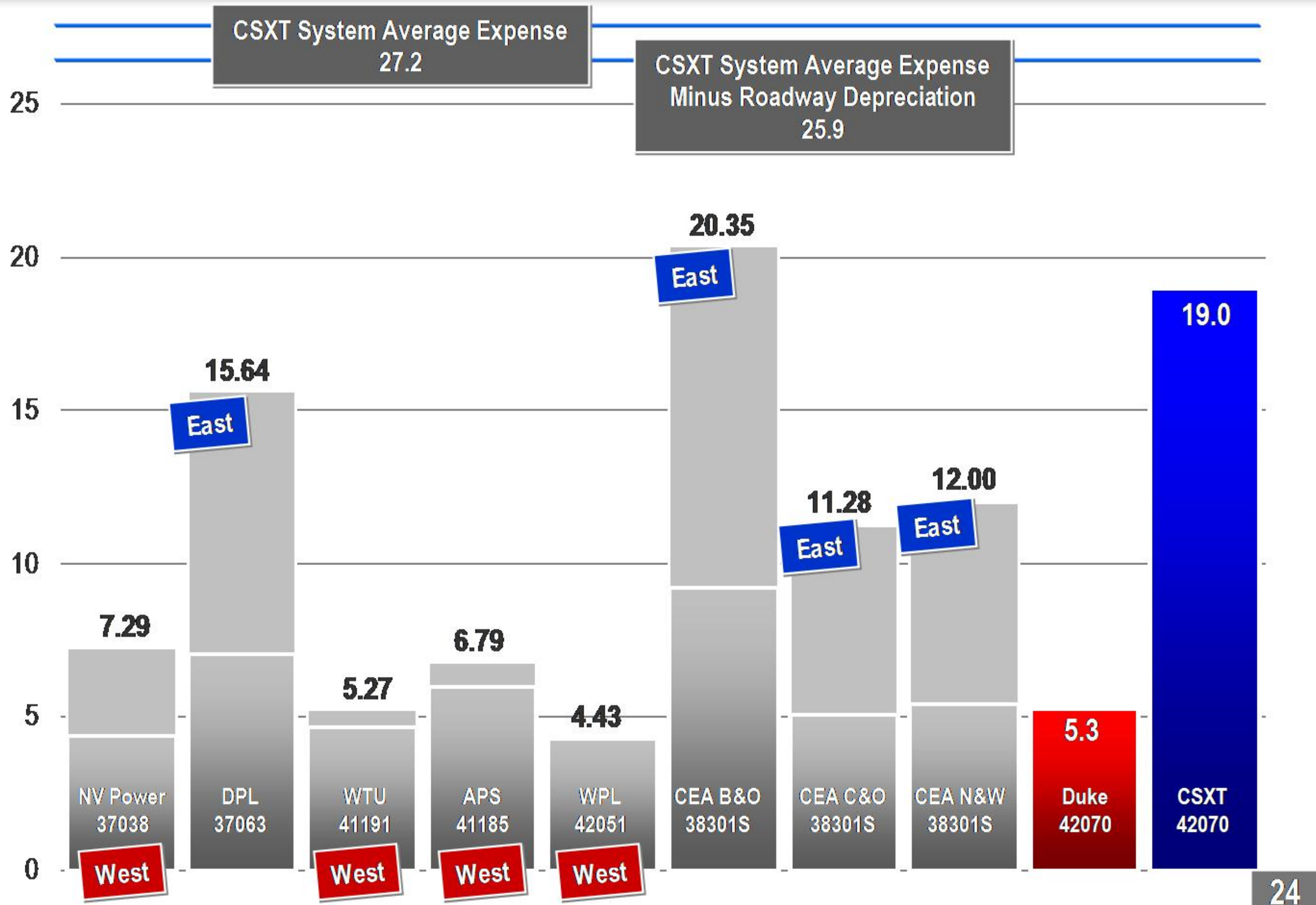
Duke's Flawed Comparison of Ton-Mile Operating Cost



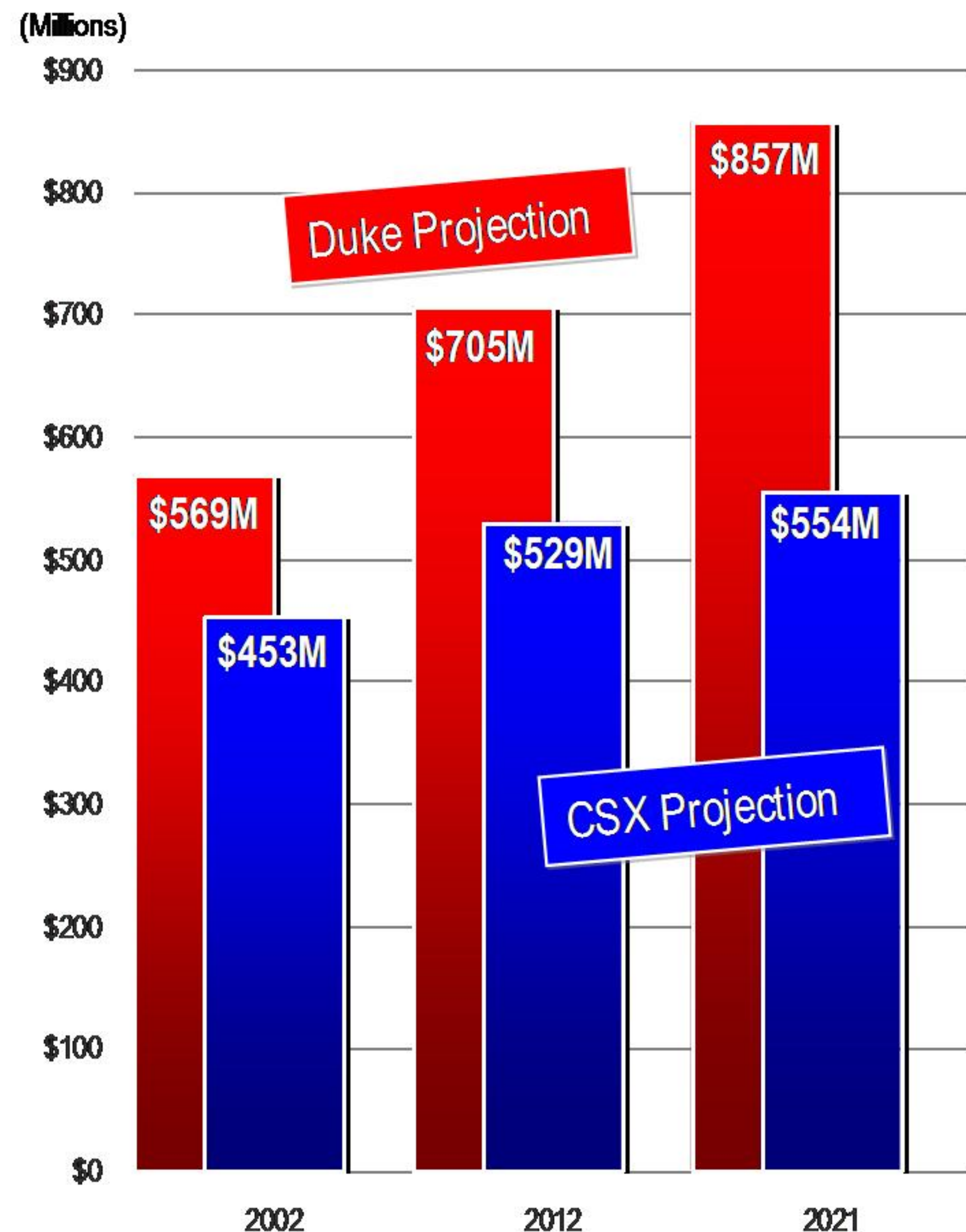
Duke's Flawed Comparison of Ton-Mile Operating Cost



Duke's Flawed Comparison of Ton-Mile Operating Cost

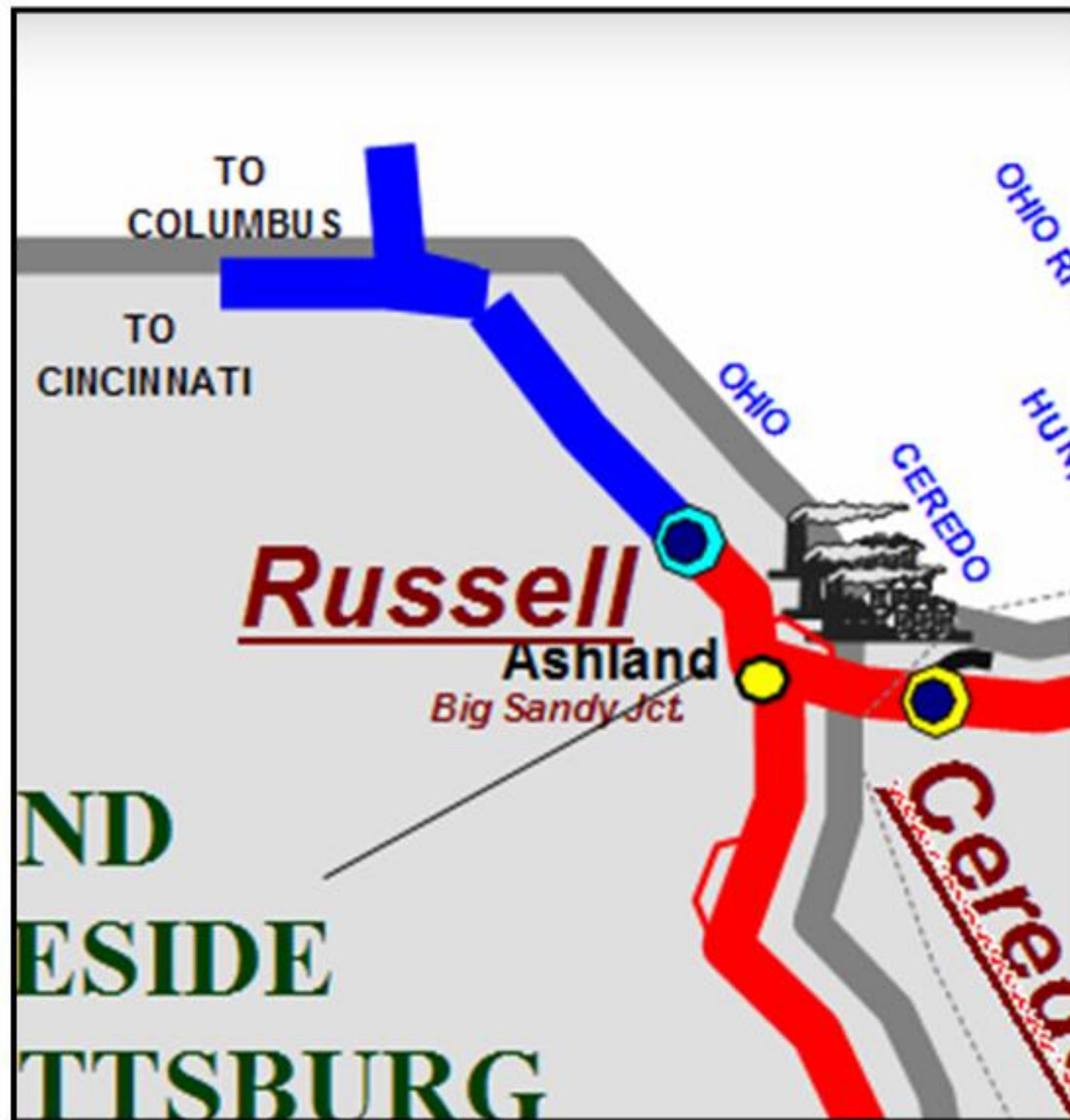


Duke Overstates New Revenues



Duke's Errors in Estimating Revenue

- Overstates 2002 traffic to its own plants by 40%
- Claims 8% decline in export traffic which actually fell 20%
- Claims ACW rate cuts support future volumes
- Ignores independent traffic forecasts for 2005-2021
- Diverts over 2,000,000 tons annually of traffic to longer, less efficient routes
- Relies on distorted application of 'mileage prorate' methodology

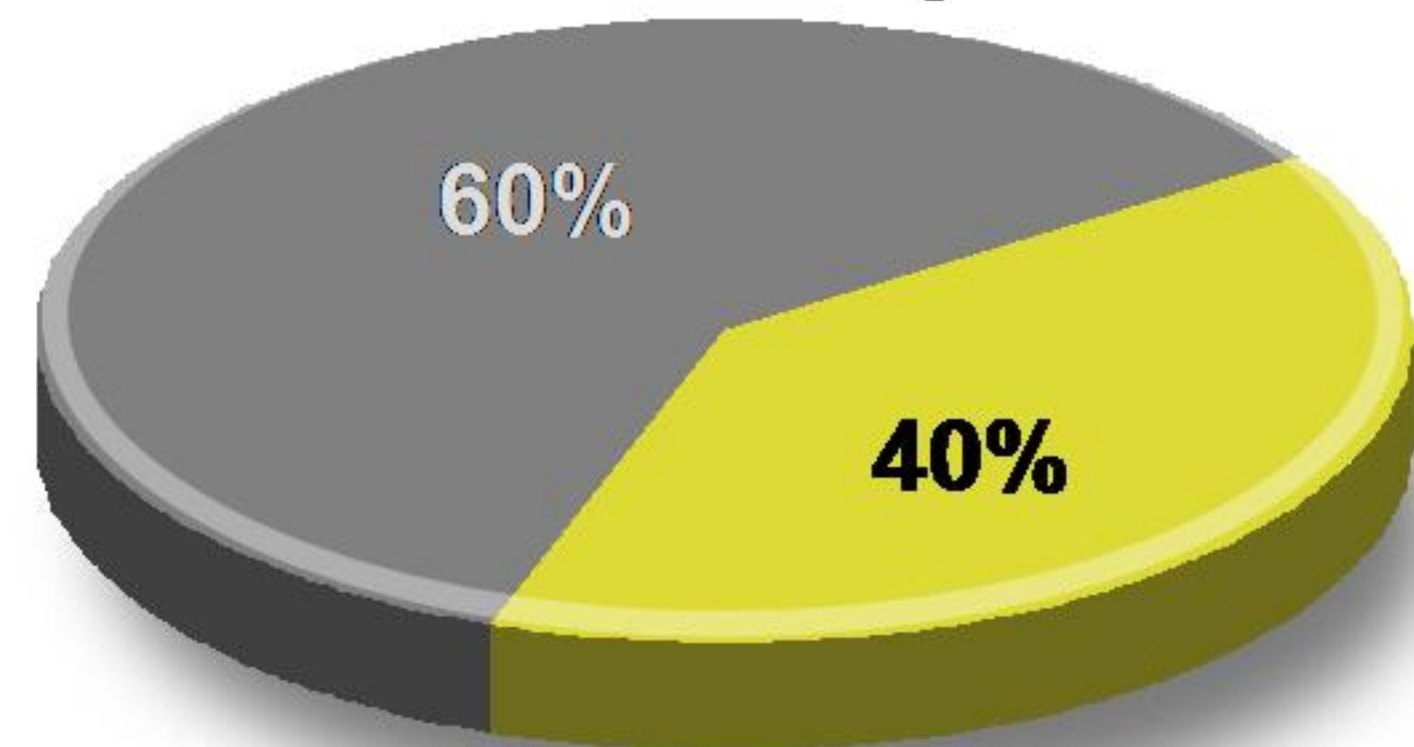


Haul Miles



4 Miles

Revenue Split

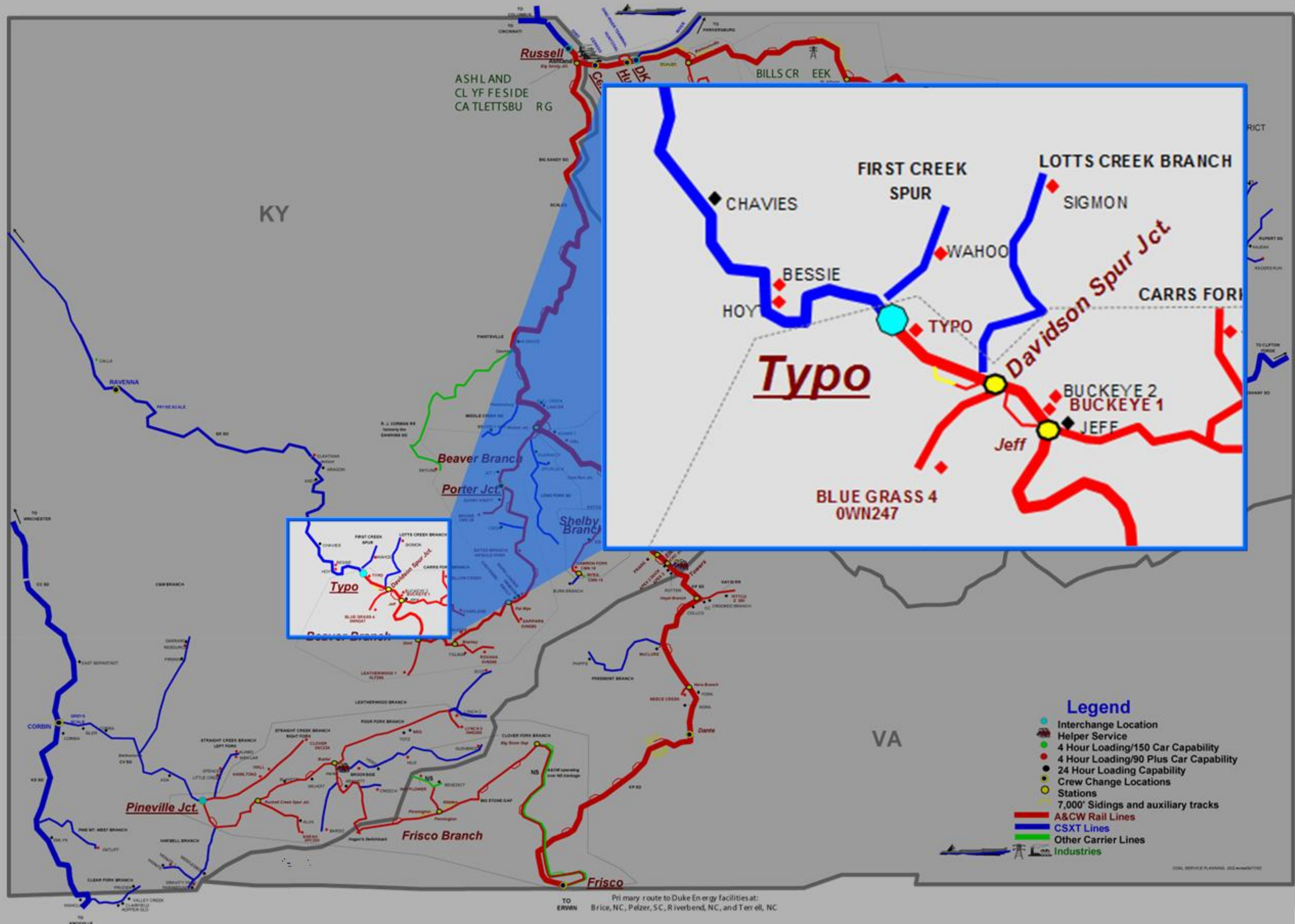


CSXT



ACW

Appalachia & Carolina Western Railroad – Northern Portion



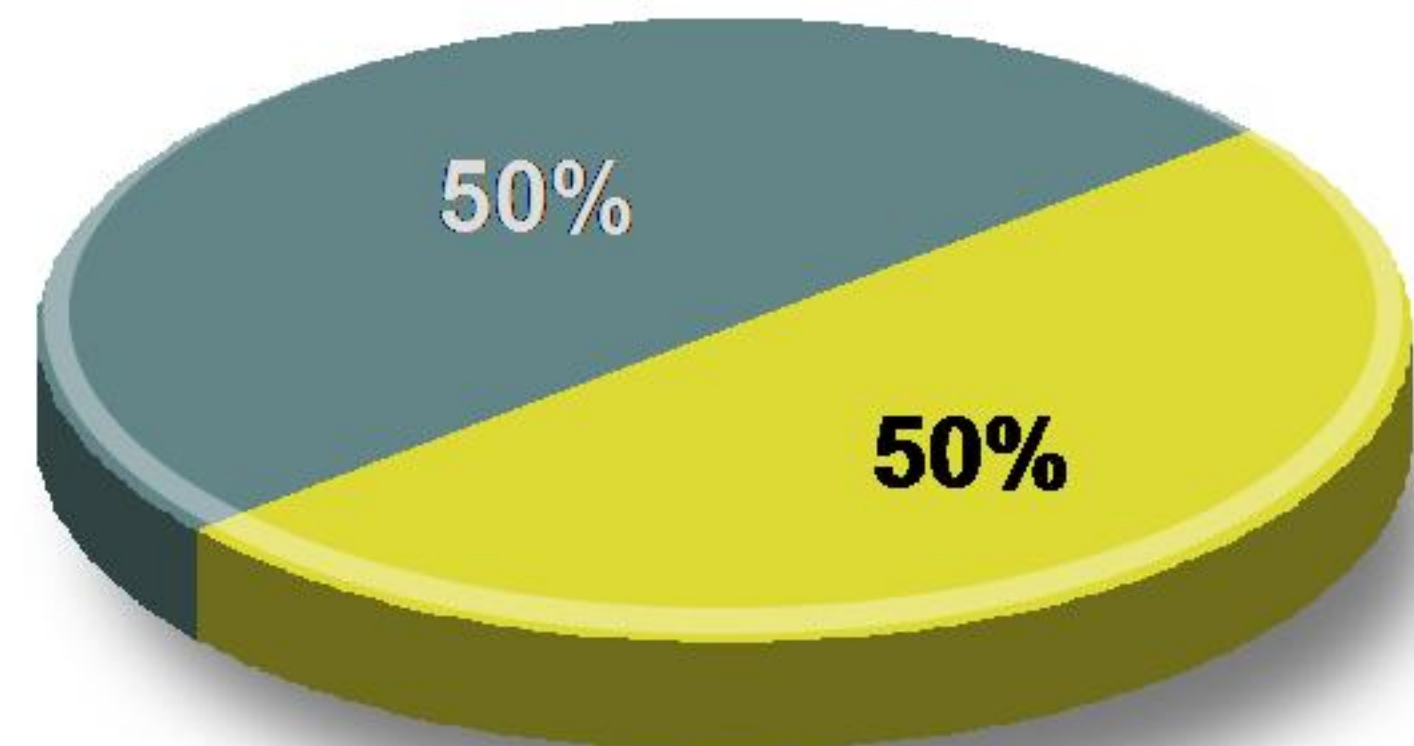


Haul Miles



7 Miles

Revenue Split

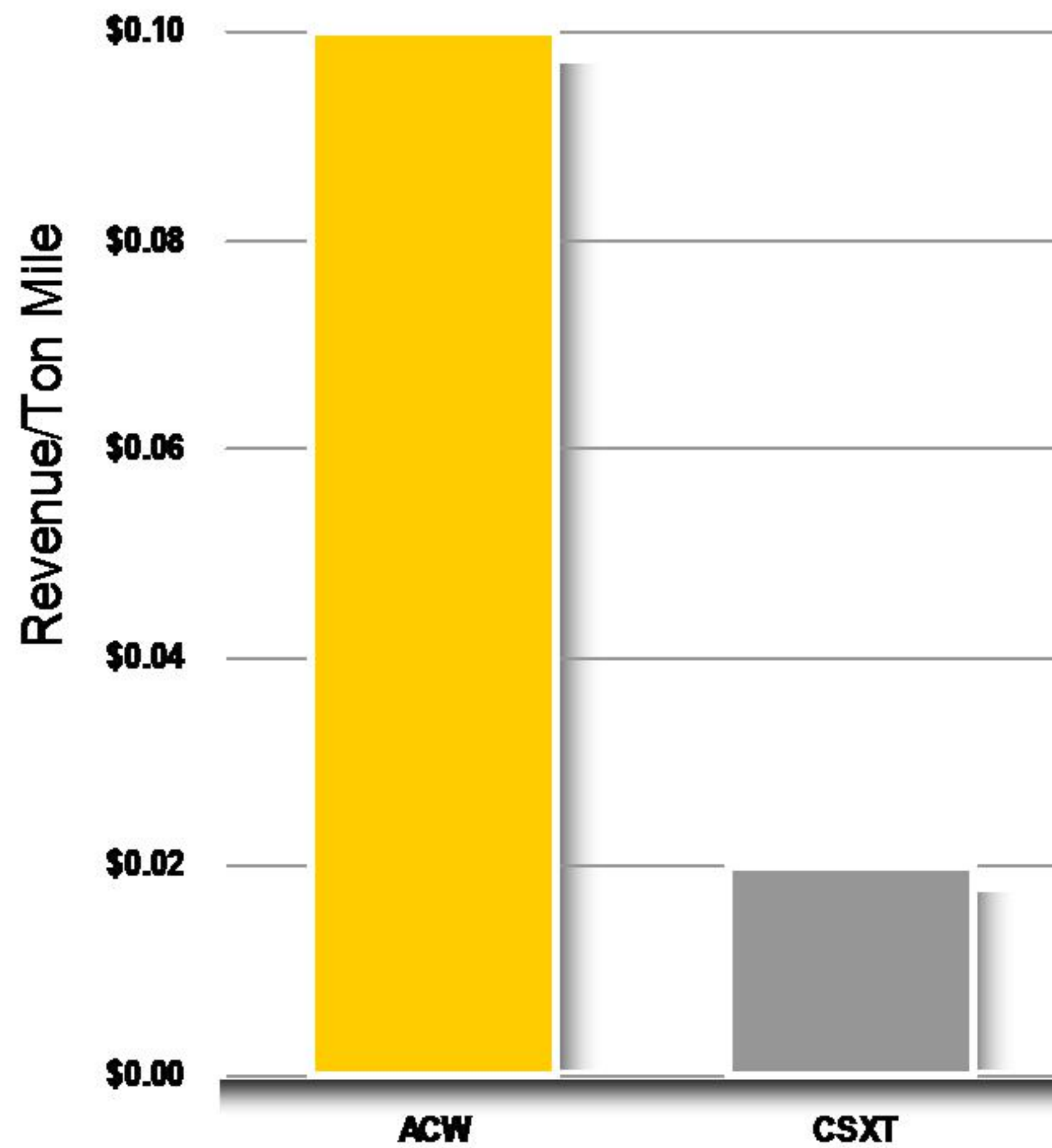


CSXT

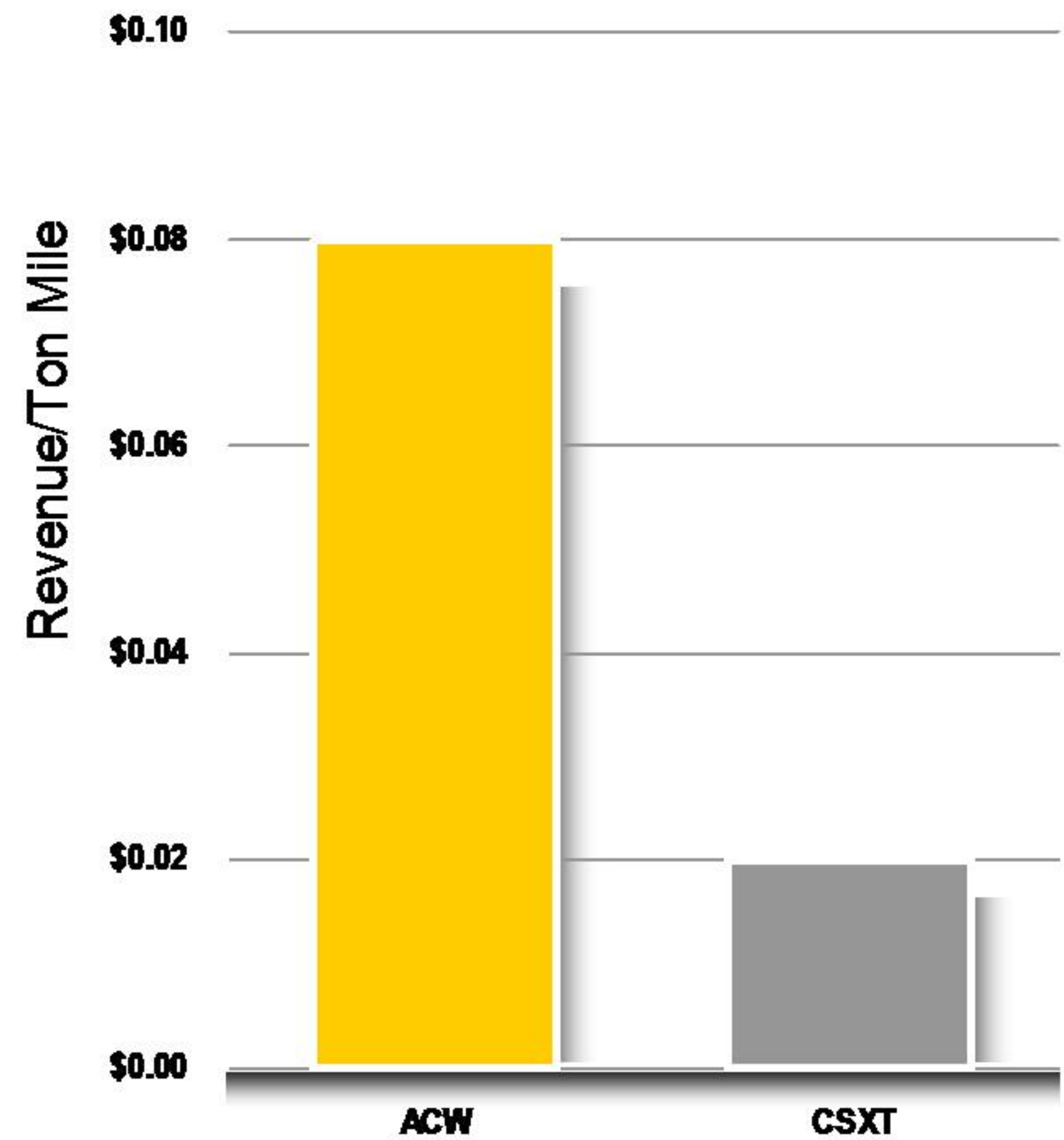


ACW

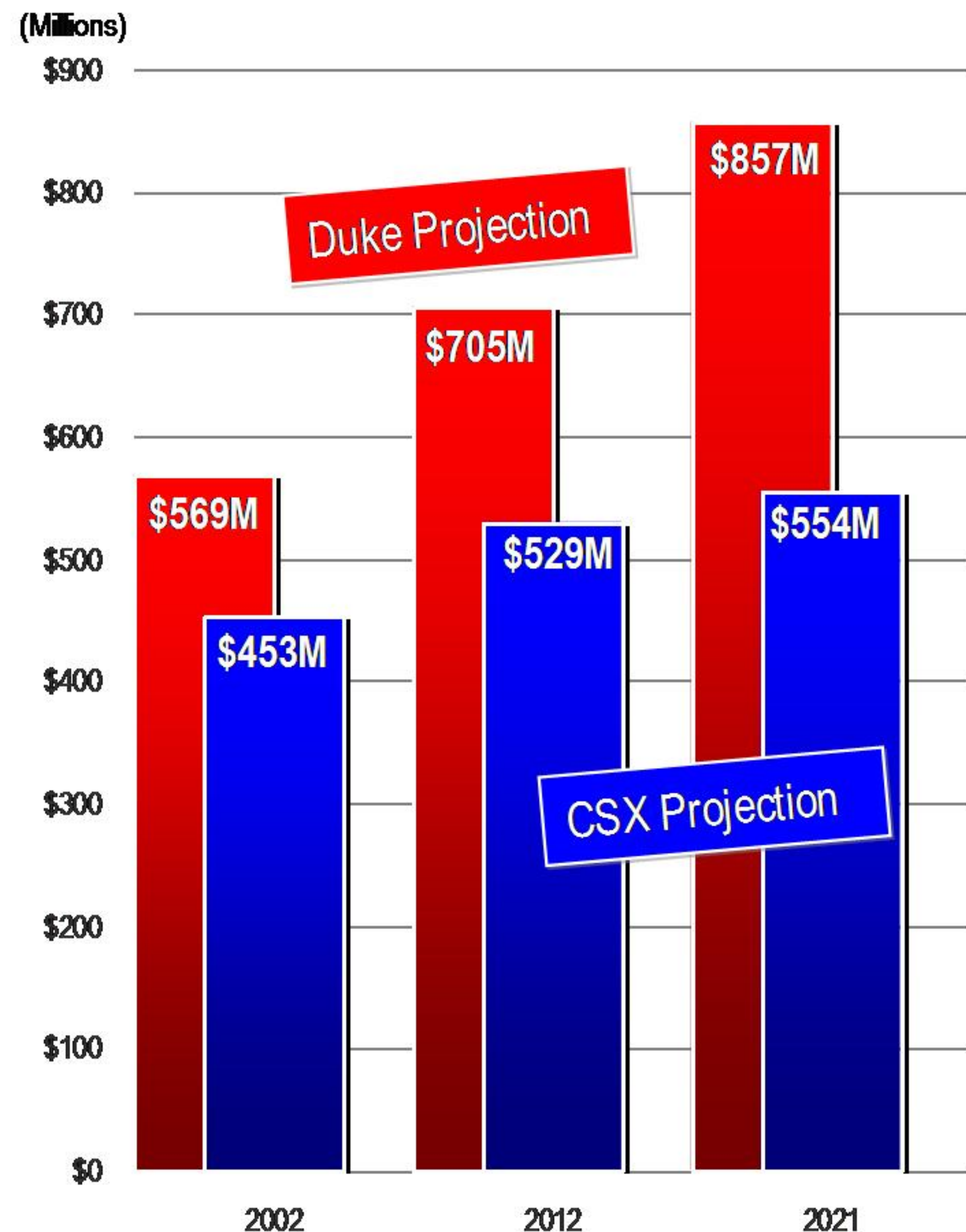
Typo



Pineville



Duke Overstates New Revenues



Duke's Errors in Estimating Revenue

- Overstates 2002 traffic to its own plants by 40%
- Claims 8% decline in export traffic which actually fell 20%
- Claims ACW rate cuts support future volumes
- Ignores independent traffic forecasts for 2005-2021
- Diverts over 2,000,000 tons annually of traffic to longer, less efficient routes
- Relies on distorted application of 'mileage prorate' methodology
- Erroneously escalates rates from 2011-2021

Duke Incorrectly Calculates Forecasted Revenue



Claimed Method to Calculate 2011 – 2020 Rate Changes (from Duke Reb. III-A-70)

$$\frac{\text{Average Change In Rates for 2002 - 2010}}{\text{RCAF-U for 2002 - 2010}} \times \text{Projected RCAF-U for 2011 - 2020} = \text{Rate Forecast for 2011 - 2020}$$



Claimed Method to Calculate 2011 – 2020 Rate Changes (from Duke Reb. III-A-70)

$$\frac{\begin{array}{c} 1\% \\ \text{for 2002 - 2010} \end{array}}{\begin{array}{c} 2\% \\ \text{for 2002 - 2010} \end{array}} \times \begin{array}{c} 50\% \\ \text{Projected RCAF-U} \\ \text{for 2011 - 2020} \end{array} = \begin{array}{c} 1.50\% \\ \text{Rate Forecast} \\ \text{for 2011 - 2020} \end{array}$$

Duke Incorrectly Calculates Forecasted Revenue



Actual Method to Calculate 2011 – 2020 Rate Changes

$$\begin{array}{c}
 \boxed{1 +} \text{ Average Change In Rates} \\
 \text{for 2002 - 2010} \\
 \hline
 \boxed{1 +} \text{ RCAF-U} \\
 \text{for 2002 - 2010}
 \end{array}
 \times
 \begin{array}{c}
 \text{Projected RCAF-U} \\
 \text{for 2011 - 2020}
 \end{array}
 =
 \begin{array}{c}
 \text{Rate Forecast} \\
 \text{for 2011 - 2020}
 \end{array}$$



Incorrect Method Used to Calculate 2011 – 2020 Rate Changes

$$\begin{array}{c}
 100\% + 1\% \\
 \text{Average Change In Rates} \\
 \text{for 2002 - 2010} \\
 \hline
 100\% + 2\% \\
 \text{RCAF-U} \\
 \text{for 2002 - 2010}
 \end{array}
 \times
 \begin{array}{c}
 3\% \\
 \text{Projected RCAF-U} \\
 \text{for 2011 - 2020}
 \end{array}
 =
 \begin{array}{c}
 \boxed{2.97\%} \\
 \text{Rate Forecast} \\
 \text{for 2011 - 2020}
 \end{array}$$

99%