

## Regulatory Analysis

### Cost Modeling -- Rail Coal Delivery Costs by Utility Plant 2006

*The objective of this assignment was to derive the cost of moving a ton of coal from mine to power plant and return the empty hoppers. A central premise of this type work is that sufficient public information is filed annually by Class 1 US railroads with the Surface Transportation Board (STB) to allow a credible analysis of a given railroad's costs for moving a ton of goods along its lines within the flow of other traffic. The annual R-1 reports filed with the STB contain financial reporting along with numerous schedules designed to augment the financial data with details of assets held, assets conditions, operations and efficiencies. There are, however, some deficiencies of this large data base for the purposes of analysis. Where possible, Vanness enhances and augments the data as described below.*

**Freshness of STB Data:** There is a long lag in the availability of the STB data of approximately eight months. Thus costs and other items subject to inflationary pressures have been updated using cost indexing information made available by the STB and/or the AAR in the quarterly Railway Cost Adjustment Factor filings and the quarterly filings of Revenue Expense and Income reports. Using actual data from the RE&I reports, the RCAF reports and the AAR's report of spot materials price changes, Vanness was able to actualize detailed cost data to Operating Expense estimates for the year end 2006, which was the base point in time for this analysis.

**Assets Stated at Historic Cost:** STB data and rate of return criteria are based on historic data. The above mentioned cost adjustment factors are imputed to investment balances in an indirect manner. For a long while this problem was mooted by low or even negative inflation, but since 2003 inflation in not just fuel but also materials and equipment prices has made it necessary to correct maintenance costs and investment balances for inflation. Assuming that a railroad will seek to recover its replacement cost of capital assets through depreciation as a part of its cost calculations for pricing purposes, Vanness has calculated the estimated replacement cost of tracks and structures and associated depreciation.<sup>1</sup>

**Financial and Operating Data are System data:** Naturally, operating expenses and assets information are reported as system aggregates. While many movement specific costs could be driven by coefficients based on 2005 system aggregates, Vanness believed that the expense items could be made more precise in a value added manner by taking the following steps:

- System costs and co-efficients were escalated from 2005 levels to 2006 in accord with the reported average increases for RCAF purposes.
- Transportation Train and Engine Personnel costs were estimated for client specific movements by using Labor Schedule A300 data for updated labor rates and fringe benefits times the number of crew personnel estimated to be required.
- Fuel Costs have risen from less than 10% of operating revenue to more than 15% in the past 30 months. Given the great importance of fuel costs to the cost structure for the foreseeable future, Vanness determined value added precision could be gained by simulating train performance and fuel usage. For

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<sup>1</sup> The same would be true of railroad locomotives; however, as explained in a following section, Vanness uses the current market cost of leasing the locomotives under an operating lease structure.

each mine-plant-mine movement, and each railroad track profile, the progress of a train as it is actually configured today consisting of more than 118 client coal cars and at least two railroad-owned high horsepower locomotives was simulated to calculate fuel consumption, elapsed running time and other variables.

- As already noted, STB recorded investments in track and structures have not specifically been subject to replacement cost adjustment, additionally recent experience<sup>2</sup> suggests that the railroads' most heavily used segments of track are deteriorating more rapidly than system-wide composite depreciation rates would suggest. Using data reported in STB Schedules 416 and 720, defining track use, density in millions of Gross Ton Miles, investment base and depreciation rates it was possible to ascribe client traffic to these track specifications in terms of track wear and tear and, consequently, derive differential capital recovery (depreciation) costs of rails, ties and ballast for classes of track used.

**Operating & Maintenance Costs:** What follows is a discussion of the derivation of each of the major cost categories in the order they are found in the Trip Plan Costs and Summary worksheets for the coal movements -- in this case arranged in the order of costs that are directly variable with traffic levels first (e.g. fuel) and descending to allocated overhead and system costs. Reference line numbers found in the discussion and worksheet refer to the STB's standard formatted analysis line numbers. For consistency, account titles, contents and nomenclature conform to STB practices. Quantitative examples are for Union Pacific Railroad.

Transportation - Train Operations: This was the largest category of costs as a percent of revenues, for example, in 2006 as projected, totaling some 34% of UP system revenues, and 4.5 mils per RTM. Fuel is the major cost item of the category at 17% of revenue, labor and fringes are 14.7% and various other costs such as train supplies, casualty losses and insurance make up the balance. (The system costs for both BNSF and UP are shown as a function of revenue, loaded car miles, GTM's and RTM's in the Summary and backup worksheets.)

- For client specific movements, Labor costs are forecast based on the estimated number of crews required times the prevailing Q4 2006 labor and fringe rates for that class of employee.

- Fuel cost for client specific movements is forecast as an independent price variable times projected trip fuel consumed, to allow for price sensitivity analysis. As a base case, system fuel cost is forecast on 2006 usage and the average year-end price of a gallon of fuel. For UP this was 1.2 billion gallons at a 2006 year end price of \$2.10 per gallon and an average of \$2.06 per gallon.

Transportation - Yard Operations: These costs have not been included in client's costs because unit coal trains do not require any significant yard handling. As a matter of information, such costs accounted for a projected 5.6% of UP's system revenue or 1.5 mils per RTM.

Transportation - Common Expenses: This category consists of locomotive and train supplies, freight loss and damage, and other minor costs. These have been reduced to a fractional co-efficient and applied to client's coal movements as a function of GTM's.

Transportation - Specialized Service Operations: Consist mainly of labor related to handling company programs and "special trains" and "Other Costs" such as the costs of operators and draymen associated with intermodal trailers. The latter have been excluded from the amounts applied to client's costs since they are not required for client's business.

Transportation - Administrative Support: This category contains Transportation Department expenses for "Other Than Train and Engine" personnel such as supervisors, dispatchers, clerks, etc.

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<sup>2</sup> 2005 and 2006 issues with track deterioration on the Joint Line in the Powder River Basin have highlighted more rapid deterioration of ballast, ties and rails than previously thought.

Costs have been reduced to fractional coefficients and applied to client's coal movements on the basis of GTM's.

**Subtotal Direct Transportation Costs:** This is the first level of cost aggregation, accounting for a projected 44% of 2006 UP system revenue, \$1.03 per loaded car mile or 12 mils per system RTM, it is also known as the *Short-Run Variable Cost (SRVC)*. Due to weight and mileage, SRVC constituted some \$3.85 per loaded car mile, or 3.5 mils per RTM for client's xxxxxx plant movement, as an example.

**Equipment - Locomotives:** On system average, locomotive ownership and maintenance costs were 9% of UP revenue, \$0.21 per loaded car mile and 2.5 mils per RTM. Of course, UP's fleet consists of a range of locomotives of varying age, value and horsepower. For client's movement specific costs, labor, materials, insurance and casualty costs were estimated based on system average costs and applied as a function of client movement specific road locomotive miles divided by all road locomotive miles. For the actual capital cost of locomotives, Vanness used the current market lease rate for the operating lease of a new, 4400 horsepower locomotive. Thus, leasing cost captures replacement cost plus elements of depreciation and interest on an hourly (annualized) payment basis according to actual use. Due to average age of UP locomotives (lower actual costs), this is deemed a conservative approach.

**Equipment - Freight Cars:** client's coal cars are provided "free on line" to serving railroads. Maintenance and repair items not attributed to railroad casualty accounts are reimbursed to the railroad at established charge out rates. Consequently, other than incidental replacement cars, no car costs need to be included in the client's movement expenses. As a matter of information, projected freight car costs will have constituted 10% of UP's revenue in 2006.

**Equipment - Other:** This category consists of expenses for vehicles, miscellaneous equipment, insurance and other costs related to non-rail equipment. These minor costs are allocated to client's movements based on system average costs per GTM.

**General and Administrative Expenses:** This category accounts for a projected 8.4% of UP system revenue or 2.4 mils per RTM. Principal components are management and support personnel costs, property and other taxes, and "all other" expenses in roughly equal proportion. A system average coefficient has been derived and applied to client's movements as a function of client movement specific transportation and equipment costs divided by total system transportation and equipment costs.

**Way and Structures Expenses and Depreciation:** This category equals a projected 12.6% of UP system revenue or 3.5 mils per RTM. It is composed of expense items relating to roadbed, track, bridges and structures maintenance. All expense items except depreciation have been allocated to client specific movements based on system average costs per GTM times client movement specific gross ton miles.

As discussed above, track and structure assets have been revalued to replacement cost and depreciation adjusted accordingly. With respect to roadbed, ties, rail and ballast, adjusted investment balances related to each category of track density are multiplied by the category specific depreciation rate as reported to STB to solve for client's movement specific depreciation cost according to the track class used. (These are analyzed in the Differential Wear Analysis worksheet.)

*Subtotal Direct Transportation + Equipment + Allocated Way and Structures: At this level of aggregation, also called Long Run Variable Cost (LRVC), LRVC typically increases (or decreases) in stair-step fashion, when viewed as a function of traffic volume. This subtotal represents the railroad's identifiable cost structure **before** addressing the return on investment required by bondholders and stockholders.*

**Return on Capital Employed:** The perspective taken for this analysis is that the railroad will formulate criteria for return on investment, and apply this as a "hurdle rate" to traffic pricing. At a minimum this rate would equal previously achieved levels measured on a system-wide basis. Thus a key consideration is

what returns on bondholder and stockholder investment, or its counterpart return on capital employed, is justified.

For determining Revenue Adequacy, the STB presents a return on capital employed (net assets investment) which measures the ratio of Net Railway Operating Income to Average Net Investment (at historic cost). A range of other measures generated from available data are shown in the table below for BNSF and UP railroads.

<b>Table of Investment Returns.</b>				
<b>Item / % rate of return</b>	<b>BNSF 2005</b>	<b>BNSF 2006</b>	<b>UP 2005</b>	<b>UP 2006</b>
<b>STB Revenue Adequacy</b>	9.8%	na	6.3%	na
<b>Op. Income / Net Road &amp; Equip.</b>	11.0%	12.7%	5.6%	9.0%
<b>EBI / LT Debt + Equity + Leases</b>	10.1%	11.4%	6.4%	8.2%
<b>Note: EBI = "Earnings Before Interest" = Net Income after Tax adding back Interest after tax adjustment.</b>				

**ROI Conclusion:** BNSF has attained ROI's in excess of 10% by its own measures, based on debt and shareholder capital, and revenue Adequacy near 10%. UP, meanwhile, is coming out of a serious earnings slump but regaining momentum. Based on trends, 2006 STB Revenue Adequacy for BNSF will probably come in at 10.5% and for UP 9.7%.

Based on these measures and accepting that a large component of each railroad's capitalization is represented by interest free Deferred Taxes a "proxy" Required Return on Capital (unlevered ROI) using 2006 Operating Profit divided by Net Road and Equipment is recommended. This also fits our available data complement; however it cannot be directly applied to replacement cost assets. This is evident because the 2006 registered returns would be much lower if replacement costs were used.

*Movement specific Required Return is calculated by solving for the Operating Profit dollars required to produce the financial return observed. Dollars are divided into Trip Costs by Tons, Car Miles, GTM's and RTM's and annualized to obtain **total movement costs, including return on capital, when added to Long Run Average Costs.***



<b>Equipment - Locomotives</b>						
175. Labor	157,893	1.09%	\$	0.0320	\$	0.0001 \$ 0.0002
176. Fringe Benefits	85,521	0.59%	\$	0.0174	\$	0.0001 \$ 0.0001
177. Materials and Supplies	152,282	1.05%	\$	0.0309	\$	0.0001 \$ 0.0002
178. Casualties and Insurance	16,082	0.11%	\$	0.0033	\$	0.0000 \$ 0.0000
179. Lease Rentals and Other Rents	257,941	1.77%	\$	0.0523	\$	0.0002 \$ 0.0004
180. Depreciation	162,004	1.11%	\$	0.0329	\$	0.0001 \$ 0.0003
181. All Other	304,088	2.09%	\$	0.0617	\$	0.0003 \$ 0.0005
<b>182. Total Locomotives</b>	<b>1,135,811</b>	<b>7.81%</b>	<b>\$</b>	<b>0.2305</b>	<b>\$</b>	<b>0.0010 \$ 0.0018</b>
<b>Equipment - Freight Cars</b>						
183. Labor	103,459	0.71%	\$	0.0210	\$	0.0001 \$ 0.0002
184. Fringe Benefits	55,822	0.38%	\$	0.0113	\$	0.0000 \$ 0.0001
185. Material and Supplies	159,518	1.10%	\$	0.0324	\$	0.0001 \$ 0.0002
186. Casualties and Insurance	10,596	0.07%	\$	0.0022	\$	0.0000 \$ 0.0000
187. Lease Rentals and Other Rents	642,289	4.42%	\$	0.1303	\$	0.0006 \$ 0.0010
188. Depreciation	42,654	0.29%	\$	0.0087	\$	0.0000 \$ 0.0001
189. All Other	76,149	0.52%	\$	0.0155	\$	0.0001 \$ 0.0001
<b>190. Total Freight Cars</b>	<b>1,090,487</b>	<b>7.50%</b>	<b>\$</b>	<b>0.2213</b>	<b>\$</b>	<b>0.0010 \$ 0.0017</b>
<b>Equipment - Other Equipment</b>						
191. Labor	5,954	0.04%	\$	0.0012	\$	0.0000 \$ 0.0000
192. Fringe Benefits	3,217	0.02%	\$	0.0007	\$	0.0000 \$ 0.0000
193. Materials and Supplies	3,246	0.02%	\$	0.0007	\$	0.0000 \$ 0.0000
194. Casualties and Insurance	953	0.01%	\$	0.0002	\$	0.0000 \$ 0.0000
195. Lease Rentals and Other Rents	54,596	0.38%	\$	0.0111	\$	0.0000 \$ 0.0001
196. Depreciation	107,984	0.74%	\$	0.0219	\$	0.0001 \$ 0.0002
197. All Other	66,512	0.46%	\$	0.0135	\$	0.0001 \$ 0.0001
<b>198. Total Other Equipment</b>	<b>242,462</b>	<b>1.67%</b>	<b>\$</b>	<b>0.0492</b>	<b>\$</b>	<b>0.0002 \$ 0.0004</b>
<b>Subtotal Direct Transp + Equipment (Short Run Average Cost)</b>	<b>8,925,706</b>	<b>61%</b>	<b>\$</b>	<b>1.8113</b>	<b>\$</b>	<b>0.0080 \$ 0.0139</b>
<b>General and Administrative</b>						
242. Labor	254,371	1.75%	\$	0.0516	\$	0.0002 \$ 0.0004
243. Fringe Benefits	124,438	0.86%	\$	0.0253	\$	0.0001 \$ 0.0002
244. Materials and Supplies	14,013	0.10%	\$	0.0028	\$	0.0000 \$ 0.0000
245. Casualties and Insurance	2,003	0.01%	\$	0.0004	\$	0.0000 \$ 0.0000
246. Property and Other Taxes	214,100	1.47%	\$	0.0434	\$	0.0002 \$ 0.0003
247. Public Relations and	5,554	0.04%	\$	0.0011	\$	0.0000 \$ 0.0000
248. All Other	252,053	1.73%	\$	0.0511	\$	0.0002 \$ 0.0004
<b>249. Total General &amp; Administrative</b>	<b>866,531</b>	<b>5.96%</b>	<b>\$</b>	<b>0.1758</b>	<b>\$</b>	<b>0.0008 \$ 0.0013</b>
<b>Ways and Structures Expense Items</b>						
167. Labor	375,274	2.58%	\$	0.0762	\$	0.0003 \$ 0.0006
168. Fringe Benefits	165,795	1.14%	\$	0.0336	\$	0.0001 \$ 0.0003
169. Materials and Supplies	116,490	0.80%	\$	0.0236	\$	0.0001 \$ 0.0002
170. Casualties and Insurance	71,066	0.49%	\$	0.0144	\$	0.0001 \$ 0.0001
171. Lease Rentals and Other Rents	5,543	0.04%	\$	0.0011	\$	0.0000 \$ 0.0000
172. Depreciation	947,172	6.51%	\$	0.1922	\$	0.0008 \$ 0.0015
173. All Other	185,531	1.28%	\$	0.0376	\$	0.0002 \$ 0.0003
<b>174. Total Way and Structures</b>	<b>1,866,871</b>	<b>12.84%</b>	<b>\$</b>	<b>0.3788</b>	<b>\$</b>	<b>0.0017 \$ 0.0029</b>
<b>System Total Freight Service Expense Including Book Depreciation</b>	<b>\$ 11,659,108</b>	<b>80%</b>	<b>\$</b>	<b>2.3660</b>	<b>\$</b>	<b>0.0104 \$ 0.0181</b>
<b>Capital Recovery Items</b>						
<b>Net Total Road Assets at Replacement Cost</b>	<b>29,133,889</b>					
<b>Total Road Depreciation at Replacement</b>	<b>1,079,670</b>	<b>7.42%</b>	<b>\$</b>	<b>0.2191</b>	<b>\$</b>	<b>0.0010 \$ 0.0017</b>
<b>System Total Freight Service Expense w. Replacement Depreciation</b>	<b>\$ 11,791,606</b>	<b>81.1%</b>	<b>\$</b>	<b>2.3929</b>	<b>\$</b>	<b>0.0105 \$ 0.0184</b>
<b>Return on Capital Employed</b>						
<b>Working Capital</b>	N/A Working Capital AAR Line 99 is negative					
<b>Net Property &amp; Equipment 2006 Book Cost(1)</b>	<b>21,676,000</b>					
<b>Return Reqm Op. Income / Net Road &amp; Equipment</b>	<b>12.71%</b>					
<b>Total Historic Return Requirement in Dollars</b>	<b>2,754,534</b>	<b>18.94%</b>	<b>\$</b>	<b>0.5590</b>	<b>\$</b>	<b>0.0025 \$ 0.0043</b>
<b>Total Cost Including Return Requirement w. Replacement Depreciation</b>		<b>100.0%</b>	<b>\$</b>	<b>2.9518</b>	<b>\$</b>	<b>0.0130 \$ 0.0226</b>
Note:						
1. Net Total per annual report.						