

Technical Assistance to Government: World Best Practices Background -- Rail Transport Tariff for Coal

Rail Transport Tariff-setting -- Background

World Developments

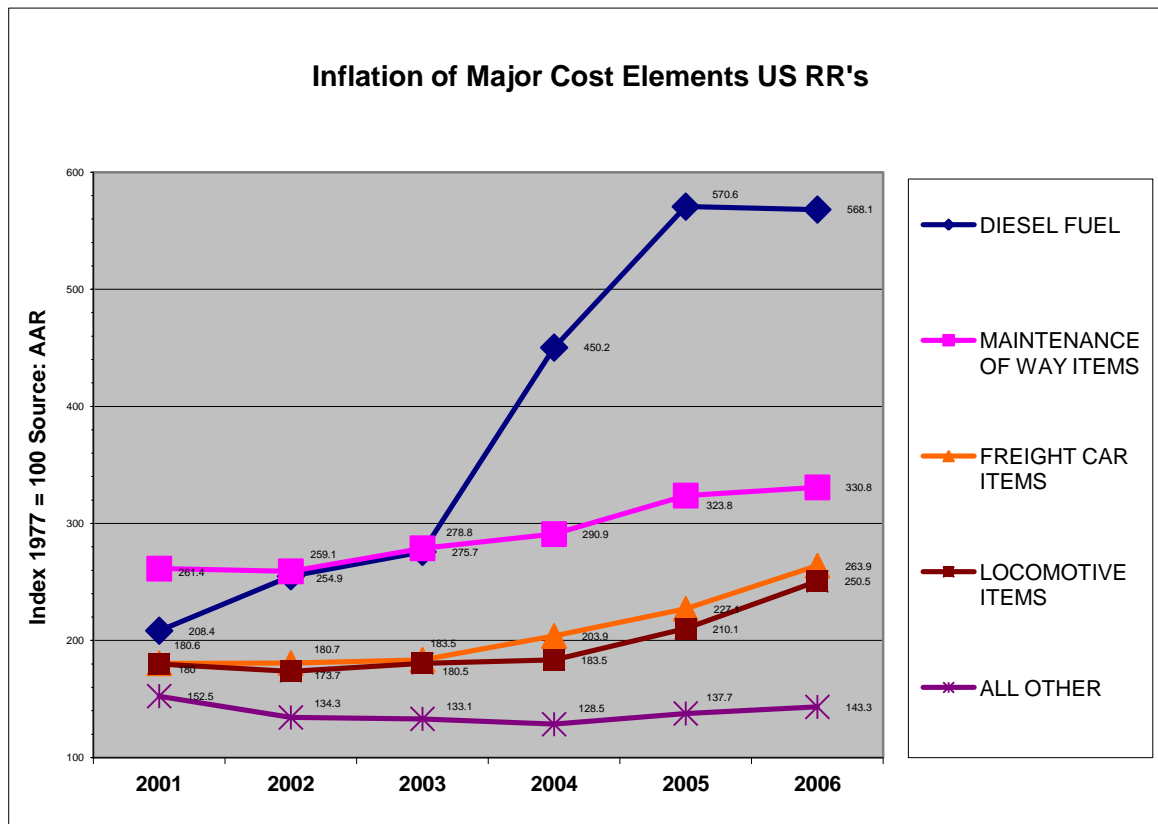
From the commencement of the 21st century in the year 2000, world railways have been impacted by trends which were not evident in the 1990's and previous decades. The growth of the Chinese economy, and subsequently Southeast Asia and India has: a.) altered the demand balance for hard minerals resources and energy resources and b.) changed the base of production for many goods. This is affecting railway transportation *demand and costs* in three ways.

Capacity Constraint: Once idle or little used rail capacity has already been absorbed by *increased direct demand* for rail cargo transport due to foreign trade, so that even in Europe where rail cargo was hard hit by EU trucking, railways must now build extra capacity on existing lines and new lines to serve expanded world demand. This consulting assignment is a sign of this.

Diesel Fuel Cost Increases: A second factor contributed to increased transport demand -- and railway costs -- world-wide. An extraordinary increase in the cost of diesel fuel brought additional traffic to the railways, as customers switched from trucks, which consume more fuel per unit of transport. The railways have generally imposed a tariff surcharge to recover rising fuel costs. This recovery, often based on adding a percentage surcharge to an existing tariff, was frequently unrelated to usage, in terms of work performed. But, however it is imposed, the fuel surcharge has become a significant element in current tariff-making.

Investment Costs: Third, as shown in the graphic following, the cost of various materials, including track materials, began to escalate, adding pressure in two ways: inflating the cost of maintaining the present plant and equipment; and rolling in the costs of additional capacity on a higher basis than that reflected in the historical assets base. The price of new rail has risen by approximately four-fold in a few short years. More recently, the same phenomenon is noted in materials for maintaining locomotives and freight cars. This will encourage railways to consider replacement costs rather than historical costs in committing capital expenditures and in rate making.

In summary, railways are now being pushed to recover higher costs for fuel and materials at the same time that they are seeking to improve their overall capital returns.



US Railway Developments

For the US, the early 2000's brought a sea change. An early sign that the capacity/demand relationship was changing came in the late 1990's when the Union Pacific's operations went into gridlock, but this was generally treated as a one-off event driven by poor planning and miscalculations by one carrier. In its planning and expenditures, the industry was slow to catch the shift.

By 2003, the Chinese production phenomenon was resulting in the growth of land-bridge intermodal shipments that the rail industry had not fully considered in its planning. As demand overtook capacity, some carriers, particularly in the West, changed their view of using pricing to recover short-term variable costs in favor of offering access to constrained capacity to the highest bidder. Decisions were made to prioritize customers based on their contribution to profitability and their long-term strategic allegiance to the carrier. And, the major carriers were encouraged by Wall Street to use the seller's market as an opportunity to improve their margins and rates of return.

Effect on Coal and Bulk Cargo

Going forward, the changes promise to fall proportionally harder on commodities, like coal, that have traditionally moved at a lower cost per ton than other commodities with different service characteristics. In the past three years, Intermodal and wagonload traffic, which once moved at low rates that reflected truck competition at the margin, has been priced measurably higher.

With main line capacity at a premium, coal shippers must now face the prospect of bidding against other traffic for track space, and intermodal is already paying far more per mile. Further, the railways are bracing for substantial near-term growth from a new traffic source, ethanol.

Strategically, coal has become relatively less important to the US railways. This can be demonstrated by a quick comparison of industry statistics for 2000 and 2005 in **Table 1**. On BNSF, revenue per ton

increased 21% in that period, while coal revenue rose by 5.3%. Put another way, coal's percentage of overall revenue fell 13% while the category that contains intermodal grew by 78%. The trend was the same on the Union Pacific, while less pronounced. **Table 1**

	English			Metric		
	US	BNSF	UP	US	BNSF	UP
2005 COAL METRICS						
Coal Wagonloads million	7.2	2.2	1.9	7.2	2.2	1.9
Coal Tons million	804	251	223	731	228	203
Coal Revenue billion US\$	9.4	2.6	2.6	9.4	2.6	2.6
Coal Revenue US\$ per Ton	\$ 11.68	\$ 10.47	\$ 11.46	\$ 12.85	\$ 11.52	\$ 12.60
Est. Lead Miles/Km	525	751	851	847	1211	1373
Coal Revenue per Ton Mile/Km	\$ 0.022	\$ 0.014	\$ 0.013	\$ 0.015	\$ 0.010	\$ 0.009
Coal Percent of Total Revenue	20%	20%	20%			
Intermodal Containers million	10.8	3.9	2.8	same		
Intermodal Revenue billion US\$	9.1	4.1	2.5			
Intermodal Revenue per Container	\$ 843	\$ 1,051	\$ 893			
Intermodal Percent of Total Revenue	19%	31%	18%			
	English			Metric		
	US	BNSF	UP	US	BNSF	UP
2000 COAL METRICS						
Coal Wagonloads million	7.0	1.9	1.7	7.0	1.9	1.7
Coal Tons million	758	220	188	689	200	171
Coal Revenue billion US\$	7.8	2.2	2.2	7.8	2.2	2.2
Coal Revenue US\$ per Ton	\$ 10.29	\$ 10.00	\$ 11.70	\$ 11.32	\$ 11.00	\$ 12.87
Est. Lead Miles/Km	525	751	851	847	1211	1373
Coal Revenue per Ton Mile/Km	\$ 0.020	\$ 0.013	\$ 0.014	\$ 0.013	\$ 0.009	\$ 0.009
Coal Percent of Total Revenue	22%	23%	20%			
Intermodal Containers million	8.6	2.5	2.4	same		
Intermodal Revenue billion US\$	6.2	2.3	1.9			
Intermodal Revenue per Container	\$ 721	\$ 920	\$ 792			
Intermodal Percent of Total Revenue	18%	24%	17%			
Notes:						
Source Railway Reports on Form R-1 to Surface Transportation Board. (regulator)						
Est. Lead (distance) is not required by STB, estimated from client studies.						

In the comparative period, the railways hauled more freight over generally the same system, charged more for it, increased profitability, and altered the commodity mix in favor of intermodal. Coal, once a mainstay, was no longer No. 1 in the West. In **Table 2**, selected financial and operating metrics derived from industry data reflect these changes in circumstances over the period from 2000 to 2005.

Table 2

FINANCIAL / OPERATING (US\$ in Billions unless noted)	2005			2000		
	US	BNSF	UP	US	BNSF	UP
Operating Revenue	46.1	12.9	13.5	34.1	9.2	10.5
Operating expenses	37.8	10.1	11.9	29	7.1	8.7
Depreciation	4.3	1.1	1.3	3.1	0.9	1.1
Operating Income	6.1	1.8	1.3	3.9	1.4	1.3
Capital Expenditures	7.1	2	2.3	5.3	1.5	1.8
Total Assets	127.2	32.8	34.4	85.7	24.5	30
Total Liabilities	71.7	15.4	20.9	53.3	14	20
STB Rate of Return %	8.5%	9.8%	6.3%	6.5%	8.8%	6.9%
Return on Equity %	9.1%	10.5%	7.5%	7.9%	11.1%	9.6%
Miles of Road (000)	120.6	32.1	32.4	120.6	33.4	33.0
Km of Road (000)	194.5	51.8	52.3	194.5	53.9	53.2
Revenue Tons Millions	2448.0	606.0	598.0	2197.0	504.0	550.0
Revenue Tonnes Millions	2225.5	550.9	543.6	1997.3	458.2	500.0
Revenue Ton Miles Billions	1,696	595	549	1,465	492	485
Revenue Tonne Km Hauled	2,487	872	805	2,148	721	711
Revenue per Ton Mile \$0.000	\$ 0.027	\$ 0.022	\$ 0.025	\$ 0.023	\$ 0.019	\$ 0.022
Revenue per Tonne Km	\$ 0.019	\$ 0.015	\$ 0.017	\$ 0.016	\$ 0.013	\$ 0.015
Notes:						
Source Railway Reports on Form R-1 to Surface Transportation Board. (regulator)						

US Railways -- Going Forward

This circumstance of US rail pricing power appears likely to continue until railroad capacity catches up with railroad demand. Market forces, including transportation alternatives for individual customers, will dictate the success of the railways in continuing to raise rates. **Table 3** shows for 2006 the effect of these forces on investments and returns of selected companies in the US coal delivery chain.

Table 3

2006 INVESTMENT AND RETURN METRICS					
US Coal Production and Consumption Chain					
	Tot. Assets				Operating
	Less Working Capital	EBIT (1)	ROCE (2)		Margin
	\$ million	\$ million	(Col 2 / 1)	Revenues	(Col 2 / 4)
Coal Producers					
Peabody	8,183	663	8.1%	5,256	12.6%
Arch	2,879	337	11.7%	2,500	13.5%
Railways					
BNSF	28,317	3,517	12.4%	14,985	23.5%
UP	32,976	2,884	8.7%	15,578	18.5%
Power Generators					
AEP	36,119	1,477	4.1%	12,622	11.7%
AEE	17,376	1,173	6.8%	6,880	17.0%
Notes:					
1) EBIT = Earnings before Interest and Taxes are deducted					
2) ROCE = Return on Long Term Capital Employed in the business					

South Africa Railways -- Transnet / Spoornet

Overview

The South African rail sector is dominated by a vertically integrated, publicly owned company, Transnet (Pty) Ltd, which has major nationwide operations in the ports, airline, road haulage and petroleum pipelines sectors, through dedicated subsidiaries. Transnet is accountable to Government of South Africa (GSA) as its sole shareholder.

The largest division of Transnet, Transnet Freight Rail (formerly known as Spoornet) bases its core competency on the transportation of freight, containers and mainline passengers on rail. The following is excerpted from the company's literature.

Freight Rail is currently positioning itself to become a profitable and sustainable freight railway business, assisting in driving the competitiveness of the South African economy. It is made up of six businesses, namely:

- * GFB Commercial
- * COALink
- * Orex
- * Luxrail
- * Shosholoza Meyl
- * Spoornet International Joint Ventures

The company maintains an extensive rail network across South Africa that connects with other rail networks in the sub-Saharan region, with its rail infrastructure representing about 80% of Africa's total. The company is proud of its reputations for technological leadership beyond Africa as well as within Africa, where it is active in some 17 countries.

GFB Commercial: Known previously as General Freight Business, GFB Commercial is the largest of Freight Rail's business units, accounting for some 70% of its income and handling some 52% of its freight tonnage.

GFB Commercial manages the flow of material and information between suppliers and customers along sections of their supply chains. It strives to integrate the rail component of the supply chain with adjoining components in order to increase supply chain efficiency and reliability at the lowest-possible cost.

COALink: Coal is a vital export commodity, generating billions of Rands in foreign exchange earnings for South Africa and rightfully deserving its pseudonym 'Black Gold'.

COALink is a specialist business unit that provides world-class transport for South Africa's export coal from the Mpumalanga coalfields to the Richards Bay coal terminal. It is one of the world's most efficient bulk export logistic supply chains, and its steam-coal export tonnage is second only to Australia's.

Orex: Orex is a Spoornet specialist business unit dealing with the transport of iron ore over the 861km railway line from Sishento Saldanha. Following the high demand for ore in the export markets, improvements to the line implemented since 1998 have resulted in the capacity of the Orex line being increased from 18 million tons a year to more than 22 million tons a year. A further expansion is now on the drawing board. Rated in a recent benchmark study as 38% better than the next best-practice operator in its field, Orex is already achieving both its vision and its mission as an international leader in providing world-class, heavy-haul logistics solutions for a growing market

Luxrail: Luxrail's primary focus is the operation of the world-famous Blue Train, which caters for a growing international tourist market. Some 250 000 travel agents, in 181 countries, voting for the World Travel Awards named the Blue Train the world's leading luxury train. Crossing South Africa's varied landscape along four routes, the train combines the comfort and luxury of a five-star hotel with unparalleled journeys. Luxrail also manages contracts with other luxury train operators using Freight Rail's infrastructure. These include Rovos Rail, which travels throughout Southern Africa and the Spier, which travels on the Western Cape wine routes.

Shosholoza Meyl: Previously known as Main Line Passenger Services, Shosholoza Meyl provides affordable inter-city passenger rail services to and from South African destinations including Johannesburg, Durban, Makhado, Polokwane, KomatiePoort, East London, Port Elizabeth, Bloemfontein, Kimberley and Cape Town. Services also connect with other Southern African destinations in Zimbabwe, Mozambique and Swaziland. Approximately four million passengers a year use Shosholoza Meyl services.

Freight Rail International Joint Ventures: Freight Rail plans to be a global leader in operations on the 1000 mm and 1067 mm (narrow gauge) rail networks of the world, especially in Africa. Through its railway operations, Freight Rail hopes to become a significant global player in the provision of freight logistics solutions to its customers on the African continent and beyond. Transnet Inferred Pricing Policies

Table 4 following Illustrates pertinent traffic and pricing metrics for Transnet Freight Rail services as broken out from Transnet Consolidated, which includes air, pipelines and ports, as well as rail. Transnet reporting has become progressively more transparent and with the benefit of some perspective about product pricing it is possible to construct a picture which sets the stage for the pricing discussion that begins in the next section of this report.

Transnet Freight Rail predecessor Spoornet went through a difficult financial and organizational period culminating in a top-to-bottom reassessment of investment and pricing strategies and policies toward non-remunerative passenger services in 2001-2003. Prior to that time the full burden of supporting passenger services and other socially-desirable but non-remunerative missions fell on the railway.

As a consequence freight tariffs were routinely forced upward (in most cases to levels which many viewed as non-competitive) while plant and equipment was left to deteriorate. In the restructuring, obsolete assets were written down, and it was decided that non-remunerative passenger services would be externally supported by government. Henceforth, freight services would receive investment commensurate with their earning power and prospects.

These objectives have increasingly been embraced and, as the table shows, recent pricing trends, geared to heavy investment in plant and equipment to cure deferred maintenance, have been upward.

Differential Pricing

Note also that Transnet is charging different prices for moving different types of cargo, generally as a function of the service demands of that cargo and its weight to tare ratio. Since much of the higher rated cargo is containers or automobiles, this comparison can be overstated unless it is viewed in that context. The price differential scale is about as one would envision, albeit with a different base, given a background of world practices, and given that a single container is likely to weigh only 20 to 25 tonnes, far less than the payload of a conventional wagon.

Orex Tariffs an Anomaly in South Africa

An anomaly existed in respect of Orex, which is virtually a stand-alone railway dedicated to moving iron ore from remote mines to the sea at Saldanha for export or to links with the national network.

Pricing of this portion of traffic (the bulk of Mining Products) reflects a complex arrangement for risk and reward sharing between the government (railway) and the mines, and was put in place as a matter of history and practicality to induce the financing of the rail lines. It is noted that this figure more closely resembles the average embedded pricing of other minerals-based world carriers who do not fully carry the twin burdens of social imperatives and "catch-up" of deferred maintenance.

Table 4 Selected Metrics for Transnet Freight Services

Transnet Freight METRICS		2002-3		2004-5		2005-6	
Item		USD	Rand	USD	Rand	USD	Rand
Revenue (Millions Rand)		1,610	11,800	1,877	13,422	2,795	17,779
Freight Traffic Metrics							
Coal Tons (000,000)			49		66		69
Iron Ore Tons (000,000)			33		27		30
General Freight Tons (000,000)			85		86		84
Tons Transported (000,000)			167		179		182
Lead Kilometers Coal Link			487		487		487
Lead Kilometers Orex			861		861		861
Av. Lead Kilometers Principal Freight Lines			500		500		500
Estimated Coal Tk'ms Millions		23,863		32,142		33,457	
Estimated Ore Tk'ms Millions		28,413		23,247		25,486	
Estimated General Freight Tk'ms Millions		42,500		43,050		41,900	
Total TKm's Millions		94,776		98,439		100,843	
Freight Revenue Averages							
Revenue per Ton Transported		9.64	70.66	10.48	74.94	15.35	97.63
Revenue per Ton Kilometer Transported		0.017	0.125	0.019	0.136	0.028	0.176
Freight Revenue Rand by Product (2003-4 Estimated)			Lead Km	R Per Ton	R Per Tkm		
Intermodal Container			500	1700	3.4000		
Automobiles			500	810	1.6200		
Non Ferrous Metal			500	210	0.4200		
Chemicals			500	150	0.3000		
Iron & Steel			500	85	0.1700		
Coal			487	80	0.1643		
Mining Products			861	75	0.0871		
Freight Revenue USD by Product (2003-4 Estimated)			Lead Mi.	\$ per Tonne	\$ per Tkm	\$ / Short T	\$ / Ton Mile
Intermodal Container			310	238	0.4755	262	0.844
Automobiles			310	113	0.2266	125	0.402
Non Ferrous Metal			310	29	0.0587	32	0.104
Chemicals			310	21	0.0420	23	0.074
Iron & Steel			310	12	0.0238	13	0.042
Coal			302	11	0.0230	12	0.041
Mining Products			534	10	0.0122	12	0.022
Notes							
1 Avg. Value ZAR per USD			7.33		7.15		6.36
2 Lead in Kilometers							
Orex							
Shisen - Saldahna			861 km				
Coal Link							
Ermelo - Vryheid			327 km				
Vryheid-Empangeni			160 km				
			487 km				

Other World Railways

There are few other world railways that are the exact complement of the US and South African railways in two respects: 1) physical production and 2) the absence of passenger services produced by the freight railways.¹ The exceptions to this statement are the *minerals* railways of Australia, the CVRD owned railways of Brazil (Estrada de Ferro Carajas {EFC} and EF Vitoria a Minas {EFVM}) and the Queensland Railways of Australia.

Of this sample, only the CVRD and Queensland railways also serve significant other cargo and passengers as so-called "common carrier" railways.

Table 5 -- Snapshot of World Minerals-Based Common Carrier Railways

2005 METRICS	EFC		EFVM		QR	
	English	Metric	English	Metric	English	Metric
Item						
Tons Transported (000)	90,309	80,633	146,677	130,962	207,200	185,000
Ton Kilometers/Miles (Millions)	48,278	69,525	47,669	68,648	128,464	185,000
Kilometers/Miles Principal Freight Lines	551.8	890	334.8	540	620	1000
Ton Kilometers/Miles per Line Kilometer	87.5	78.1	142.4	127.1	207.2	185.0
Revenue (Millions)	N/A	N/A	N/A	N/A	2,500	2,500
Est. Revenue per Tkm US\$ (1)				Note		0.0135
Guage		Standard		Meter		Cape
Notes						
1. Limestone REG2 / EFVM joint tariff CSN in 1995 =	US\$		0.0259			

As can be seen from the above Table 5, these railways carry enormous quantities of iron ore and coal from mines to ports as well as general cargo and passengers. Both EFVM and EFC support significant general cargo transportation not only for the mines, but for others, and EFVM operates daily passenger service from Vitoria ES to Belo Horizonte MG and return.²

Queensland Railway has an extensive passenger service to support, which accounts for relatively low overall revenues per ton kilometer, but it also has a successful general cargo business and it has expanded into railway services in neighboring New South Wales.

They do this at very high efficiency. It was estimated that even before 2000 the EFC and EFVM were registering Operating Profit of 33% of revenue (or operating expenses totaled only 67% of revenue) or the same as today's best performing of the North American railways.

This then forms the backdrop for the railway pricing decisions concerning the Moatize Mine development.

¹ In the US passenger service is rendered by Amtrak, a separate government-owned corporation.

² Companhia Rio do Vale Doce is also the dominant investor in and manager of the EF Centro Atlantico which connects with EFVM in Minas Gerais state and forms a connection to the remainder of Brazil. This was formerly Regions 2, 7 and 8 of the Rede Ferroviario Federal SA. Historically, significant traffic has been shared by these railways.

Coal Tariff Setting versus Rail Coal Delivery Costs

Prevalent Methods of Tariff Calculation

There are prevalent practices for negotiating tariffs and contract rates used in US and essentially the same themes are used by the EU railways and other world railways. Current methods are quite different from those employed under regulation and by the government owned railway of history. In those days tariffs tended to be set by mechanically calculating the weight of the cargo and the distance hauled times a "rating factor", as blessed by the regulator or the directorate of the railway. It was frequently said that these rating factors were the product of "black box" mathematics and were unrelated to either the true cost of the service or the value of the service. Too often they produced inadequate revenue for the railway to reinvest in itself in one case and unreasonable high charges in another.

The Surface Transportation Board, the US regulatory body, has embraced the principal of "differential pricing". This is the pricing of transportation of the subject tons of cargo to be moved, along with all other cargo moving on the railway's infrastructure, with a view toward overall "revenue adequacy" for the company. This policy allows some traffic to be priced lower or higher than other traffic moving to or from the same places, but exhibiting different characteristics -- in other words a ton of automobiles is not equivalent to a ton of steel.

These freedoms are subject to "reasonableness tests" to prevent monopoly abuses, but otherwise, pricing calculations, in practice, center on the "average cost" of moving a unit of cargo among all other cargo. Average cost is further defined as short run variable cost and long run variable cost as explained below. These are considered "guidelines" for discussions between the railway and the client and may be modified to meet the objectives of each party within boundaries.

In the US these railway cost matrices adhere generally to the principles of the Uniform Rail Costing System (URCS); however these are routinely modified by railway costing departments to reflect their own needs.

Two examples of cost matrices are discussed below. Please refer to samples that are presented in the **Appendix**.

Cost Detail for US Conrail (COSAC): This costing system example shows the full costs of transport in 1988. Note that these are divided between "LTV" or Long Term Variable Costs and "MLTV" Modified Long Term Variable costs.

Note also that total costs sum to total revenue, since this formula also takes into account the required return on investment (return to shareholders and creditors). Of the average \$650 revenue available per wagonload unit of cargo, approximately \$232 of costs associated with the infrastructure and corporate overhead are excluded to calculate the MLTV or Contribution Margin costs. Pricing decisions can be taken within the range bounded by LTV and MLTV costs but may not be quoted below MLTV cost, as this would result in direct losses.

Trip Plan Cost Detail for RFFSA Region 2 (now EFCA) of Calcario (Limestone): This costing worksheet shows in US dollars the build up of cost elements supporting a tariff rate to move limestone for 481 km from Arcos MG to Volta Redonda SP in Brazil in 1996 on train LRM01.

The train specific cost elements are virtually identical to the Conrail costs but are arranged by natural element instead of by department as shown for Conrail. Like Conrail the costs are separated by Long Term Variable (variáveis de longo prazo) and Short Term Variable (variáveis de curto prazo).

Note also that the realized tariff for this large volume 1.2 million MT move does not recover all costs. With a tariff of US\$12.49 per metric ton, short term variable costs US\$4.67 are covered, leaving a Contribution Margin of US\$7.82 to cover overheads US\$4.27 and capital costs US\$2.80, with only US\$0.75 available to cover long term costs of infrastructure and asset replacement.

Other Non-Traditional Contracting Methods

Unique tariff calculations have been used in Argentina and Brazil under the former state-owned railways regimen to help restore and / or expand available railway services where these were interrupted due to lack of motive power, rolling stock or deteriorated tracks.

Generally, these systems included a mechanism for pre-purchase of transportation wherein funds were deposited with the state-run railway to fix equipment or restore tracks in the short-term and then the deposit was reduced as the client moved product.

To recognize the risk and opportunity cost of the client's capital, tariffs were reduced to near the level of Modified Long Run Variable Cost or zero contribution. It should be noted that this was not considered to be more than a temporary expedient.

Pre Negotiation Analysis

Pre-Negotiation analysis is expected to derive the average cost of moving a ton of Moatize Mine coal from mine to port and return the empty hoppers. A central premise of the work is that sufficient information is available or can be estimated to allow a credible analysis of the railway's costs for moving a ton of coal along its lines within the flow of other traffic.

For the US, 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, conditions, operations and efficiencies. This data is reformatted by the Association of American Railroads in its Green Book¹ to make it more "user friendly", and is available to all parties who wish to purchase it. In the Moçambique the situation is likely to require a more flexible approach to analysis using what data is available and in the time frame available. Some guiding principles for the analysis are listed below.

Updating Recurring Costs

Costs and other items subject to inflationary pressures should be updated using cost indexing information made available by the World Bank 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 railways materials price changes, one would be able to actualize historic detailed cost data or estimates to the year end 2007, which can be the base point in time for this analysis.

Assets Stated at Historic Cost

Railway data and rate of return criteria are usually based on historic data. The above mentioned cost adjustment factors can be 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. We are assuming that a railway will seek to recover its replacement cost of capital assets as a part of its cost calculations for pricing purposes.

Value Added Precision

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

- System costs and co-efficients should be made current by updating. -
Transportation Train and Engine Personnel costs can be estimated for CVRD specific movements by using Labor Schedule data for updated labor rates and fringe benefits times the number of crew personnel estimated to be required.
- The same would be true of railway locomotives and wagons given load - to - load cycle times, however, as explained in a following section, we can use the current market cost of leasing the locomotives and

wagons under an operating lease structure for an acceptable substitute.

- Fuel Costs for US railways have risen from less than 10% of operating revenue to more than 20% in the past 30 months. Given the great importance of fuel costs to the cost structure for the foreseeable future, value added precision should be attempted by simulating train performance and fuel usage. For each mine-port-mine movement, and each railway track profile, the progress of a train as it is actually configured consisting of coal wagons and at least two high horsepower locomotives should be simulated with reasonable precision to calculate fuel consumption, elapsed running time and other variables.³

- As already noted, existing investments in track and structures probably have not specifically been subject to replacement cost adjustment. However, Beira Line new building and restoration investments will automatically capture the "replacement" costs. Additionally, recent experience suggests that the railways' most heavily used segments of track are deteriorating more rapidly than system-wide composite depreciation rates would suggest, so these must be evaluated.

- The perspective taken for this analysis is that the railway operator 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 rate of return on bondholder and stockholder investment, or its counterpart return on capital employed, is justified.

Conclusion: Study Product is a Trip Costs Summary

What follows from this exercise is each of the major cost categories in the order they are found in the Trip Plan Costs Summary worksheets examples given here -- in this case arranged in the order of Short Term Variable costs that are directly variable with traffic levels first (e.g. fuel) and descending to Long Term Variable costs (e.g. allocated overhead and system costs).

³ Sometimes such simulations are undertaken with a computer driven Train Performance Simulator, however, reasonable precision can be achieved with manual calculations made by an experienced rail operations planner.

Glossary:

AEE: Ameren Electric Energy and affiliates

AEP: American Electric Power and affiliates

R-1: The annual financial and data report filed by all Class 1 railways with the STB

STB: Surface Transportation Board

AAR: The Association of American Railroads publisher of data on cost adjustment factors and the Green Book of financial and operating data.

RCAF: Railway Cost Adjustment Factor is that factor issued quarterly in anticipation by which maximum rates may be increased to give effect to inflationary cost pressures, if any.

RE&I: A report issued quarterly by the STB summarizing the financial performance of the railways in terms of summarized revenue, expenses, earnings and traffic statistics.

A300: The detailed STB report of hours worked, hours paid and labor rates of pay by class of railway employee

GTM: Gross Ton Mile is the number of annual tons of traffic traversing a mile of track including the weight of locomotives, cars and contents.

RTM: Revenue Ton Mile is the number of annual tons of traffic traversing a mile of track including only the weight of cargo contents.

SRVC: Short-Run Variable Cost consisting of direct costs for transportation service including fuel and labor exhibiting variability highly correlated to traffic activity levels.

LRVC/LTVC: Long Run (Term) Variable Costs consist of Short-Run Variable costs plus Equipment costs plus allocated General and Administrative costs plus allocated Way and Structures expenses. LRVC typically increases (or decreases) in stair-step fashion when viewed as a function of traffic volume, i.e. it varies over a longer period.

Capital Recovery: Capital Recovery is the same as depreciation: the amount of annual cost reserved for replacing the wearing assets of the railway. Wear rates and depreciation rates seldom match unless detailed investment by assets class and corresponding depreciation is known.

EBIT: Earnings before Interest and Taxes.

Return on Capital / ROCE: Return on Capital (or Return on Capital Employed) is an additional element over and above long run average costs including capital recovery that must be added to costs to provide for returns to bondholders, lessors and shareholders.

CFM: Empresa Nacional dos Portos e Caminhos de Ferro PO Box 2158, Maputo Moçambique Tel: +258 427173 Fax: +258 424228

CCFB or (Beira Railroad Corporation): is a railway company formed by a lease from the Mozambique Ports and Railways (CFM) to the Indian Rites and Ircon International consortium to operate a railroad that originates from the port of Beira, Mozambique as terminal. The Beira line is important as it provides a port access for landlocked states such as Zimbabwe, Malawi, Zambia, and the Katanga province. The Beira railway has two major segments, the Machipanda line to Zimbabwe, and the Sena line to the coal fields of Moatize with further connection to Malawi. Both segments suffered during the guerrilla fighting in the 1980s when RENAMO sabotaged the railroad. Operational activity has been regained on the Machipanda line, and rehabilitation is expected to be completed on the Sena line by 2009.

Appendix

CONRAIL 1988 COST DETAIL ON AN LTV AND MLTV BASIS

Dollars In Millions

Maintenance of Way

	<u>LTV</u> Long Term Variable	<u>MLTV</u> Modified L-T Variable
Track Accounts (Running & Switching)	\$ 64	\$ 41 ✓
Road Depreciation	68	0
Other*	140	49 ✓
Total M of W	272	90

Maintenance of Equipment

Locomotive Repairs (Road & Yard)	92	92
Locomotive Depreciation (Road & Yard)	37	0
Freight Car Cost	479	479
Trailer Cost	32	32
Other*	63	32
Total M of E	703	635

Transportation

Train Crews	325	325
Train Fuel	115	115
Servicing Road Locomotives	22	22
Train Inspection	52	52
Train Dispatching	20	0
Total Train Accounts	534	514
Switch Crews	146	146
Yard Fuel	14	14
Yard Operations	65	49
Total Yard Accounts	225	209
Loss and Damage	15	15
Station Clerical & Acctg. (Excl. Billing)	49	0
Intermodal (Lift, Drayage & Trucking)	54	54
Other*	160	45 ✓
Total Transportation	1,037	837

General & Administrative

G&A	94	0
Property Taxes & Other	30	0
Total G&A (Incl. Property Taxes)	124	0

Total Expenses	2,136	1,562
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Return on Investment

Road Property	228	0
Locomotives	52	0
Work Equipment	11	0
Total ROI	291	0

Grand Total	\$2,427	\$1,562
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Average Per Revenue Unit	\$ 650	\$ 418
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* See next page for description.

CONRAIL 1988 COST DETAIL ON AN LTV AND MLTV BASIS

Dollars In Millions

Maintenance of Way

	<u>LTV</u>	<u>MLTV</u>
Track Accounts (Running & Switching)	\$ 64	\$ 41
Road Depreciation	68	0
Other*	140	49
Total M of W	272	90

Maintenance of Equipment

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Locomotive Depreciation (Road & Yard)	37	0
Freight Car Cost	479	479
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Road Property	228	0
Locomotives	52	0
Work Equipment	11	0
Total ROI	291	0

Grand Total

\$2,427 \$1,562

Average Per Revenue Unit

\$ 650 \$ 418

* See next page for description.

Maintenance of Way

1/ Other -

Signals & Interlockings
Comm. & Elec. Power Systems
Buildings & Terminals
Roadway Machines
Administration
Casualties & Insurance

Maintenance of Equipment

2/ Other -

Work Equipment Repair
Computer & DP System Repairs
Work Equipment Depreciation
Administration
Casualties & Insurance

Transportation

3/ Other -

Administration
Casualties & Insurance
Communication Systems Operations
L&D Claims Processing

Costing
2/16/89

R.F.F.S.A. - SUPLAN - DIVCUT
 CALCULO DO CUSTO DE TRANSPORTES
 VERSAO 3.3
 REFERENCIA: NOV/95 US\$= 0.96
 DATA: 09/05/96 HORA: 09:47

PRODUTO : CALCARIO
 ORIGEM : ARCOS
 DESTINO : CALCARIO
 CLIENTES: CSN e CSN
 REGIONAL: SR2

1. FLUXO

1.1. Transporte anual				TU		1,250,000
1.2. Trens utilizados:	LRM01					
1.3. Distancia em km	481+	0+	0+	0+	0+	0= 481

2. TARIFA

3. CUSTO TOTAL DO TRANSPORTE

3.1. Custos variaveis de longo prazo

3.1.1. Custos variaveis de curto prazo

3.1.1.1. Combustiveis e lubrificantes	2.45	5.08
3.1.1.2. Material de manutencao locos	0.76	1.57
3.1.1.3. Material de manutencao vagoes	0.37	0.77
3.1.1.4. Material p/ reposicao trilhos	1.10	2.29

3.1.2. Pessoal

3.1.2.1. Equipagem	1.38	2.87
3.1.2.2. Manutencao de locos	1.10	2.30
3.1.2.3. Manutencao de vagoes	0.81	1.68
3.1.2.4. Reposicao de trilhos	0.20	0.42
3.1.2.5. Reposicao de lastro	0.28	0.59
3.1.2.6. Reposicao de dormentes	0.25	0.51
3.1.2.7. Conservacao de via	0.60	1.25
3.1.2.8. Operacao de patios	0.19	0.40
3.1.2.9. Outros custos	1.59	3.30

3.1.3. Material

3.1.3.1. Reposicao lastro	0.55	1.15
3.1.3.2. Reposicao de dormentes	0.57	1.19
3.1.3.3. Conservacao de via	0.48	0.99
3.1.3.4. Outros custos	0.25	0.52

3.2. Custos de capital

3.2.1. Locomotivas	2.21	4.60
3.2.2. Vagoes	0.53	1.10
3.2.3. Equipamentos de patio	0.06	0.11

3.3. Administracao Regional

3.3.1. Pessoal	3.96	8.23
3.3.2. Material	0.30	0.63

C.F.F.S.A. - SUPLAN - DIVCUT - GR2
 CALCULO DO CUSTO DE TRANSPORTES
 VERSAO 3.3
 REFERENCIA: NOV/95 US\$= 0.96
 DATA: 09/05/96 HORA: 09:48

PRODUTO : CALCARIO
 ORIGEM : ARCOS
 DESTINO : CALCARIO
 CLIENTES: CSN e CSN
 TU ANUAL: 1.250.000

Trans utilizados: LRM01
 Formacao: EAO
 Encerramento: EKK
 Anexao vagoes: EAO
 Retirada vagoes: EKK

						Totais
Distancia em km:	481+	0+	0+	0+	0+	0= 481
Retorno vazio % :	100	0	0	0	0	0
Horas percurso:	21.50+	0.00+	0.00+	0.00+	0.00+	0.00=21.50
Tipo de vagao:	GFD					
No. vagoes fluxo:	27	0	0	0	0	0
Tara do vagao:	17.0	0.0	0.0	0.0	0.0	0.0
Lotacao do vagao:	60.0	0.0	0.0	0.0	0.0	0.0
Locos principais:	GEU200					
Quantidade:	3	0	0	0	0	0
Locos de auxilio:						
Quantidade:	0	0	0	0	0	0

	US\$/TU	US\$/1000TKU
CUSTO TOTAL DO TRANSPORTE	19.98	41.54
Custos variaveis de longo prazo	12.92	26.86
Custos variaveis de curto prazo	4.67	9.71
Custos de capital	2.80	5.81
Administracao Regional	4.27	8.87
TARIFA	12.49	25.97