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Methods and Practices in Pricing Railway Track Access

Research conducted for the Canada Transportation Act Review

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**Methods and Practices in Pricing
Railway Track Access**

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1. INTRODUCTION

This document is a research working paper prepared for the Canada Transportation Act Review.

The purpose is to prepare a clear and concise description of methods and principles applicable for infrastructure owners to set prices for access to railway tracks by tenant operators.

The style of the report is in the form of a management consulting study as distinct from that of an academic paper. References are documented where appropriate and germane to an important comment in the text, but the criteria for inclusion are relatively liberal in comparison with an academic work on the same subject.

1.1 Background

Canadian transportation legislation has evolved at significant pace over the last half of the Twentieth Century. In the railway mode, the era of significant change was triggered by the completion of the MacPherson Royal Commission in 1962 and subsequent promulgation of the National Transportation Act in 1967.

One of the interesting features of the NTA 1967 was incorporation of a Policy Statement among the statutes. The philosophy of the Act was to substitute competition for regulation, and thus set Canada on a course distinct from the path then being followed in the United States in respect of oversight of the transportation industry. Canada would promote intermodal competition to support the objectives of transportation efficiency, economy and adequacy at the lowest total cost to the economy. Another significant policy shift was implemented in the form of statutory compensation for imposed public duties, and user charges to recover full costs of public facilities and services were enabled by the Act.¹

Twenty years later, the National Transportation Act of 1987 (NTA 1987) made changes to respond to market conditions. In the intervening 20 years other legislation had been introduced to solve problems related to rail transportation, notable in this period was new legislation covering of grain transportation in Eastern and Western Canada. Some of the problems that were addressed had been percolating since the beginning of the Twentieth Century.

NTA 1987 strengthened the Canadian legislative emphasis on competition over regulation as governing forces. It introduced railway competitive access provisions and defined processes to enhance competitive choices for railway customers, particularly captive shippers with high dependency on one Railway. This Act incorporated also a provision for the Minister of Transport to carry out a Review within five years, and to report back to parliament with the findings of that review.

The Review of NTA 1987 was duly completed and its recommendations were carried forward for public discussion and debate. Subsequently, the Canada Transportation Act (CTA) was passed into law in 1996. CTA made minor changes to the competitive access provisions and generally kept the process in tact. This legislation also incorporated a Review provision to “assess whether legislation... provides Canadians with an efficient, effective, flexible and affordable transportation system, and, where necessary or desirable, recommend amendments to (a) the national transportation policy set out in

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¹ An account of the regulation and practice of railway pricing in Canada is available in a monograph prepared by W.G. Scott: Canadian Railway Freight Pricing – Historical and Current Perspectives, 1836 – 1983; Canadian Institute of Guided Ground Transport, Queen's University, Kingston, Ontario, 1985.

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Section 5; and (b) the legislation...². One recommendation of the NTA 1987 Review, which is pertinent to the present study, was for the government to examine shared track usage as a government policy option.

1.1.1 Terms of Reference

The Canada Transportation Act Review (CTAR) is established as of June 30, 2000, with the mandate to complete a comprehensive review by July 1, 2000. In establishing the Review, the Minister of Transport further stipulated that the competitive rail access provisions will require special emphasis and called for an interim report on access issues from the Review by December 31, 2000. Specifically, the Review Panel Terms of Reference direct as follows:

“...consider proposals for enhancing competition in the railway sector, including enhanced running rights, regional railways and other access concepts. These concepts need to be assessed in the broader context of increasing North American integration and ensuring cost effective service for shippers over the long term”

The challenge of this aspect of the mandate of the Review is multi-faceted.

First, circumstances dictating the nature and extent of competitive choices vary considerably across the regions of Canada, across industrial sectors and across public interest groups. Is there one solution that fits all? Or, is a multiple-choice suite of solutions more appropriate?

Second, the subject itself is technically complex despite the apparent simplicity of sending blocks of vehicles up and down a line without hitting each other. Rail capacity is an important consideration, yet there is not a common understanding of operational, economic and commercial aspects of owning and operating railway track. Is there a creditable way to define key issues so as to achieve a common understanding among a wide variety of interests?

Third, a communication and process factor impedes dialogue and debate because various parties are failing to comprehend the pressures and concerns of other stakeholders. The regulatory process for settling disputes is adversarial, and as such it does not encourage open sharing of information, or compromises. Is it possible to find a common language, or terminology and mutual understanding of the problems and opportunities for all participants?

This report addresses one part of the challenge, that is to identify pricing and performance arrangements that would be fair for both owner and tenant in situations of shared access of railway tracks. The merits and deficiencies of shared track access are outside the scope of this work, to be addressed elsewhere by the CTA Review; the main question concerns the methods and principles to arrive at an equitable and efficient exchange of valuable considerations between owners and tenants.

1.2 Objectives and Approach

The study objectives and scope are described below.

- ❖ Develop a sound basis for understanding railway track capacity in order to establish performance measures for contractual arrangements to access railway lines and yards;

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² R.S.C. Chapter C-10.4 (1996, c, 10), Canada Transportation Act, section 53. (2). The legislation... refers to the Act or any other Act of Parliament for which the Minister is responsible that pertains to the economic regulation of transportation and transportation activities under the legislative authority of Parliament.

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This scope includes examination of different methods in use to quantify rail capacity. Also, in respect of these methods, the following issues are included: quality of service; variable costs and economic opportunity costs attributable to track owners; and, business risks and liability issues to which both tenants and owners are exposed;

- ❖ Examine a range of costing and pricing approaches currently used in different cases where rail lines and yards are shared (both with and without traffic solicitation privileges) between arms-length parties;

Various commercial circumstances result in different arrangements. This work will focus on Canada and the USA using three categories: **a) Convenience between equals** for temporary or permanent access (i.e. reciprocal arrangements elsewhere between the same two parties are likely for emergency diversions, co-production, coordinated service etc.); **b) Public service**, including **Commuter and Passenger** trains; and, **c) Carriers for Profit** – a party would use an existing rail line to operate on behalf of a single customer, or as a common carrier;

- ❖ Demonstrate pro-forma examples of the application of selected concepts to illustrate the nature of the negotiations and substance of agreements that might take place between owners and tenants in hypothetical, yet representative, circumstances.

1.2.1 Approach

The approach to the present study is traditional for a consulting assignment:

- Fact finding
- Analysis
- Conclusions and report

Fact finding consists of reviewing current and recent research (i.e. last five years) concerning railway access pricing and allocation of train paths. Various sources are explored in North America, Europe, Australia and other parts of the world. There is much research activity in progress at this time; it is perhaps stimulated by the prospect of major legislation under consideration both in the European Union, and in the United States regarding terms and conditions for open access to rail lines. The emphasis in this project is to review work that explicitly covers the subsidiary issues of allocating capacity to tenants and methods to arrive at efficient prices.

Analysis is based on hypothetical examples to illustrate relationships that are plausible in a realistic albeit fictitious situation. The plausibility derives from an analytical approach to develop data that are reconcilable with industry averages in some cases and estimates of direct costs attributable to cost objects in some other cases. The technique uses pro-forma models of hypothetical situations.

Finally, formulation of conclusions and report preparation is delivered by means of this document.

1.3 Report Organization

Section 2 serves as a background reference to relate policy developments to the specific requirements of this study, and to identify ideas and contributions that might be useful in the Canadian context. There are two parts to Section 2: the first part is a quick survey of experience around the world to identify Situational Factors; the second part is an overview of Economic Cost Factors and methodologies that are employed in current practice, along with their rationales for use. A framework for incorporating business risk (which could include exposure to revenue loss) is introduced in Section 2.

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Section 3 goes to the heart of the subject: current pricing practice for access to railway trackage. Three different types of circumstances are considered separately in the text.

- Convenience – an arrangement between two carriers, advantageous to both, either temporarily or permanently, that involves exchanging of rights of access (e.g. trackage rights, running rights, haulage etc.);
- Commuter and Passenger – includes imposed or voluntary public duties to provide track and terminals for local and long distance passenger services; a method is presented to estimate the extent of track usage allowing for distinction between peak and off-peak users.
- Carrier – by which a party (not necessarily a “railway”) would use an existing railway line to operate on behalf of a single customer or as a common carrier. Application of business risk principles to access pricing is demonstrated by way of example.

Section 4 includes conclusions and a possible process for working through the stages of negotiating track access between host and tenant.

2. ECONOMIC PRINCIPLES AND COSTING METHODS

Railway pricing has been a topic of political, commercial, and academic debate for more than one hundred years. The debate has polarizing aspects, like the opposite ends of a bar magnet. Pricing “value of service”, or differential pricing is at one polar extreme; and pricing for marginal cost of service is the opposite. Railways are business enterprises at one pole, and public utilities at the opposite.

Economic science is concerned with efficient allocation of scarce resources, where efficiency is determined by achieving the greatest total benefit for society at the lowest total cost to society. A simple view of how this translates to railway pricing is that in the presence of perfect competition, the optimum amount of rail transportation that will be demanded occurs at a point where the value of the service (i.e. the price a customer is willing to pay) is equal to the marginal cost to the railways at that level of production. This should be simple enough; value of service and marginal cost ought to be the same and market forces govern prices. But there is more to consider.

The problem is made sticky by the functional forms of production costs and demand prices. Railway cost has increasing returns to scale (also referred to as economies of scale), meaning, marginal cost declines as output increases, thus the average cost is always greater than the marginal cost of output. Consequently, prices equal to marginal cost will not recover the total cost of the producer. The long-term options are to provide external subsidy or else shut down.

With increasing returns to scale, the producer has common costs that are not attributable to any specific product through cause-and-effect, but somehow they must be recovered through revenues. Economy of scale also causes a “natural” monopoly (i.e. the total cost of generating a given level of output is always lower with one firm than it would be with two or more firms). While this is efficient from a cost point of view, it lacks competition as a governing force to manage behaviour of producers.

Customers can discern most of the variable cost structure of railways by undertaking to lease equipment, build terminal facilities, hire staff, etc. These are not necessarily at issue here. The common costs are linked to concepts of sharing of track occupancy, maintenance and operation among various users; this is a protected domain of railway companies. To ensure efficiency, provide excellent service and set fair prices, economic regulation is necessary.

2.1 Situational Factors

The generic issues, as described above, boil down to determining how capacity is allocated to users, how these allocations incur cost, and how cost is relevant ultimately in setting compensation.

Objectives, methods and practice vary considerably around the world. The following framework is used to present international comparisons of granting track access rights, applying costs to compensation arrangements and establishing accountability for performance.

- Governance – compliance to transportation policies, safety regulations, competition rules, economic and social policies, sustainability, and dispute resolution.
- Operation – Access terms and conditions, and actual performance.
- Funding of Infrastructure – Variations range from private enterprise with no subsidy, to state agencies with capital and operating subsidies; somewhere in between is cash self-sufficiency.

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- Markets – Effective competition is a key concern; there is a distinction between access rights with and without traffic solicitation privileges over the shared segment.

2.1.1 World-Wide Perspectives

Separation of infrastructure from railway operations is becoming more and more common around the globe. The concept is endorsed by the World Bank and often a commitment to segregate infrastructure and operations is stipulated as a condition attached to World Bank assistance. In many of these cases there is anticipated cost reduction from breaking up a state-monopoly and introducing better practices by inviting private sector operators.

Generally, except for the examples described below, there is little material pertinent to this study.

Australia at some point in the future, is a possible exception. But, at the present time the railway sector is in transition from separate State-owned systems (originally built to different gauges to impede interconnectivity) to one national rail system. The rules of engagement and the identities of the main players are undergoing change as this is written. Technical challenges regarding connectivity of the system and uniformity are dominating the immediate agenda to find private investors for operating entities.

The tasks are formidable to improve standardization and harmonization in regulations and operations across state borders. The Australian Rail Track Corporation began operation on July 1, 1999 to provide a single point of access to the interstate standard gauge network. There are high expectations, particularly among operators who would use this track, but the terms and conditions of finance, investment and access are evolving, and the responsibility for oversight and governance has not yet been accorded³. There may be some interesting developments as the situation unfolds.

Latin America is another region that could be evolving in a direction that might eventually offer comparisons with North America. The emphasis until now has been privatization. Separation of infrastructure from operations to promote “genuine” competition has not proved popular in Latin America. The preferred approach is to tender out long term geographic concessions. Commitments to invest new capital are important selection criteria. In one case that features trackage rights the result arguably is an unfair pricing arrangement⁴ (Pacific Railway - Fepasa - operates on the central/southern network of the Chilean State Railways – EFE, and pays EFE fees for track access),

2.1.2 European Union

The European Union (EU) has been leading the way toward segregation of infrastructure and operations and attempting to open up competition within the rail mode. The EU has agreed on general policy directions, but in compliance with the “subsidiarity principle” in the Treaty, that respects the sovereignty of the member nations as foremost in determining the methods of application for the principles and policies of the Parliament, Council and Commission of the EU.

The result is a hodgepodge of arrangements to grant access rights and determine compensation across the Community. The extent of differences increases as the Eastern European countries adopt these policies in the hope of joining the Union eventually.

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³ Presentation by John Kirk, Executive Director, Australasian Railway Association Inc: Uniform Regulation and Track Access – overcoming a century of state-based systems; August 26, 1999.

⁴ Rail Privatisation Sweeps the Continent; International Railway Journal and Rapid Transit Review, September, 2000; article on Latin America

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Fundamental economic principles drive European policy concerning economic justification for, and use of railway infrastructure. Economic efficiency (maximum benefits at minimum total cost to society) is at the core. There is strong conviction that markets should be open to competition, not just within modes, but across all modes of transportation; there should be a common approach for railway undertakings to rely upon, not the hodgepodge that exists; and, transparency in methods and charging schemes is also important.

With respect to economic efficiency, the current policy trend is toward charging users “Marginal Social Cost” for track access including external factors (especially environmental impacts) in the equation. Recognizing that pricing at the level of marginal social cost will not recover all the costs of infrastructure, it is accepted by the EU and member states that they would have to sustain financial support for railways.

European policy is not firmly established as yet, and debate continues at all levels at this time. The overall framework for the future has been evolving through studies, consultation and legislative proposals over the last five years. The Commission submitted a Green Paper: “Towards Fair and Efficient Pricing in Transport” in 1995⁵. This was followed by a White Paper: Fair Payment for Infrastructure Use: A phased approach to a common transport infrastructure charging framework in the EU⁶. Both documents incorporate all modes of transportation.

At present, there is a document out for discussion in the form of a Commission Communication to the Council, European Parliament, Economic and Social Committee and Committee of the Regions: “The Common Transport Policy – Sustainable Mobility: Perspectives for the Future” (the latest revision seen in this work is dated May 6, 2000); it reinforces the move toward marginal social cost as a basis for pricing infrastructure in all modes.

The Community of European Railways (CER) is generally in favour of the policy proposals proposals, and endorses the marginal social cost principle. With regards to open markets and free-wheeling competition, however, the CER reaction is guarded. The CER would like to have more clarity in the allocation of responsibilities between business and public authorities before opening up the market⁷.

It is said that the proof of the pudding is in the eating. How do all these lofty principles apply to the real world? And, what changes might occur as a result of the policy initiatives mentioned above? Table 1, below, provides a brief summary of the as-is and the to-be world.

The overriding policy objective of the EU concerns society at large, and railway infrastructure is a societal resource for which it is accepted that there will be continuing public sector financial responsibility.

Table 1: European Framework for Rail Access

| | AS IS | TO BE |
|------------|--|--|
| Governance | Council Directives and Regulations 91/440 EEC – Rail Development 95/18/EC – Licensing/safety cert. 95/19/EC – allocation and charging Regulation (EEC) No 2183/78 – costing method; (EEC) 2830/77 – accounts +++more Each member state applies | New Directive in process to consolidate all except 91/440 and 95/18 – Document 599PC0616(03) Uniform approach incorporating Regulatory Body in each member state, and each Infrastructure manager will be required to produce a “ Network Statement ” in compliance with provisions of the |

⁵ European Commission, Directorate-General for Transport – DG VII; COM(95)691

⁶ Commission of the European Communities; COM(1998)466 final, Brussels, 22.07.1998

⁷ Discussion paper by the Community of European Railways: Revision of the Common Transport Policy (CTP) – A contribution by the Community of European Railways; September 25, 2000.

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| | <p>differently and is accountable for general adherence to guidelines.</p> <p>Dispute resolution focuses on interactions between member states, rather than customers or businesses.</p> | <p>directive. Approved Network Statements will be the basis of governance.</p> |
| Operation | <p>Prices range from nil to full capital recovery⁸. Pricing schemes vary from one- and two-tier prices to more elaborate arrangements with reservation charges and peak congestion premiums. It is also as simple as a percent share of revenue of the Railway Undertaking (RU).</p> <p>Allocation methods vary considerably, as do assignment of responsibilities for allocation. In some countries there is an appeal mechanism.</p> | <p>The Network Statement will set forth the rules, procedures, time tables and charging schemes.</p> <p>Transparency, equitability, unrestricted access at defined terms and conditions, consistency across a network and uniformity across the EU are compliance criteria.</p> <p>If capacity is inadequate, then the Infrastructure Manager would be required to produce an enhancement plan. It is not quite clear how this will play out in practice – the guiding principle is, if demand exceeds supply, then enhance supply.</p> |
| Financing | <p>Requirement to separate infrastructure accounts from any RU and balance books such that Access Fees plus Member State Contributions equal Infrastructure Costs.</p> <p>Costs can include external financing of new infrastructure and renewals. Market cost of capital is allowable for private financing .</p> <p>Focus is almost exclusively on public sector role.</p> | <p>Opens door for PPP, but does not change the fundamental direction toward separation and accountability.</p> <p>Driven by Economic Cost-Benefit, to do what is most efficient for society and assumes responsibility for the public sector in making up producer deficits.</p> |
| Markets | <p>Open access to markets is a key platform for the EU. But...</p> <p>Rules and procedures are oriented to the established regime, centred on bureaucracies in the member states.</p> <p>A new entrant would have to work through the existing bureaucracy. Not many have done so yet.</p> | <p>Easier rules and procedures to start up RU; better information.</p> <p>Value of service pricing will be permitted only if agreeable to both RU and Infrastructure Manager; Marginal Social Cost is the fallback.</p> <p>"Use it or lose it" provisions applicable to train paths.</p> |

There are serious differences between the European model and the vertically integrated railway industry that serves Canadian shippers and travelers. The most serious difference with respect to this study is the pricing approach that implies a continuing public sector responsibility to provide financial assistance.

2.1.3 North America

This section concentrates on Canada's nearest and most important trading neighbour, the United States. Mexico is less significant because of recent and on-going changes.

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⁸ The Community of European Railways has posted an overview of institutional settings for infrastructure management across European Countries, and this is periodically updated. This document is based on a data as of May 16, 2000. The URL is: www.cer.be/docs/studies/2000.05.16_implem_95-19.doc

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Division of the Mexican National Railway into geographic long term concessions and privatization are recent initiatives (within the last five years). The situation remains in a transitional state while the new owners and operators take stock of their situations, form alliances, develop investment plans to revitalize the industry, and continue to serve existing customers. Issues of open rail access are not yet agenda items.

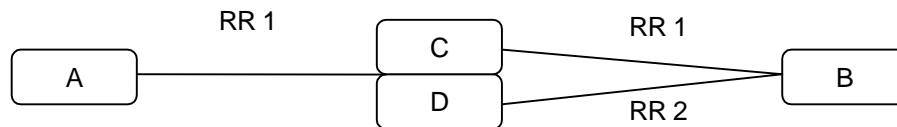
Competitive access to rail lines is a controversial topic on both sides of the longest unprotected border in the world. Recent mergers among Class I carriers have produced effects that continue to fan the flames of controversy. One of the major change issues being considered is to open rail competitive access as an offset to deterioration of intra-modal competition.

A salutary side effect of all this interest is abundance of research on issues of access and competitive pricing. There are some excellent studies available to shed light on principles and methodology.

October 3, 2000 the Surface Transportation Board has issued a Notice of Proposed Rulemaking⁹ for major railroad mergers. There are deadlines for comment and rebuttal leading toward issuance of final rules by June 11, 2001. Draft legislation was before the Senate (The Surface Transportation Board Reauthorization Act of 1999) and the House of Representatives (H.R. 3398) to alter existing Railroad legislation. These Acts died on the order paper at the close of the 106th session of Congress, but they continue to stir up debate and discussion.

North American competitive access is often raised in the context of the so-called **Bottleneck** situation illustrated in Figure 1, below.

Figure 1: Railway Bottleneck Situation



A customer now ships by RR1 between points A and B; RR1 is the only carrier serving both points. The customer is not happy with this arrangement (service reliability, prices, equipment availability and condition, time etc.) and prefers RR2, who serves point B, but RR2 cannot access point A without RR1's consent to run over RR1 from CD (their closest interchange) to A.

Table 2: American Framework for Rail Access

| | AS IS | TO BE |
|------------|---|---|
| Governance | Title 49 of the United States Code Title 49 of the Code of Federal Regulations Administration by the Surface Transportation Board (STB) and Federal Railroad Administration (FRA) Judicial Branch of government also important for dispute resolution. | New proposals are in the form of amendments to laws and regulations. A main thrust will be to shift burden of proof from plaintiffs (to show abuse of market dominance) to respondents (to prove the best public interest is served). Other technical changes will make |

⁹ STB Ex Parte No. 582 (Sub-No. 1) Major Rail Consolidation Procedures; Service Date – October 3, 2000.

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| | Legislation and regulations are highly prescriptive and technical as opposed to being performance oriented. | the appeal process of STB more accessible to plaintiffs (e.g. in bottleneck cases) |
| Operation | <p>Negotiation and agreement between consenting parties is the primary modus operandi. Refusal to provide access is insufficient for an access remedy by STB.</p> <p>Constrained Market Pricing Theory¹⁰ is employed by STB in recent and current decisions, and it is being challenged in the courts by the Railroad industry. Present legislation uses upper and lower limits of price, derived from actual costs.</p> | <p>Negotiation will continue to be the preferred approach.</p> <p>Improved access to regulatory remedies by plaintiffs and simplified process will shift power away from bottleneck carriers in negotiations – impact is uncertain at this time. Debate is charged with drama and rhetoric. Establishment of prices for access is not yet clearly defined. Regulators are still working on “a better mousetrap”. Policy changes are expected to result in greater use of “through routes”, terminal trackage rights and reciprocal switching.</p> |
| Financing | Industry is self-financed from operating revenues. | The railroad industry argues that proposed competitive provisions will threaten financial viability. Debate rages on this topic. |
| Markets | <p>Competition is a key policy objective to serve the public interest. The practice has been to define market dominance in broad terms¹¹ . Mandated access requires proof of market dominance and anti-competitive abuse of that dominant position.</p> | Enhanced competition is one goal of proposed new legislation and regulations. Market dominance criteria would be interpreted much more narrowly, and anti competitive behaviour would not be a necessary condition for mandated access. |

The Bottleneck problem arises when RR1 insists on terms and conditions that are prohibitive to RR2, wiping out whatever competitive advantage RR2 has (e.g. lower cost). There is not a universally acceptable method to determine whether RR1 is practicing unfair competition, or if its behaviour is reasonable under the circumstances. There are regulations and guidelines regarding such disputes, but shippers complain that the process is costly and time consuming for the applicant. Critics also point out that past practice of the Interstate Commerce Commission and its successor, the Surface Transportation Board has been to give the benefit of the doubt to the bottleneck carrier¹².

The burden of proof under existing rules is on the plaintiff to prove either inadequate service or vertical foreclosure (i.e. complete denial of access for a more efficient routing). Proof of vertical foreclosure is based on establishing that RR1 is market dominant and that RR1 also is abusing its market power to compete unfairly with RR2.

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¹⁰ In the simplest and briefest explanation, Constrained Market Pricing is analogous to principles behind the application of Competitive Line Rates under the CTA.

¹¹ Prior practice of the ICC and the STB as been to require proof that all of the following types of competition was lacking: a) intra-modal; b) inter-modal; c) geographic (alternative sources); d) product (substitution). In recent decisions, the STB has rejected c) and d) as criteria, and this is being challenged in the courts by Railroads. H.R. 3398 would have amended legislation to explicitly exclude geography and product criteria from market dominance determinations.

¹² A comprehensive discussion of these issues including background to legislation and landmark case descriptions is available in: Massa, S; Injecting Competition in the Railroad Industry Through Access; Transportation Law Journal, Vol 27 Issue 1, Winter 2000; Denver, CO.

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The bottleneck situation, and methods that are under consideration to deal with it, are specific to diversion of existing traffic from one carrier to another. It falls short of the scope of this study because it does not include the possibility that RR2 or some third party might want to open up new markets between A and CD, or create a bridge for gaps in its network, requiring access over some or all of RR1's network.

On the other hand, it goes beyond the scope of this study because some situations in the US would be remedied in Canada by competitive access provisions that exist in the CTA (i.e. Competitive Line Rates, Final Offer Arbitration and extended inter-switching).

Thus, the common ground between the Bottleneck problem and this study concerns the sub-set of policy solutions whereby RR2 would operate its own trains over RR1 between CD and A. With this proviso, the present "as is" and prospective "to be" situation is highlighted in Table 2, above.

2.1.4 Canada

With respect to economic principles and methodology regarding compensation, the positions divide into opposites. Free marketers at one extreme would un-bundle infrastructure and make track capacity available at marginal cost, thereby maximizing social welfare through perfectly competitive markets (i.e. the European approach). At the opposite extreme railways as natural monopolies, argue that the lowest overall cost to society is achieved by vertically integrating infrastructure and operations and basing prices on value of service rather than cost (aka "differential pricing"). The monopoly model depends upon effective regulation to supplement natural market forces in striving toward economic efficiency (i.e. minimizing "deadweight loss").

Price and service have been and continue to be the key concerns on all sides of the question. The Europeans have dealt with price and are now coming to grips with service. Americans are concentrating on service and availability, but they are not as far advanced as Canadians regarding competitive access, nor have they settled on an acceptable approach to pricing.

Canada is ahead of its trading partners regarding rail access issues. Opening up competitive access in a context of a private sector railway industry is breaking new ground. Therefore, application of methods and principles to the question of pricing will have to be innovative.

2.2 Economic Cost Factors

Why is it rail access so complex and nebulous?

There are many reasons, and most of them are naturally associated with the perishable and exclusive nature of infrastructure capacity. Track capacity is perishable because there is no product inventory, if a section of track is not at used a moment in time, then that capacity is gone forever; capacity is exclusive because any segment (i.e. signal block) can be used by only one train, or other entity (e.g. a section gang) at a time, no other entity can use the segment until it is safely cleared.

The following paragraphs attempt to explain the operating and economic factors, using illustrative examples.

2.2.1 Overview

For the sake of clarity, simplicity, and focus, providing locomotives, cars , fuel and crews to operate trains is excluded from this discussion.

Railway infrastructure consists of land, right of way (graded and aligned suitable for operation along the line and at terminal points), structures (bridges, viaducts, culverts etc.), sub-grade, track structure (rail, ties, ballast and other track material), traffic control and communications.

Operation of the very first train on a track requires most of the investment to have been put in place beforehand: continuous track structure, occupancy control, and maintenance and inspection of track to ensure safety standards are met. If the track is to serve customers along the route, then facilities would likely be required to accommodate the service needs of that customer – sidings and switches at least.

The second train on a new track will not require any more facilities if it can operate without interfering with either the first train or the maintenance and inspection of track. Eventually, after adding more trains, and commensurate intensification of maintenance and inspection, interference delays will occur. Then costs will increase, either in the form of operational changes to absorb the delays caused by interference or by increasing the level of investment by adding track, enhancing traffic control or making improvements to maintenance technology.

This represents substantial investment and significant operating cost to keep in place, and it is the principle contributing factor to the economies of scale.

The types and intensity of interactions between track users and effectiveness of mitigation measures are the primary objects of studies of rail capacity. It is far from an exact science, and difficult to compare with other industries like oil and gas pipelines or telecommunications. Rail traffic is heterogeneous and dynamic; the capacity consumed by one user can vary, depending on concurrent operating requirements to meet all other demands.

The approach in this document is to build on simplified representative examples. Initially, four examples will be used and built up with arbitrary estimates of quantities and costs. The details of the examples will develop as the text progresses.

First, the infrastructure descriptions to be used in examples are in Table 3, below.

Table 3: Infrastructure Description (Assumptions)

| Description | Case 1 Multiple Mixed | Case 2 Primary Main | Case 3 Other Main | Case 4 Branch |
|------------------------------|--------------------------|------------------------|----------------------|------------------|
| Track description | | | | |
| % multiple track | 100 | 30 | 10 | 10 |
| Traffic Control | CTC | CTC | OCS | OCS |
| Bi-directional | YES | YES | YES | YES |
| Slow orders | Low | Low | Med | High |
| Max siding length | 2,100m | 2,100m | 1,200m | 1,200m |
| Investment | | | | |
| New (\$/km) | \$1,500,000 | \$800,000 | \$600,000 | \$500,000 |
| Annual (\$/km) ¹³ | \$230,000 | \$125,000 | \$95,000 | \$75,000 |
| Maintenance | | | | |
| Annual min/km | \$5,000 | \$3,000 | \$3,000 | \$3,000 |
| Min Var \$/KGTKm | \$0.88 | \$0.88 | \$0.88 | \$0.88 |
| Max Var \$/KGTKm | \$1.87 | \$1.83 | \$2.69 | \$10.28 |
| Operation | | | | |
| Control \$/train-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 |

Note : use extreme caution in referring to these numbers. They are strictly for illustration of relationships within this document. The data are based loosely on averages obtained from Statistics Canada publication 52-216, Rail in Canada for 1998, supplemented with a priori assumptions made by the author.

Suppose one were to imagine new construction of four different lines, each 150 km in length, intended to serve distinct markets in each case. Suppose also that four lines exist in other places, completely independent of the new lines and that they are similar in all respects except that these lines have been in place for 25 years or more.

Stand-alone cost is analogous to the first supposition, new construction. In the latter supposition it may be argued that the only relevant costs are **marginal costs**, short term costs of maintenance and operating the line. A more comprehensive observer would consider **Long-term marginal costs** by including capital to add sidings or crossovers, improve signaling technology, increase yard capacity at terminals etc.. The maximum figure for maintenance in Table 3 represents the longer term view of renewal and replacement of infrastructure based on use over time.

Other costing concepts arise from time to time and for different purposes. For example, some results are based on **fully allocated costs** which are based on determining the total variable costs and distributing the remainder (constant costs) uniformly across all activities according to a formula (e.g. pro rate with revenues, or costs, or some output measure).

Finally, there is the European methodology of Marginal Social Cost, which is the variable cost of one additional vehicle or transport unit using the infrastructure.

"Marginal Cost Components can include:

- **Operating costs:** energy, labour, some maintenance costs.
- **Infrastructure damage costs:** maintenance costs, wear and tear of the infrastructure, reflected by such as resurfacing of roads, rails and runways.

¹³ A capital recovery factor of 0.155 is used to represent recovery of entire investment over 25 years at 15% interest. Land cost is excluded from this discussion.

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- **Congestion and scarcity costs:** the cost of time delays to other users or non users, resulted from congested traffic flows(on roads, queues for airports or railway stations). Moreover, a transport operator's use of infrastructure may prevent another operator from using it (e.g. an airport runway).
- **Environmental costs:** air, water and noise pollution;
- **Accident costs:** costs in terms of material damage, pain and suffering and production losses."¹⁴

The final decision has not yet been taken whether or not to proceed with this approach. If it does go ahead, it will be implemented in three phases spanning many years (5 or more).

2.2.2 Rail Capacity

Is it possible to calculate how much capacity one train uses?

Total track capacity at any time is dependent not only on the physical properties of the route and method of operation, but also on the mix of concurrent demands. Thus, Track capacity is not constant, but variable with prevailing conditions.

Important parameters in the determination of rail capacity over a period of time can include the following:

- Speed limits – higher speed limits can increase capacity because trains get through quicker; track geometry (grades, curves, structural restrictions, turnout characteristics etc.), track class (five classes relate speed limits to tolerance standards in track maintenance) and external factors all influence the speed limits causing them to vary considerably across any segment and from time to time.
- Distribution of train speeds and priorities – uniform train speeds are most desirable because interference between trains is likely to be minimized;
- Siding spacing (single track), siding capacity relative to train length, and distribution of siding lengths – all relate to ability to mitigate effects of interference between trains meeting and overtaking, and for other purposes such as clearing the line of maintenance equipment;
- Proportion of multiple tracks – as the amount of siding track increases, the previous terms can be simplified to a continuous variable, % of multiple tracks.
- Crossover spacing (multiple tracks) – With different train speeds and priorities, and constant maintenance activity trains need to cross over, even if the operation is intended as single-direction multiple tracks.
- Signal block spacing – closer signals allow trains to follow more closely (most of the rail network in Canada is still using a fixed block system, which is the basic model for this study – advanced train control systems are available that can manage train separations automatically, employing variable moving blocks with indications and/or overrides in the drivers cab);

¹⁴ See footnote 7, COM(1998)466 final, page 8.

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- Train characteristics – Power, weight and length of trains determine the time over the line and time penalties associated with slowing and stopping; train length is pertinent if it is long in relation to siding length.
- Traffic peaking and directional imbalance patterns;
- Incidence of disruption due to unforeseen events or scheduled outages (e.g. infrastructure maintenance programs)

Transient properties of capacity result in a range of interpretations and alternative definitions of the productive capacity of a rail line or a rail system. Most definitions relate to the number of trains that can pass through a segment in a unit of time; if the segment has trains entering and leaving at different places, then an equivalent factor based on average density is more meaningful (e.g. Total train-kilometers per kilometer of route per day). Other measures of output are Gross-tonne-kilometers (including the tare weight of cars and locomotives – useful for track wear and tear), and Revenue-tonne-kilometers.

Even with a simple measure of output like train-kilometres per 150 kilometres per day¹⁵, the capacity can still be an elusive quantity. Some definitions in use are provided below.

Lock-up: the number of trains per day at which system “lock-up” occurs. It can be used in long range planning to determine upper bounds for some analyses, and to test simulated investment strategies. It is not useful in an operating context.

Slowest train: the number of trains per day at which a specified time limit is reached by the slowest train. This is a practical definition, and the time limit is often determined by maximum hours of work allowable for a train crew.

Maximum Production: Production can be measured in various ways, for example capacity could be the number of trains per day at which the number of train kilometres produced is greatest. This definition takes average speed into account.

Fluid Operations: the maximum number of trains per day such that queuing time in terminals does not exceed a specific limit. This definition is useful as lines and terminals approach saturation and it is significant in that it takes into account interactions between lines and terminals.

Restoration: the number of trains per day at which operations could be restored to fluid conditions within prescribed time limit after a major service disruption (e.g. wash-out, avalanche etc.).

This collection of definitions is hardly exhaustive, yet the range of capacity estimates that might result from this selection is significant. Nevertheless, there is one common theme running through all definitions of capacity -- a concept of “service delay.” **“Service delay” to trains is the total amount of delay attributable to traffic interference on a line.** Each definition requires some consistent approach to determining the amount of delay incurred; and the variance results from the amount of delay that can be tolerated.

A “**service delay**” approach is applied by railways in long range planning for growth and change in traffic. It relies on detailed, specific event simulations. Changes in all of the variables are tested and

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¹⁵ Train-Km/150Km-day is the output measure that is used in the examples that follow. 150 Km is almost the length of a typical sub-division on main lines, thus the output measure would be a weekly number of trains that a sub-division would handle from end-to-end. Postulating based on a sub-division is also convenient for purposes of some of the assumptions used in this report.

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iterative adjustments are made until some predetermined target of service delay is reached. Decisions are made to proceed or not based on expected costs, benefits and risks.

If the problem is to accommodate another outside user, such as a commuter or passenger service, then the target level of service delay is established at a level that would have been achieved without introduction of the new service. The iterative process is repeated until a satisfactory result is found.

This is specialized work, and it is generally closely held in the Railway Companies. It is relatively expensive to conduct because the models require considerable amounts of data to set up and calibrate. Many cases need to be evaluated before conclusions can be reached. Published research is scarce.

A seminal work was conducted in 1975 for the Federal Railroad Administration of the US DOT¹⁶ to develop parametric relationships from a large number of simulated cases. The results were successfully tested and became useful for high level studies of specific situations to eliminate fruitless ideas and sharpen up more promising strategies before launching into the more costly step of detailed simulations.

Another application of this work, which was not published, involved using the parametric relationships to estimate impacts on service delays that would arise from introduction and removal of new train services to different lines. The approach was to estimate the impacts on service delay resulting from the desired changes; then to alter input factors so that the original base-case service delay could be restored. The changes most often were in the form of adding infrastructure.

A key concept in the parametric study is that the relationship between delay and volume (all else being held constant) was found to be a straight line that goes through the origin (i.e. a linear equation). The slope of the line relating train delay per train to the number of trains per day is called the "**Delay Slope**". A metric translation of the original version is:

$$\text{Delay Slope} = \text{Interference delay per train per 150 train-km} / \text{trains per day (hours per train-km /trains-per-day)}$$

An illustration of this methodology might make it clearer and easier to grasp its significance to this study. Table 4, below builds upon the examples in Table 3 to include traffic and interference assumptions. The proviso that these are hypothetical conditions, and are not to be construed as representing any real situation remains in force.

- Case 1 represents a busy route through a metropolitan area with some passenger train activity.
- Case 2 represents a typical busy single track main line.
- Case 3 is a main line also, in terms of its functions and condition; it is relatively low density, as in a developing area or access to a mine.
- Case 4 is what its name suggests, a branch line with one train pair every two weeks loaded one way and empty the other.

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¹⁶ Report No. DOT-FR-4-5014-2: Peat, Marwick, Mitchell & Co.; Parametric Analysis of Railway Line Capacity, August 1975, Final Report prepared for Federal Railroad Administration, Department of Transportation, Washington D.C.

Table 4: Traffic and Interference Parameters

| Description | Case 1 Multiple Mixed | Case 2 Primary Main | Case 3 Other Main | Case 4 Branch |
|-----------------------|--------------------------|------------------------|----------------------|------------------|
| Track description | | | | |
| % multiple track | 100 | 30 | 10 | 10 |
| Traffic Control | CTC | CTC | OCS | OCS |
| Bi-directional | YES | YES | YES | YES |
| Slow orders | Low | Low | Med | High |
| Max siding length | 2,100m | 2,100m | 1,200m | 1,200m |
| Traffic | | | | |
| Trains/wk | 275 | 115 | 12 | 3 |
| Peak to average % | 124% | 124% | 124% | N/A |
| Average speed (kph) | 55 | 50 | 35 | 15 |
| Speed variation | medium | low | low | low |
| Average Gtonnes | 2,500 | 5,000 | 5,000 | 2,250 |
| Ann'l GTKm/Km | 80MM | 30MM | 3MM | 300K |
| Interference factors* | | | | |
| Train delay/150km | 0.50 hrs | 0.75 hrs | 0.75 hrs | N/A |
| Delay Slope | 0.013 | 0.046 | 0.440 | N/A |

Note : use extreme caution in referring to these numbers. They are strictly for illustration of relationships within this document. The data are based loosely on averages obtained from Statistics Canada publication 52-216, Rail in Canada for 1998, supplemented with a priori assumptions made by the author.

* Interference factors used here are interpreted from Figures 1 to 6 in the 1975 Parametric Analysis Study for FRA, to be compatible with the other assumptions established for these cases.

Train delay/150Km in Table 4 represents the average interference delay (sometimes also referred to as dispatching delay) over an entire sub-division. Increasing train frequency by one train per day would cause delay to the average train on the line to increase by an amount equal to the “delay slope”. So, if 16 trains per day (roughly Case 2) were increase to 17 trains, then the average delay per train would increase by 0.046 hours, roughly 3 minutes per train. This seems small, but over an entire day it could mean a delay of 45 minutes, which could be enough to cause missed connections and other associated costs.

The direct cost associated with incremental delay is crew wages and fuel consumption in idling, accelerating and decelerating the train. Also spare locomotives and rolling stock are needed to compensate for longer cycle times occasioned by uncertainties and delay.

This analysis is considered inappropriate for a branch line (Case 4) because there is abundant capacity at a level of one train per week. So, in this case, principles and methodology for access pricing will be considered independent of track capacity constraints.

2.2.3 Cost Elements and barriers to agreement

All stakeholders seem to agree that recovery of variable cost for track access is reasonable, although there are different opinions on the definition of “variable”. The American system features prescriptive regulatory measures to deal with uncertainty, while in Canada the move has been toward broader

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policy direction, leaving the details to the parties. Consequently, US practices are a rich source of definitions.

In an ideal world, one could determine a cost for units of capacity and include them in some variable cost formula and build on that. The cost elements might include:

- Infrastructure maintenance (dependent on number, weight and speed of tenant trains)
- Operating costs (e.g. dispatching and control, delays to existing traffic)
- Other components of fixed cost related to infrastructure, for example costs associated with acquisition and ownership of land, environmental mitigation measures, and property taxes; often these are excluded from cost determination and taken into account while dealing with contribution over costs, if at all. (Examples used in this working paper exclude these factors.);
- Capacity use, different alternatives:
 - Consumption cost: economic rent of an asset for the time it is occupied (some attributable proportion of the depreciation, plus cost of capital or economic opportunity cost) – it can be complicated and contentious – this approach is carried forward in this document to represent an upper level of capacity cost;
 - Slot cost: economic rent including the delay costs for displaced traffic – interference delay is dealt with explicitly a separate topic in this document;
 - Stand-alone cost: the equivalent rent of an hypothetical line, that would be constructed to handle the volume of the proposed tenant as the base user of the line; this notion is carried forward to the examples in following sections;
 - Incremental cost: the equivalent cost to construct additional capacity that would be needed to accommodate the additional traffic – this is used in current practice for significant additions to capacity to handle passenger and commuter trains – it is seldom used in isolation, but in combination with some other approach like “capacity consumption”;
 - Traditional Regulatory Costing: the variable portion of depreciation, amortization and cost of capital attributable to the tenant based on statistical analysis of historical relationships of costs to output variables such as Gross Tonne Kilometres and Train Kilometres – passenger subsidies under NTA 1967 used this method;
 - Arbitrary determination from nil to full stand-alone cost: the final result of negotiations is agreement at an arbitrary amount, despite all the science that might lead up to the conclusion.

In the situation that is now being raised before the CTA Review, there are new elements of cost, perhaps intangible in nature, that could enter the scope of analysis. The possibility of a third party carrier gaining access to infrastructure of another carrier in order to increase competition with the owner raises the issues of business risk and a level playing field for all parties.

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The established owner must continue to invest in the line while recovering investment that is already sunk in the system connected to the line. **The approach to business risk in this work is to include it in the capital cost of the owner to allow for risk and exposure to loss of revenue as a result of tenancy.** This in turn requires a mutually agreeable and transparent determination of asset base and cost of capital.

Asset Base

One approach to evaluate the asset base is to use the traditional regulatory costing methods, based on asset book values and statistical determination of variability coefficients. In some low density lines, net market value, or salvage value of the line is used to determine value. The extreme case is to consider a null value for the existing asset, and this is the one used in subsequent examples to develop minimum price thresholds.

The stand-alone approach is oriented to full replacement cost of assets. This would best approximate the situation of a prospective tenant who would otherwise face the alternative of making a new investment. Another way to identify maximum cost levels is to consider only the segment being considered for tenant access, and to prorate investment between host and tenant based on a measure of output (i.e. in this report train-kilometres are used as the measure.). The term **“proportional stand-alone cost”** is used in the following text to represent this approach.

The term “stand-alone cost” in the United States is used in “Bottleneck” situations to refer to the stand alone cost of a tenant carrier over the whole of the route from origin to destination. Segmentation of a movement to isolate the target joint-use section is not accepted for rate-making purposes. “Proportional stand-alone cost” is different in that it refers only on the segment under consideration for competitive access.

Finally, the examples in this text use full replacement cost to determine asset base value. This is consistent with attempting to find a maximum value, or upper limit. It might be argued successfully that net replacement cost should be used instead, to represent depreciated asset value. The point serves only to illustrate that there is a great deal of legitimate room for negotiation on asset values between willing parties.

Cost of Capital

Choice of an appropriate cost of capital, or opportunity cost, is also a maximum and minimum type of problem.

A minimum condition might be represented by the market rate of long term borrowing for a preferred creditor. This takes a minimum view of risk, for example as a secured creditor would do. At the time of this writing, bank prime rates and corporate bond rates are in the vicinity of 7%. For example, a commuter authority paying for track additions would likely encounter this level of cost.

A maximum condition could be the pre-tax hurdle rate that a corporation would use in its internal strategic allocation of capital to non-core, or green-field investments. Corporate hurdle rates are subjective and depend on many factors including business risk. Target rates in the range of 25% to 30% pre-tax are common. This type of situation is appropriate for Greenfield projects that are part of emerging strategies (i.e. not sustaining core business activities).

An example to illustrate the hurdle rate could be the following: initially the company has capital structure of 25% debt financed at an average rate of 7%, and 75% equity at an after tax market target return of 12%, and a tax rate of 35%; if a new investment project were in line with core business strategy (i.e. no risk premium attached), then the hurdle rate would be around 15.6%; an after tax premium for risk around 6% (moderate to high risk) would raise the hurdle rate to around 25%.

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Cost of Capital is a major subject in itself. It goes far beyond the scope of this work. An arbitrary middle ground of 15% is used to develop the base case examples in this report.

An alternative is the prescribed regulatory cost of capital for Canadian railways in determining allowable costs. For purposes of illustration, an elaboration of all these factors could begin to look like the situation depicted in Table 5, below.

Table 5: Cost Scenarios

| Description | Case 1 Multiple Mixed | Case 2 Primary Main | Case 3 Other Main | Case 4 Branch |
|---------------------------------|--------------------------|------------------------|----------------------|------------------|
| Track description | | | | |
| % multiple track | 100 | 30 | 10 | 10 |
| Traffic Control | CTC | CTC | OCS | OCS |
| Bi-directional | YES | YES | YES | YES |
| Slow orders | Low | Low | Med | High |
| Max siding length | 2,100m | 2,100m | 1,200m | 1,200m |
| Investment | | | | |
| New (\$/km) | \$1,500,000 | \$800,000 | \$600,000 | \$500,000 |
| Annual (\$/km) | \$230,000 | \$125,000 | \$95,000 | \$75,000 |
| Base \$/train/km | \$16.08 | \$20.90 | \$152.24 | \$480.77 |
| Maintenance | | | | |
| Annual min/km | \$5,000 | \$3,000 | \$3,000 | \$3,000 |
| Min Var \$/KGTKm | \$0.88 | \$0.88 | \$0.88 | \$0.88 |
| Max Var \$/KGTKm | \$1.87 | \$1.83 | \$2.69 | \$10.28 |
| Operation | | | | |
| Control \$/train-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 |
| Add 2 trains/day | | | | |
| Average characteristics | | | | |
| Extra output ¹⁷ | | | | |
| Trains/wk | 14 | 14 | 14 | 14 |
| GTKM/wk | 5,000,000 | 11,000,000 | 11,000,000 | 5,000,000 |
| Train Km/wk | 2,100 | 2,100 | 2,100 | 2,100 |
| Unit Cost components | | | | |
| Investment \$/trn-km | \$15.30 | \$18.63 | \$70.27 | \$84.84 |
| Mtce \$/KGTKm | \$1.87 | \$1.83 | \$2.69 | \$10.28 |
| Opn \$/trn-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 |
| Delay \$/trn-km | \$0.91 | \$1.32 | \$1.13 | \$0.00 |
| Sub tot - max \$/train start | \$3,328 | \$4,562 | \$12,923 | \$16,390 |
| Capital cost sensitivity | | | | |
| At 5% COC | | | | |
| Invest \$/trn-km | \$7.08 | \$8.46 | \$31.49 | \$40.13 |
| \$/train start | \$2,095 | \$3,035 | \$7,106 | \$9,683 |
| At 30% COC | | | | |
| Invest \$/trn-km | \$29.99 | \$35.83 | \$133.33 | \$169.92 |
| \$/train start | \$5,531 | \$7,141 | \$22,382 | \$29,152 |

Note : use extreme caution in referring to these numbers. They are strictly for illustration of relationships within this document. The data are based loosely on averages obtained from Statistics Canada publication 52-216, Rail in Canada for 1998, supplemented with a priori assumptions made by the author.

¹⁷ Extra output is in relation to the base case conditions previously shown in Table 4.

3. PRACTICE REGARDING PRICES

“Value of service pricing” is the established practice in North American Railroads. The key issue is knowledge about choices by producers and consumers. Shippers and carriers are not on a level playing field, according to shippers. Traditionally, the regulatory approach has been to impose “ceilings” on prices in some relationship to costs, and to intervene only when the customer complained about the behaviour of producers possibly exceeding the limits of fairness. Results do not attract laudatory praise from shippers.

Railways have practiced value of service pricing from the earliest days, and shippers have complained about the practice from about the same time. Railways around the world have also been vertically integrated enterprises, owning and controlling the infrastructure over which they operate. Despite vocal advocates in favour of dis-integration throughout most of the twentieth century, only in the last decade have there been significant moves to separate infrastructure from operations in some parts of the world.

Positions seem to be divided along adversarial lines, with limited direct communication taking place between advocates of opposing sides. One possible reason is that the regulatory procedures for dispute resolution are fundamentally adversarial confrontation and litigation. The spectre of litigation hanging over a negotiation is seldom conducive to open sharing of information.

The examples used in this report attempt to represent both sides of the questions in hypothetical situations.

3.1 Introduction

There are various circumstances where running rights, can be used and the nature of the relationship between owner and tenant can be sensitive to distribution of risks or reciprocity in the relationship between the parties. Three types are described below.

- **Convenience:** mutual agreement between owner and tenant for reasons of improved efficiency, operating convenience, mitigation of exposure to disruptions, municipal relations and other reasons. Usually the owner and tenant are both operating railway companies and there are multiple such agreements in place at any one time (CN and CPR have numerous such agreements with each other and with other connecting carriers). There are established practices for compensation, usually driven by principles of cost sharing. These are operating agreements and usually do not include traffic solicitation privileges for the tenant.
- **Commuter and Passenger:** Intercity passenger services by VIA Rail Canada are covered in legislation, and the rights of access are negotiated within broad guidelines that are confined to variable cost. There are differences between Canada and the United States, but compensation for track access is close to marginal cost in both cases; there will be no further mention of VIA Rail passenger services in this report¹⁸. There are commercial passenger services, such as the Rocky Mountaineer in Western Canada, and commuter services which are in effect commercial tenants of railways and operate in co-production

¹⁸ A Royal Commission on Passenger Transportation covering all modes was completed in 1992. Directions: The Final Report of the Royal Commission on National Passenger Transportation; Minister of Supply and Services Canada, 1992 is in 4 Volumes. Provision of infrastructure for intercity transportation is examined in the report and in working papers that were also made available.

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with freight traffic. These trains represent special circumstances that are expanded below.

- **Carrier:** Submissions to the CTA Review indicate that there is latent demand among captive shippers, short line railways and other related interests to be able to form operating businesses, gain access to existing rail lines and set up alternative competitive services. Possibilities range from individual shippers wanting to operate their own trains without solicitation privileges to carriers who would set up in business to compete with track owners over their own lines. This set of circumstances is the major area of contention regarding rail competitive access.

3.2 Convenience

3.2.1 Description

Convenience arrangements define agreements between consenting equals to share the use of infrastructure to achieve mutual operational advantages and exchange other considerations. Mutual interest and reciprocity are inherent in this class of track access.

Various forms exist in the industry, each designed for specific circumstances to meet the needs of customers. Some examples of terminology and scope of these agreements are:

- Running rights (trackage rights) – one railroad runs over another’s tracks for an agreed charge based on volume (tonnage, axles, cars, or some other acceptable measurement) and a prescribed annual fee. The owner looks after the track and train control; the tenant provides equipment, fuel and operating crews. Solicitation privileges are generally excluded.
- Co-production – two carriers with parallel tracks might pool the operation and operate as one under some circumstances. There are no standard approaches to compensation and risk-sharing; each situation is decided on its own merits and may not even involve compensation for track access (e.g. if both contribute equally to the common pool).
- Reciprocal switching, terminal inter-switching, terminal trackage rights – represent a class of access that has prescribed compensation schemes; competitive disputes can be referred to the Canadian Transportation Agency (CTA) or the in the USA, to the Surface Transportation Board (STB).
- Haulage – the owner hauls the cars of the tenant over its tracks for charges based on volume and service.
- Detours – arrangements that can become active during temporary line outages or disruptions to service. Standing agreements exist in the industry to activate procedures in defined circumstances. Requests for such assistance are seldom denied and compensation is based on a set fee for train miles plus direct incremental expenses.

This is not meant to be exhaustive or definitive. There is probably an appropriate solution for any unique set of circumstances. Also, there is a reciprocal aspect to every one of these situations. Any party to these arrangements is equally likely to be on the receiving end as on the giving end at any time.

Organizationally, the administration of these arrangements is an operational matter, with very little commercial input. The risks are considered minimal, in fact many such arrangements are risk mitigating.

The costs involved vary with circumstances and may involve the following components, but not necessarily all, depending upon nature, purpose and term of the arrangement. A long term trackage agreement could include:

- Economic rent – some share (say 30%, or 50% or % of usage) of the cost of capital applied to the historical asset base expressed as a fixed annual fee;
- Expenses – annual costs are determined specifically for the line as near as possible, including direct overheads (e.g. social benefits, supervision etc.) and then apportioned according to use, it could also be a pre-determined share of actual costs.

Asset valuations are based on historical book values and economic rents are tied to prime market lending rates.

With improvements in information technology and managerial ability to assign costs to activities and objects much more efficiently, there are some instances of simplification of trackage agreements to direct volume related charging mechanisms (e.g. flat fee per car-mile, adjusted periodically).

3.2.3

Negotiation issues

As mentioned above, financial agreements are based on historical costs and book values. The only topic for negotiation in bi-lateral arrangements is the sharing formula and minimum payment provision. In multi-lateral arrangements (e.g. detours, reciprocal switching) there are the equivalent of industry standard practices.

The principal motivations are operational and involve an expectation of mutual gain. If the final terms and conditions of one party are not as attractive as the next best alternative of the other party, then negotiations are concluded and the parties go their separate ways.

Agreements are kept simple (% of costs, fixed fees, or \$/car). Thus measurement is also simple and verification of charges is not an onerous task for either party.

Performance is different; it depends upon good will between the parties at all levels in their respective organizations. In cases where they share track while competing with each other over the shared portion, there can be instances where the owner might temporarily take advantage of a controlling position. However, reciprocity is a key consideration in the long run, and it is not in the interest of either party to initiate a provocative or retaliatory action with enduring consequences.

The term of such arrangements can be from year-to-year, or multi-year. While exceptions exist to prove any rule, the maximum term is around twenty-five years, with renewable options.

3.3 Commuters and Passengers

3.3.1 Description

As mentioned in the introductory paragraphs to Section 3, pricing VIA's intercity passenger trains today is an exercise in costing more than pricing. On the other hand, arrangements with Commuter Railways and other passenger operators are commercial.

The situations in Montreal, Toronto and Vancouver (and potentially the National Capital Region as well) are common in that local commuter rail operating authorities are government agencies acting on behalf of the Provincial Government (AMT, GO Transit, West Coast Express). The agencies own and operate the trains and contract with host railways and others to provide services.

With respect to infrastructure, arrangements include track access (track and stations) and crews to operate the trains. Complete agreements are much more varied and complicated than this would suggest, but the important issues within the scope of this paper concern the infrastructure portion. Provision of crews and all other external arrangements such as ticketing, equipment maintenance etc. are excluded from the scope of this document.

The nature of commuter requirements implies relatively intense activity for bursts of time over short sections of the network. Considerable investment in additional infrastructure has been undertaken over the years, to accommodate today's service in freight, commuter and passenger trains.

Railways, work with the agencies to deal with interference issues operationally, or to plan, finance and build plant additions.

The Rocky Mountaineer is different because it runs over longer distances, covering several subdivisions, at much lower frequency and has longer dwelling time in terminals. The discussion that follows is sufficiently general in nature that commuters and special passenger trains can be considered as similar entities.

3.3.2 Cost Factors for Owner and Tenant

Contracts include compensation for track occupancy of existing track plus financing related additions. The tenant pays for the cost of additions. Charges to the commuter operator are based on historical operating costs and asset replacement values are tied to market-based cost of equity capital.

Other factors in the pricing arrangement are based on output measures such as train starts, train miles etc., and they are based on actual costs incurred in the service, augmented for contribution to overhead attributable to the activities carried out.

The tenant is required to indemnify the host railway and to provide proof of adequate insurance. Adequacy is determined by the host in accordance with counsel from risk management specialists. The amount can be significant .

Business risk to the host is a secondary consideration in this case. Competitive risk to existing and future business is absent because the passenger operator and the host railway are not competing with each other. The risk of disruption to schedules and service performance, leading to loss of revenue is a concern both to the host railway and the tenant. In some instances a formula can be established, in principle at least, to mitigate the risk through mutual performance incentives and penalties.

Infrastructure consumption cost is the contentious negotiating issue: How much money? And, when? And, why do the plant additions have to be made before trains can begin operation? Secondary issues include flexibility to make adjustments in response to changing circumstances, such as sharing in productivity improvements, adjusting schedules, changing operations in stations and boarding/detraining.

Dispute resolution mechanisms are limited in comparison with freight customers. Final Offer Arbitration is a possible recourse in CTA Section 160, but it is not clear how this impacts negotiations as a leverage factor.

Considering that price is a key factor, the following paragraphs provide an illustration of the magnitude of the price discussions.

The text below refers to Cases 1 and 2, multiple- and single-track main line examples. A methodology for evaluating the effects of adding of one train pair each day to the base case is illustrated, using the concepts of service delay as defined herein.

Table 6, below, recaps the salient assumptions for these cases. Maximum and minimum values for certain elements are introduced in Table 6. The maxima reflect full cost recovery at gross replacement values associated with use of infrastructure; the minima are arguably the direct costs incurred as a result of the operation of the trains, based on restricted definitions of cost responsibility.

The two additional trains have the same properties as the average existing train.

Variable cost displays no significant differences between maximum and minimum assumptions, except with respect to track maintenance. The maximum condition includes a proportional share of a fixed amount per year for each sub-division to keep a section crew in place and equipped, plus an allowance for program replacement of rail, ties, ballast, structures, etc.. The minimum condition illustrates short term maintenance based on workload excluding any constant factors.

Investment cost is interesting because it appears to decline on a unit basis with increased traffic, as it should do. If the investment is unchanged as the train density increases, then unit costs decline in inverse proportion with density increase.

The difference between maximum and minimum cost estimates is substantive. The divergence is because of the treatment of track occupancy, a topic which is expanded in the following paragraphs.

Table 6 includes consideration of capital additions to plant to offset interference on account of additional trains. Delay slopes that would be typical for such lines suggest the cumulative weekly delay to all trains would be about 7 hours in CASE 1 and 10.6 hours in CASE 2. In percentage terms, these represent 0.9% and 3.1% of average total transit time in the base case.

Table 6: Commuter Impacts – 14 trains/week

| | CASE 1 Multiple Mixed | | CASE 2 Primary Main | |
|---|--------------------------|------------------|---|---|
| Description | Maximum | Minimum | Maximum | Minimum |
| Track description | | | | |
| % multiple track | 100 | 100 | 30 | 30 |
| Traffic Control | CTC | CTC | CTC | CTC |
| Bi-directional | YES | YES | YES | YES |
| Slow orders | Low | Low | Low | Low |
| Max siding length | 2,100m | 2,100m | 2,100m | 2,100m |
| Traffic | | | | |
| Trains/wk | 275 | 275 | 115 | 115 |
| Peak to average % | 124% | 124% | 124% | 124% |
| Average speed (kph) | 55 | 55 | 50 | 50 |
| Speed variation | medium | medium | low | low |
| Average Gtonnes | 2,500 | 2,500 | 5,000 | 5,000 |
| Ann'l GTKm/Km | 80MM | 80MM | 30MM | 30MM |
| Investment: base case \$/train/km | \$16.08 | | \$20.90 | |
| Maintenance | | | | |
| Min Var \$/KGTKm | | \$0.88 | | \$0.88 |
| Max Var \$/KGTKm | \$1.87 | | \$1.83 | |
| Operation | | | | |
| Control \$/train-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 |
| Add 2 trains/day Average characteristics Extra output ¹⁹ | | | | |
| Trains/wk | 14 | 14 | 14 | 14 |
| GTKM/wk | 5,000,000 | 5,000,000 | 11,000,000 | 11,000,000 |
| Train Km/wk | 2,100 | 2,100 | 2,100 | 2,100 |
| Unit Cost components After addition | | | | |
| Investment \$/trn-km | \$15.30 | | \$18.63 | |
| Mtce \$/KGTKm | \$1.87 | \$0.88 | \$1.83 | \$0.88 |
| Opn \$/trn-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 |
| Delay \$/trn-km | \$0.91 | \$0.91 | \$1.32 | \$1.32 |
| Sub tot \$/train start | \$3,328 | \$662 | \$4,561 | \$1,053 |
| Annual Cost | \$2,423,000 | \$481,000 | \$3,320,000 | \$767,000 |
| Capital Investment to mitigate service delay | | | | |
| Service delay incr – All trains tot hrs/week | 7.0hrs | 7.0hrs | 10.6hrs | 10.6hrs |
| Suppose: | No change | No change | 8,400m (2 new double- length sidings) | 8,400m (2 new double- length sidings) |
| Investment | 0 | 0 | \$6,700,000 | \$6,700,000 |
| Cost per train start | 0 | 0 | \$1,425 | \$1,425 |

Note : use extreme caution in referring to these numbers. They are strictly for illustration of relationships within this document. The data are based loosely on averages obtained from Statistics Canada publication 52-216, Rail in Canada for 1998, supplemented with a priori assumptions made by the author.

¹⁹ Extra output is in relation to the base case conditions previously shown in Table 4.

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It is unlikely that significant additions would be considered in the CASE 1, negotiations would more likely be focused on compensation for delays and discussion would center on detailed discussions of daily operating requirements. Therefore no capacity additions are considered appropriate in this example.

CASE 2 is much more sensitive because the scenario is single track that is very busy at times. A case would likely be made for track additions. A parametric approximation can be useful to narrow the range of possibilities and improve cost resolution in early stages of planning, before launching into detailed simulations.

The steps to follow in such an approach would be the following:

1. Using parametric relationships as developed in the reference cited in Footnote 17, determine the delay slope and the total and average delay to trains for the line without commuter trains. (Computerized versions of the parametric model are available from a proprietary source).
2. Using the delay slope calculations, project total delay with additional traffic; if the incremental traffic will significantly alter the mix of traffic over the line, first recalibrate parametric relationships to determine a new delay slope and total delay with the incremental traffic.
3. Carryout additional trials of the parametric model to estimate, by iterative steps, the amount of operational or infrastructure changes necessary to restore the original level of service delay to existing traffic.
4. Develop rough estimates of alternative mitigating schemes to narrow the choices to those most productive.

While application of the parametric approach is quicker, less costly and more accessible than detailed simulations, it is a supplement to, not a substitute for, detailed simulations. The main purpose in adding such a step is to improve common understanding of the issues and allow both parties to experiment without unduly burdening progress toward mutual agreement.

Table 6 represents one possible outcome of using a model and carrying through steps 1 to 4 above. Adding 2 double sidings represents upgrading the line from 30% multiple track to about 35%, producing a small change in delay slope. The result is a significant investment, sensitive to many factors. Half the investment, e.g. one long siding, might also support a result within acceptable tolerance, but such a determination might require the detailed simulations to be confirmed.

It is also notable from Table 6 that incremental cost of service delay to existing traffic is relatively small in relation to the investment costs required to restore original service delay. For example, the cost of delay at \$1.32 per train kilometre cannot add up to more than \$150,000 per year; in contrast, the remedial investment is in the order of \$7,000,000. Delay cost avoidance alone is far below threshold criteria to justify the investment.

So, why consider the investment under these conditions?

Investment in track and control systems is similar to all modes of transmission and transportation, in that the total investment requirement is determined by service design standards under peak conditions, not average. The justification for the investment is based on the anticipated changes to contribution from business that would be generated,

or displaced by alternative peak supply and demand situations. This is where track capacity enters as a key issue for negotiation in the railway examples.

The actual traffic patterns are both important and significant. Cases 1 and 2 are specified as having a peak-to-average ratio of train production around 125%. This would mean that Case 2 infrastructure would be designed to handle 20 trains per day rather than the average of 16, and that adding a train pair per day would likely mean that the design capacity would have to increase to more than 22.5 trains per day after adjustments for decreased track availability owing to maintenance. Passenger traffic usually coincides with busy periods of operation near major terminals.

Even in such a contrived situation as presented herein, there are options to define capacity that depend entirely on local circumstances outside this specification. For example, if the commuter section is to be closed to freight trains during certain times, then the optimal approach might be a queuing model, to ensure that trains can be stored on and off the line with minimum disruption across the host's network; another method could be based on the slowest train model, and so forth. These are the issues that can only be resolved through detailed planning and dialogue to identify and to mitigate potential congestion situations.

One remedy for negotiation and agreement is to make the distinction between peak and off-peak periods and to consider investment costs separately. Using the single track example in Table 6, suppose that peak levels of demand occur normally within an eight hour period, five days a week; therefore, peak conditions can occur approximately 25% of the time (i.e. forty hours in a seven day week). Suppose also that the existing mix of traffic includes the equivalent of 20 commuter trains a week all within peak periods.

- Peak train production is at the rate of 20 trains per day and off peak train production is at the rate of 15 trains per day, and the average is 16.4 (say 16), initially.
- Adding 2 daily trains increases average production to 18, and peak production to 22.5 trains per day, the off-peak rate is unchanged.
- Suppose further that off-peak service levels could all be met with 20% multiple tracks, but peak service now requires 35% double track.
- Off-peak traffic could be assessed an average share of the total rent of the lower level of investment (e.g. 1/18th of the estimated investment for 20% multiple track).
- Peak traffic would share in the base investment (i.e. at the rate of 1/18th as above), plus each train would incur its pro-rata share of the investment cost to add 15% more multiple track. In this example, almost nine freight trains and all commuter trains would share the extra cost between them – this would result in a higher maximum cost per incremental train start compared with Table 6.
- Minimum costs are not impacted by any of these considerations.

Negotiations inevitably find some grounds for compromise from starting positions on both sides and result in a unique solution appropriate for each case. There will always be common cost to recover somehow from the revenue stream of infrastructure, and the only applicable law in economics is that there is no law to attribute common costs.

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3.4 Carriers

3.4.1 Description

The third set of circumstances is often associated with the “Bottleneck” problem described in Section 2.1.3. The bottleneck problem is concerned only with diversion of existing traffic from a host to a tenant. This report deals with a more general case that pertains also to a tenant operating over a host railway’s track to compete with it for existing and new business.

3.4.2 Cost Factors for Owner and Tenant

There is considerable economic research regarding the natural monopoly characteristics in the rail sector. The research in the US is inspired by the growing controversy over large scale rail mergers and consequential negative impacts on competitive choices for shippers. The dilemma for analysts is: competition, to set prices at optimal levels; versus consolidation, toward a natural monopoly as the lowest cost solution²⁰.

With respect to rail infrastructure, the key practical challenge of open competitive access is to find a way to distribute the business risk in an equitable manner between owners and tenants using a line. The tenants should pay a fair price, and the owner should ensure performance. A price that is fair would leave a reasonable owner indifferent to the ownership of trains operating over the line when allocating scarce resources for maintenance and improvement of the line. A price that is fair would also be an internal input cost for an owner developing prices and service offerings to compete with a tenant.

Open access at marginal cost to the producer is an appealing solution, theoretically. However, determining marginal prices that do not entail subsidies is an intractable problem. The most efficient access price (from a social welfare perspective) is at marginal cost, where supply and demand curves intersect. With increasing returns to scale, this price will always be lower than a price necessary to achieve full cost recovery for the producer of infrastructure.

With respect to the bottleneck situation, examples are being drawn from the telecommunications sector and from oil and gas pipeline transmission. These sectors have recently undergone segregation of trunk line operations from production and local distribution in the United States. Various economic concepts have used in these sectors and are being assessed in relation to the rail bottleneck problem. The one receiving most attention at present is the “**Efficient Component Pricing Rule**” (ECPR)²¹.

The essence of the ECPR for rail carriers is to set the price at a value for which the host railway is indifferent to continuing the entire movement of traffic or hosting only a short portion of the haul from the bottleneck interchange to the customer over its exclusive route. The ECPR establishes that the host carrier should be indifferent at a price that includes its own variable costs plus the total contribution it now earns from the traffic. In other words, if the host carrier’s contribution from the traffic is the same amount under either long haul or short haul, then refusing to admit the tenant would be monopolistic behaviour and abuse of market power.

From the point of view of the customer and the tenant, if the tenants costs are lower over the whole route, and she can make a satisfactory contribution over her variable costs at a price the customer is willing to pay, then an access agreement would be carried out.

²⁰ John Bitzan, Ph.D., Upper Great Plains Transportation Institute, North Dakota State University; Railroad Cost Conditions – Implications for Policy; Prepared for the Federal Railroad Administration, Grant # DTFR53-99-H-00025, May 10, 2000. This document is an extensive study of welfare implications of railroad mergers and competition.

²¹ Eric Beshers, Haigler Bailly Services, Inc.; Efficient Access Pricing for Rail Bottlenecks; Prepared for Volpe National Transportation Systems Center, June 1, 2000. This is a review of some of the key questions surrounding the issue of rail access prices, carried out at the request of the FRA. ECPR and other concepts are described and evaluated.

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This rule, and other similar approaches narrow the scope of uncertainty, but they do not resolve the thorny problem of determining a value for consumption of capacity, or of determining what would be a reasonable contribution for a new opportunity.

3.4.3 Negotiation issues

Risk and reward are the core issues in negotiations. Risk is significant in any situation where a competitor shares one's assets, and it is even more pronounced if solicitation privileges are accorded with the right of access. Some examples are provided in the Section 3.4.4 to illustrate the concerns on both sides.

Other negotiating issues such as duration, amending formula (including flexibility to respond to changing market conditions), termination and dispute resolution would depend on the regime that might be established to bring about the conditions of open access. If the price and performance issues can be resolved such that the playing field is level, then these could become secondary issues.

Risk and reward in respect of contributions over marginal cost, therefore, is the focus of illustrative examples that follow.

3.4.4 Pro-forma examples

Case 2 – Single main track, Case 3 – Single other, and Case 4 – Branch are the examples used below. The “maximum” calculations reflect proportional stand-alone costs, as defined previously; the “minimum” calculations reflect the view of a parsimonious tenant.

Table 7, below, illustrates the financial impact of traffic density. The differences between maximum and minimum price levels are all sufficiently great to stress even the most cordial relationships. Low density situations are counter-intuitive in that the maximum-minimum value approach leads to amounts that can be an order of magnitude apart. In contrast, the natural expectation is for the lower density lines to be priced closer to marginal cost in order to attract business. The hidden factor is exposure to risk.

The maximum numbers provide a quantitative indication of the host's apprehended exposure to risk. Without the threat of revenue loss, a reasonable yet shrewd track owner would welcome any opportunity for increased contribution; such an owner would attempt to settle for the maximum price that the tenant is willing to pay so long as the price is consistent with or higher than other comparable arrangements with “most preferred customers”.

Solicitation privileges and other schemes to enhance competition combined with tenancy alter dramatically the negotiating pressures. The lower density lines are economic burdens on a stand alone basis, but until they become candidates for abandonment, they contribute sufficiently to total network to justify retention. Railways contend that customers on these lines are beneficiaries of differential pricing. When contribution is eroded to an unsustainable level, then abandonment is the only solution. Prospective tenants then would be forced to view the opportunity as prospective owners or else withdraw.

If a tenant intends to solicit traffic that is on the line already, then the US bottleneck situation is analogous. To the extent that costs and contributions of the host railway can be determined, the ECPR represents a solution that ought to preserve the viability of the host. ECPR is not the only alternative way to achieve an acceptable level of comfort or indifference for the owner.

The method used herein relies on determination of the input factors to provide track capacity to a tenant, and incorporating a quantification of business risk and exposure in the same manner a corporation would assess an investment proposal for a new venture, using hurdle rates for capital investment that incorporate risk factors.

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The natural objective of a prospective tenant would be to gain a network at minimum risk and cost. To the extent that there would be a regulatory involvement, the challenge is to find a solution that distributes the risk evenly between host and tenant while establishing a level playing field.

The European approach is third party ownership of track. Progress is evident, though the path forward is strewn with obstacles, and the public sector has a monetary stake in the outcome.

North American rail infrastructure, with few exceptions, is in the private sector, and is financially profitable. Acquisition of rail lines from the present owners would present a major financial challenge that does not appear to be on the public agenda for consideration. Thus self-sustaining solutions are needed, and this would conflict with adoption of a marginal cost type of pricing.

The maximum price limit, using a proportional stand-alone approach, provides one solution to sharing information and distributing risk. It is proposed as a useful reference point. The minimum level based on short term marginal costs is also useful as a reference point at the low extreme.

There are many paths to solutions between these limits. The main point is that the two or three parties (i.e. host, tenant and possibly customer) are the market. The best solution is a negotiated one.

Table 7: Carrier Impacts

| | CASE 2 Primary Main | | CASE 3 Primary Other | | CASE 4 Branch | |
|--|------------------------|------------------|-------------------------|------------------|--------------------|-----------------|
| Description | Maximum | Minimum | Maximum | Minimum | Maximum | Minimum |
| Track description | | | | | | |
| % multiple track | 30 | 30 | 10 | 10 | 3 | 3 |
| Traffic Control | CTC | CTC | OCS | OCS | OCS | OCS |
| Bi-directional | YES | YES | YES | YES | YES | YES |
| Slow orders | Low | Low | Medium | Medium | High | High |
| Max siding length | 2,100m | 2,100m | 1,200m | 1,200m | 1,200m | 1,200m |
| Traffic | | | | | | |
| Trains/wk | 115 | 115 | 12 | 12 | 3 | 3 |
| Peak to average % | 100% | 100% | 100% | 100% | n/a | n/a |
| Average speed (kph) | 50 | 50 | 35 | 35 | 15 | 15 |
| Speed variation | low | low | low | low | low | low |
| Average Gtonnes | 5,000 | 5,000 | 5,000 | 5,000 | 2,250 | 2,250 |
| Ann'l GTKm/Km | 30MM | 30MM | 3MM | 3MM | 0.3MM | 0.3MM |
| Investment: base case \$/train/km | \$20.90 | | \$152.24 | | \$480.77 | |
| Maintenance | | | | | | |
| Min Var \$/KGTKm | | \$0.88 | | \$0.88 | | \$0.88 |
| Max Var \$/KGTKm | \$1.83 | | \$2.69 | | \$10.28 | |
| Operation | | | | | | |
| Control \$/train-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 | \$1.30 | \$1.30 |
| Add -- trains/week | 3 | 3 | 3 | 3 | 3 | 3 |
| Average characteristics | | | | | | |
| Extra output | | | | | | |
| GTKM/wk | 2.3MM | 2.3MM | 2.3MM | 2.3MM | 1.0MM | 1.0MM |
| Train Km/wk | 450 | 450 | 450 | 450 | 450 | 450 |
| Unit Cost components | | | | | | |
| After addition | | | | | | |
| Investment \$/trn-km | \$20.37 | | \$121.79 | | \$240.38 | |
| Mtce \$/KGTKm | \$1.83 | \$0.88 | \$2.69 | \$0.88 | \$10.28 | \$0.88 |
| Opn \$/trn-km | \$1.30 | \$1.30 | \$1.30 | \$1.30 | \$1.30 | \$1.30 |
| Delay \$/trn-km | \$0.87 | \$0.87 | \$0.79 | \$0.79 | \$0.0 | \$0.0 |
| Sub tot \$/train start | \$4,750 | \$990 | \$20,600 | \$970 | \$39,700 | \$492 |
| Annual Cost \$,000 | \$741,000 | \$154,000 | \$3,210,000 | \$151,000 | \$6,200,000 | \$77,000 |
| Capital Investment to mitigate service delay | | | | | | |
| Service delay incr – All trains tot hrs/week | 2.3 | 2.3 | 2.3 | 2.3 | N/A | N/A |
| Suppose: | 1 siding | 1 siding | nil | nil | | |
| Investment - additional Cost per train start | \$1,700 | \$1,700 | | | | |

Note : use extreme caution in referring to these numbers. They are strictly for illustration of relationships within this document. The data are based loosely on averages obtained from Statistics Canada publication 52-216, Rail in Canada for 1998, supplemented with a priori assumptions made by the author.

4. CONCLUSIONS

Negotiation between consenting parties is the fundamental process regarding access to railway property to operate trains. Problems and complaints about access generally stem from failure of the parties to agree on price.

People can see rail lines in many regions of this Country. Most often they see them empty. It is difficult for the public to grasp why it should be so expensive to organize and operate trains over these “empty” lines.

The previous sections of this report demonstrate that the problem is multi-faceted and fraught with many complex inter-relationships that are dynamic and sensitive to changing circumstances.

Almost all real situations require someone to build a model of the operation and establish quantitative objectives (the model could be a mental picture, some numbers on the back of an envelope, a spreadsheet, or an elaborate computerized simulation). Once the model is in place, the challenge becomes finding the common ground for communication.

Three questions are raised in Section 1.1.1, as follows:

1. Is there one solution that fits all? Or, is a multiple-choice suite of solutions more appropriate?
2. Is there a creditable way to define key issues so as to achieve a common understanding among a wide variety of interests?
3. Is it possible to find a common language, or terminology and mutual understanding of the problems and opportunities for all participants?

There does not appear to be one answer, or even one process to arrive at answers. Different needs and different situations call for different approaches, and there is a gamut of choices to pick from. Communication, mutual understanding and sharing of pertinent information are essential ingredients and solutions are often found in the presence of these qualities. However, such an approach is at odds with the adversarial model of dispute resolution that exists in regulatory and legislative processes in Canada and the US.

The second question remains open for assessment. The attempt in this work is to offer suggestions for methodology based on past and current experience. Understanding of capacity consumption and the nature of investment risk in rail infrastructure are crucial to setting fair prices.

The third question must be answered in the affirmative if good-faith negotiations are accepted as the key process by which to move forward. A suggested process for establishing negotiations, maintaining a level playing field and encouraging participants to work through problems together is shown in [Figure 2, below](#), Track Access Pricing Process.

Step 1 identifies the opportunity and opens discussions between a competent tenant and the host. A request should be specific in terms of points covered, the services that would operate and the rights and privileges being sought. The details should include the types of information that are needed to analyze train interference, as indicated in Section 2.2.2.. Ancillary services such as yarding of trains should be included.

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Step 2 provides for the host to evaluate the request, set up parametric or other models to provide the basis for collaborative evaluation of options. This step is primarily operational, to get the base definition of service correctly specified.

Steps 3 and 4 clarify the purpose and prepare both sides to begin discussion of price, risk and service issues. The upper and lower limits prepared for both parties to share and use as reference in negotiations that would ensue during Step 5.

Disclosure – how much information? to whom? and, when? – will be a critical concern of both parties. The analytical work is likely to be carried out by the host, but the tenant needs to know and be able to understand the key assumptions and how they are used in the methodology to estimate delay and interference parameters and other operational consequences of joint operation.

Business risks and other commercial considerations are crucial to determining that point at which a reasonable host would be indifferent to exclusive or shared access. Disclosure on these topics should be restricted to methodological exchanges. It is understood that commercially sensitive information should remain private with the respective parties.

If agreements are reached, then implementation can proceed. If not, then a dispute resolution process would be activated at the request of the parties in Step 6. Some form of mediation, conciliation or collaborative problem solving with a third party who is mutually trusted and respected for technical competence, is envisaged. The guidelines for facilitation can be drawn from National Transportation Policy in Section 5 of the CTA.

If within a prescribed time the parties reach agreement, then implementation can proceed. If not, then a binding arbitration process in Step 7 would result in a prescribed solution or a declaration that there is no basis for agreement and access is denied.

Methods and practices for pricing railway track access are likely to receive considerable attention in the immediate future, and there is much to be learned from monitoring the nature and pace of change happening in Europe and North America.

Figure 2: Track Access Pricing Process

