

***Illustration of Financial Impacts on
System Stakeholders***

Prepared for:

Rail Freight Service Review

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1. Purpose of the Project

On May 30, 2007, the Government of Canada announced the introduction of a Bill, which contained improvements to the shipper protection provisions of the *Canada Transportation Act*. The announcement also indicated that the government would undertake a review of rail freight service.

The overall objectives of this review are to:

- Conduct a review of the rail-based logistics chain (including shippers, terminal operators, ports, and vessels), with a focus on service provided to Canadian shippers and customers by Canadian National Railways (CN) and Canadian Pacific Railway (CP) within Canada, including to and from ports and border crossings;
- Identify problems and issues with respect to railway service including those stemming from other elements of the logistics chain;
- For shippers located on shortline railways and experiencing problems with rail service, examine the relationship between shortline and main line carriers to determine whether such problems are attributable to service, operating, or marketing practices of the main line carriers;
- Identify best practices and how these can be expanded to address service issues; and
- Make recommendations on how to address these problems and issues, including both commercial and, if necessary, regulatory solutions.

The review is being conducted in two stages. The first stage consists of quantitative and analytical work. In the second stage, draft recommendations are being developed by a Panel of three eminent persons based on the results of the analytical phase and any other relevant information that is available. The Panel will consult stakeholders on the draft recommendations and submit a final report to the Minister of Transport, Infrastructure and Communities.

On July 24, 2008 Transport Canada released the terms of reference for the quantitative and analytical stage of the rail freight service review. This report has been prepared in response to the requirements of the Request for Proposals covering the description of financial impacts on system stakeholders. The objective of this report is to provide a general description of the type and magnitude of financial impacts that various system stakeholders, including shippers, receivers, terminal operators and railways experience when there are problems with the rail-based logistics chain in Canada. This report is not intended to be comprehensive in nature but rather to provide quantified illustrative examples of such impacts.

2. Overview

During the course of stakeholder consultations undertaken as part of the Rail Freight Service Review work QGI met with a number of stakeholders to discuss the types of problems that can occur in the Canadian rail freight logistics system and the nature of the operational and financial impacts that result when these problems occur. A select group of stakeholders were asked to provide quantifiable examples of these impacts based on their past experience. In order to present a balanced view of system problems and impacts QGI looked to obtain examples from various industry sectors that reflected the experience of each major stakeholder group. The examples illustrated in this report reflect problems encountered by railway shippers and receivers, terminal operators and railways.

The cases illustrated in this report have been provided to QGI by individual system stakeholders including: three shippers from the manufacturing, forest products, and grain sectors respectively; one warehousing and distribution company; a port based grain terminal operator; and a railway. In some instances the examples are based on specific events experienced by individual stakeholders. In other cases they describe more general situations or conditions that occur from time to time and have a negative impact on one or more stakeholders within the rail freight logistics system. Although some of the events described in this report occurred within the service review period (October 2006 – September 2008) some occurred prior to or following this period.

Quantification of the financial impacts is based on data provided by the stakeholders. In many instances cost impacts are presented at an aggregate or summary level in order not to divulge proprietary commercial information. In all cases the cost data has been reviewed by QGI and discussed with stakeholders as necessary. Furthermore in some cases QGI has altered some specific event data such as dates and locations in order to protect the confidentiality of individual stakeholders.

3. Shippers

The three shipper examples described below include:

- a value added manufacturing company that relies on railway service to support just in time inventory management and logistics operations for the shipment of small lot sizes to customers located in Canada and the United States;
- a major bulk grain shipping facility located in Western Canada that is highly dependent on railway car supply and transportation services in order to balance inbound delivery of grain from producers and the shipment of grain to port terminals for vessel movement to final export destinations; and
- a large forest products company shipping lumber from several lumber mills to receivers in Canada and the United States.

3.1 Value Added Manufacturer

A medium sized manufacturing company located in Western Canada produces and ships value-added products by rail directly to wholesalers and to warehouse operators for subsequent distribution in both Canada and the United States. The products are produced in bulk and typically shipped by rail in specialized hopper cars. The shipper has invested in its own fleet of rail cars to reduce its reliance on railway supplied cars particularly for supplying long term customers in specific markets. The size of the rail car fleet was established jointly by the shipper and its railway partner based on annual shipment volumes, the expected cycle times¹ for cars based on the destinations to be served and the storage capacity at both the shipper's plant and receivers' facilities. Consistent rail service at origin and total rail car cycle times are important to ensure the smooth flow of product to customers and manageable finished product inventory levels at the production facility.

Description of Event

During a three month period in the winter of 2008-2009 this company received inconsistent rail service that had a direct impact on its plant operations, logistics costs and the relationship with its customers. Poor railway service with respect to loaded transit times and timely spotting of empty cars during this period resulted in extended periods of inadequate supply of empty cars to meet the shipper's needs. This resulted in the plant having to interrupt production repeatedly due to lack of on-site storage capacity and to use truck transportation in order to continue meeting its customers' needs. Whereas this product is normally shipped in bulk in rail cars, truck movements require the shipper to transfer the product into bags at significant cost. In addition to the production and shipping problems experienced

¹ A freight car cycle is a measure of the elapsed time for the movement of a car including the time for each segment of a car trip. The segments include time in loading, loaded transit, unloading and empty transit to its point of next loading. Car cycles for individual fleets are generally computed by summing the time spent by all cars for all car trips in each cycle segment and dividing by the total number of car movements in that segment. The weighted average times for all segments are then added together to produce an average car cycle number.

by the company its customers were also negatively impacted. The shortage of rail car availability for loading and delays in the movement of loaded cars to destination resulted in product shortages being experienced by the company's customers. This resulted in receivers needing to purchase substantially more expensive substitute products in order to meet existing contractual obligations and maintain service to their customers – a cost ultimately absorbed by the shipper.

Financial and Operational Impact

During the three month period in question production at the manufacturing plant was interrupted repeatedly over the course of multiple days – in many instances more than once per day. This resulted in significant production downtime and more than 100 hours of lost labor productivity when maximum storage capacity was reached and no rail cars were available for loading. In order to minimize the financial impact of this lost production and to try and continue serving its customers the plant opted to bag product and ship it by truck. During this three month period the company shipped more than a dozen truckloads of product to its customers. As noted earlier these actions still did not meet the needs of its customers who were required to purchase substitute products from local suppliers.

The total financial impact on the manufacturing company of this extended rail service failure is estimated to be more than \$125,000 when lost plant productivity (60%), trucking costs (30%) and product substitution costs (10%) are included. This estimate does not include the ownership costs associated with the shippers' investment in its rail car fleet, lost market opportunities due to reduced plant production or any potential long term financial losses that may result from damage to the company's reputation as a reliable supplier.

3.2 High Throughput Country Grain Elevator

A typical high throughput country grain elevator operation must coordinate the activities of buying, gathering, elevating, blending and rail car loading and shipment. For many elevators weekly operations are anchored on planned railcar loading with other operations, including the receipt of grain by truck from farms, being scheduled around this activity. In fact for most elevator operations when railcars are being loaded, particularly large blocks of cars such as those loaded at high throughput elevators, all other operational activities including the receipt, elevation and blending of grain are stopped. This is due in part to the operational mechanics of the elevator systems but more so because all operational staff are required to be involved in rail car loading activities. The delivery and receipt of grain from producers is generally scheduled during periods when rail cars are not being loaded. The timeliness of railway service is therefore a key factor in the elevator's overall operational efficiency.

The grain company's transportation and logistics group, usually managed from the company's corporate office, is responsible for the ordering of rail cars and overall coordination of logistics activities with railway and elevator management. This includes scheduling of car spotting and pickup activities, making arrangements with producers to purchase and deliver grain and ensuring the appropriate staff is on site to support these activities. Some grains also

require coordinating a qualified grain inspector's participation in the loading process. The loading of a 100-112 car train at a high throughput elevator is normally planned to require 24 hours of the elevator's time. The failure of the railway to deliver empty cars for loading on the planned days at the expected times can result in negative impacts on all other elevator activities.

Description of Event

In the example provided by this shipper a 100 car train was planned to be spotted for loading at the elevator at 0800 on a Saturday morning. The planned delivery of the empty cars at this time had been scheduled by the railway and communicated to the grain company as part of its normal operations planning a number of days earlier.² The facility has a capacity of 25,000 tonnes and was approaching its working capacity - normally estimated at 65% of the storage capacity – making the timely loading of this train important to avoid capacity constraints in receiving additional grain deliveries. As Saturday is not a normal working day for most operational staff (the elevator would normally schedule some staff to receive producer grain deliveries on weekends) the planned rail car loading required the scheduling of 5 operational and 1 clerical staff.

The train did not arrive as scheduled that morning. This resulted in local elevator management personnel contacting the company's transportation and logistics group who in turn made numerous attempts to contact the railway. Calls to the local railway operations staff were eventually returned and the logistics group was advised the train would not be delivered that day. Later that same day the grain company was advised by the railway's customer service department that the train would be spotted for loading the following morning. The loading crew was rescheduled for the next day and the railway, without advance notification, once again failed to deliver the cars. The railway subsequently scheduled the train for delivery on Tuesday two days later. The train was ultimately delivered for loading on the following Saturday - a full week later than originally scheduled.

Financial and Operational Impact

These repeated railway service failures resulted in negative impacts on the grain company in two areas. First the company suffered lost productivity stemming from: labor costs related to the scheduling of elevator personnel at overtime rates on the initial weekend; unproductive employee time when grain deliveries were suspended and no rail car loading occurred on the Tuesday; and costs related to the scheduling of qualified grain inspectors.³

² On a weekly basis, CN and CP review orders submitted by grain shippers and confirm to shippers the car demand that is accepted at each location. They then develop and communicate their operating plans which identify the specific days that each railway is scheduled to deliver rail cars to each shipper facility. CN's Planned Service report is available via the Internet on Thursday and is sent out via fax on Friday morning preceding the grain service week that begins on the following Sunday. CP currently advises grain shippers with its Final Service Plan on the Wednesday preceding the next grain service week.

³ Some grains, depending on the destination, must be inspected by a qualified inspector contracted by the grain company. The amount of grain requiring inspection is estimated to represent approximately 25% of all grain loaded. A typical inspection charge is \$45/ car and the grain company will typically be charged by the inspection company, albeit perhaps at a lower negotiated rate, in cases where the train does not arrive for loading as scheduled.

Secondly, local management, on the assumption rail cars would be loaded on the initial Saturday, had scheduled several producer deliveries for the Monday and Tuesday of that week. Unable to load the cars as scheduled and with the elevator approaching its operating capacity, a number of these planned deliveries had to be rescheduled for later in the week. In several cases producers with whom delivery arrangements had been made elected to sell and deliver their grain to competitors' elevators.⁴ As this grain was already scheduled for the following week's rail shipments and planned for previously contracted international sales for which the price, premium and grade had already been negotiated the elevator was required to source alternative product at a higher cost⁵ in order to meet its contractual obligations. This situation was further compounded when the elevator had to suspend grain deliveries scheduled for the following Saturday to allow for train loading resulting in more producers exercising their prerogative to deliver their product elsewhere.

The short term financial impact of this single event is estimated at approximately \$10,000 when lost labour productivity (50%) and incremental costs associated with sourcing replacement grain (50%) are included. These costs are limited to the single occurrence described in this example. However, the impact of this type of service failure for not only this shipper but the grain industry as a whole is thought to be much more significant. This shipper estimates that its railway partners fail to deliver the planned number of cars to an elevator on the planned day approximately half of the time. Furthermore QGI, in its case study examination of daily car supply performance for grain shippers determined that CN and CP successfully delivered 100% of planned cars on the planned day only 12 – 21% of the time.⁶

3.3 Forest Products Shipper

Forest product companies in Canada generally sell lumber into North American markets in either truck lot or rail car lot sizes. The typical industry terms of sale provide the purchaser with the lower of the market price applicable in the week the product was committed to be shipped or the week the product was actually shipped from the mill. In times of declining market prices these terms of sale place all financial risks associated with delays in origin loading on the lumber producer. Similarly in a market where prices are rising and delays are incurred in shipping at origin the purchaser would be entitled to the lower price applicable in the week the product was committed to be shipped. For many forest products companies that have a high dependence on rail transportation these commercial terms bring added importance to the level of car demand fulfillment and the timeliness of car supply by their railway partners.

⁴ Grain companies will sometimes "contract" with a producer to buy grain under certain conditions which may contractually obligate the producer to the grain company. Most often though, if the grain company reschedules the delivery or turns the producer away from the elevator, as was the case here, the producer is free to sell and deliver his grain to any other elevator.

⁵ The grain company was required to pay higher trucking and grade premiums to secure the necessary grain on short notice.

⁶ Analysis of Railway Fulfillment of Shipper Demand and Transit Times, QGI Consulting March 2010

As was described in QGI's report on railway car ordering systems and processes⁷ forest products companies place their orders for cars on a weekly basis and may input those orders a number of weeks in advance of when the cars are required.⁸ Each railway requires the shipper to confirm final order levels the week prior to when the cars are to be delivered. CN forest products customers order rail cars through CN's Guaranteed Car Order (GCO) program and the railway commits to the number of orders it will fulfill by day of the week. For CP there is no guarantee of supply either on a specific day or within the order week.

The example described below does not pertain to a specific event but rather describes a common situation faced by lumber shippers and is intended to illustrate how failure to receive timely car supply in a volatile commodity market can have negative financial consequences for a shipper.

Description of Event

In the example provided, lumber prices in the North American market are declining at a rate of approximately 2.5% per week resulting in a reduction in prices of approximately 10% during a five week period. During this period, the company has initially ordered 500 rail cars per week - consistent with its historical weekly order and loading patterns – for a total of 2500 cars. In the first week the railway supplies only 400 cars or 80% of the requested cars resulting in a shortfall of 100 cars. Given the initial shortfall the company then increases its order size for the subsequent four week period in an attempt to recover the lost volumes. Capacity limitations at origin prevent the company from recovering the full 100 car shortfall in a single week but rather it must distribute the incremental car orders over the following four week period. The railway is successful in fulfilling 100% of orders for the subsequent four weeks and, for the five week period in total, supplies all 2500 cars originally ordered.

Financial Impact

As is illustrated in the table below, the shortfall of 100 cars against orders in the first week presents the company with a potential revenue loss of \$3.2 million dollars if it is unable to recapture this volume of shipments in subsequent weeks. In each subsequent week the company is able to recover a portion of the shortfall but based on the terms of sale, is obligated to adjust the price weekly to reflect the current market price which has fallen each week through the period. By the time the company is able to recover the initial shortfall of 100 cars, the price has fallen by more than 10%. Therefore, while the company's total demand for cars was met over the five week period, the delay in the provision of the cars on a week to week basis combined with declining market prices results in a significant financial loss to the company.

⁷ Railway Car Order and Car Supply Processes, QGI Consulting March 2010

⁸ CN's Guaranteed Car Order program allows shippers to order cars up to four weeks in advance whereas CP's Delta car order program allows shippers to order cars up to three weeks in advance.

	Cars Ordered	Cars Supplied	Cumulative Car Surplus (Shortage)	Price of Lumber \$US/MFBM ⁹	Market Value of rail car load of Lumber ⁽¹⁾	Revenue Loss Due to Price Adjustment and Car Shortage	Comment
Week 1	500	400	(100)	\$300	\$32,700	-	If not recovered in subsequent weeks total loss = \$3.2 million
Week 2	525	525	(75)	\$292	\$31,828	\$21,800	Recovered 25 car loads from Week 1
Week 3	525	525	(50)	\$285	\$31,065	\$19,075	Recovered 25 car loads from Week 1
Week 4	525	525	(25)	\$278	\$30,302	\$19,075	Recovered 25 car loads from Week 1
Week 5	525	525	0	\$271	\$29,539	\$19,075	Recovered 25 car loads from Week 1
Net revenue loss						\$79,025	

(1) Based on 109M board feet of lumber per car.

It is noted that if this shipper had ordered its cars through CN’s GCO program and had all 500 cars guaranteed by the railway in week 1, it would have received \$10,000 in penalty credits from the railway defraying approximately 12% of its net revenue loss.¹⁰ If this shipper had ordered its cars through CP’s Delta car order program it would receive no compensation for the shortfall as CP does not guarantee car supply to its shippers and pays no penalties in the event that it fails to supply cars against all confirmed orders within the order week.

⁹ Lumber volumes in North America are customarily sold by grade and type according to a standard volume measure of a “board foot.” A board foot is the equivalent volume of lumber as a board one foot wide, one foot long, and one inch thick. Therefore MFBM stands for “1000 board feet”.

¹⁰ The penalty system for the GCO program operates on the basis of debits and credits accumulated by the railway and the shipper. The GCO program is invoiced or paid out by CN monthly based on the net debits and/or credits accumulated by the order party.

4. Warehouse and Trans-load Operator

Significant volumes of rail traffic in Canada are shipped to warehouses or trans-load operators, all of whom are as dependent on rail service as shippers. The example below discusses the challenges faced by a warehousing and distribution company with a high dependence on rail service for inbound shipments and to a lesser extent for outbound shipments.

The company, with operations in Central and Western Canada as well the Eastern United States, relies heavily on railway service for delivery of loaded boxcars to its distribution centers and the outbound shipment of rail cars and domestic intermodal containers. The company handles a wide range of commodities including pulp and paper, grocery and retail goods, chemicals and pharmaceuticals. The company receives products at its facilities where they are warehoused, consolidated, sorted, repackaged and then distributed based on their customers' requirements.

Although the company operates a number of facilities, the example described below involves the company's Toronto area warehousing and distribution operation. The facility has a rail siding capable of holding 8 standard box cars, although a typical switch will see 7 cars spotted at one time. The facility operates 7 days per week, 18 hours per day and the siding is accessible to the railway 7 days per week, 24 hours per day. The facility receives approximately 57% of all inbound traffic by rail and ships approximately 5% of its outbound traffic by rail. Inbound traffic volume in 2008 was approximately 1,600 rail cars representing an average of 135 cars per month or 6.3 cars per day, based on five switches weekly. In 2009 average daily volumes were comparable at an average of 6.2 inbound cars per day.

The facility plans its daily operations based on shipment tracking data provided by their customers through electronic data interchange (EDI) as well as the loaded and empty car spotting information provided by email and fax by the serving railway.

Description of Event

Between January 2007 and November 2009 the company's serving railway reduced or changed local switching services to the distribution center on three separate occasions. In January 2007 service was reduced from 7 days per week to 5 days per week (Monday – Friday). In August 2008 the switching schedule was changed with Tuesday and Thursday service replaced by service on Saturdays and Sundays. Finally in November 2009 service was further reduced to four days per week (Friday, Saturday, Monday, and Tuesday). These changes were made unilaterally by the railway without consultation with the shipper and with little advance notice provided.

Financial and Operational Impact

The operational and financial impacts described below relate specifically to the rail service the company experienced in 2008. Beyond the repeated reductions in scheduled service frequency the company also experienced numerous instances of missed or incomplete switch assignments resulting in some instances in only a portion of the required cars being spotted and in some cases no cars at all. The shipper believes this is a result of increased workload on switch crews resulting from local reductions in operating personnel. In many cases the railway switch crew was unable to complete all planned switching activity within their assigned eight hour shift.

As a direct result of the level of rail service the company’s operations were impacted in a number of ways:

- the railway failed to switch the company on 38 separate occasions impacting the delivery of 266 rail cars;
- the company’s operations were repeatedly disrupted resulting in lost labor productivity estimated at more than 750 man hours and reduced asset productivity for its tractor and trailer fleets related to delays on some 800 truck delivery shipments waiting for rail car deliveries;
- lost revenue opportunities associated with planned backhaul movements tied to truck deliveries originating at the distribution center;
- despite a relatively consistent shipment pattern from its customers of 2 – 7 cars per day the company experienced repeated significant backlogs of up to 20 or 30 cars on individual days; and
- the company incurred an estimated 1400 days of demurrage on rail cars not delivered in a timely manner by the railway.

The company estimates the financial impact of these service failures in 2008 to be \$240,000 when lost productivity for equipment and operations personnel and rail car demurrage are included.

Item	Total
Lost warehouse productivity resulting from missed rail car deliveries	\$ 20,000
Rail Demurrage cost	\$ 120,000
Lost tractor and trailer productivity	\$ 100,000
Total Financial Impact	\$ 240,000

These costs do not reflect any long term costs the company may incur as a result of customer dissatisfaction caused by the delay of freight or damage done to the company’s reputation as a reliable service provider.

5. Terminal Operator

The majority of bulk rail traffic such as grain, coal or potash is shipped by rail to port terminals for loading to ocean vessels for subsequent movement to export destinations. The following example illustrates the impact on a grain terminal located at the Port of Vancouver of railway service failures in the timely spotting of grain cars for loading at country elevator locations.

The grain company's transportation and logistics group is responsible for managing the supply chain from country origination through to delivery at final destination by the ocean vessel. For the inland portion of the movement this group coordinates all planning activities for the movement of grain to port working with the company's marketing group, individual country elevators, and railway and port terminal personnel. The port grain terminal receives grain by rail from country elevators and dries, cleans, blends and loads grain to vessels for export. While weekly terminal work plans are anchored on the scheduled arrival times for ocean vessels, the coordination of train arrivals is an important part of the planning process so as to ensure the right grain is in position for loading to the right vessel at the time the vessel arrives. This involves the coordination of inbound trains, the preparation and physical positioning of the grain in the elevator facility and the berthing of vessels to the terminal's docks. Unlike a country elevator, the size and design of a typical port terminal allows for railcar unloading, vessel loading and internal processing of grain to occur simultaneously.

As part of its planning process the grain company shares vessel line up information, including changes in expected vessel arrival dates, with the railways' planning groups on an ongoing basis. The loading of trains and individual blocks of cars at origin elevator locations are often planned based on expected vessel arrival dates and take into consideration the expected inland transit time based on the company's prior experience with shipments in specific corridors.

Description of Event

In the example provided a sale of 28,000 tonnes of grain was arranged between a Canadian grain company and a foreign buyer for transit by ocean vessel from the Port of Vancouver. The contract period was November 15-30, meaning that the vessel bill of lading date must fall within those dates in order to avoid contract extension penalties. If the bill of lading date was after November 30, the grain company would be subject to a penalty as follows:

- 1-4 days late: 0.5% of sale value
- 5-6 days late: 1.0% of sale value
- 7-8 days late: 1.5% of sale value
- 8+ days – negotiated contract default settlement.

There are two major sources of financial risk for grain marketers; contract penalties as noted above and vessel demurrage. Vessel demurrage is charged when ship loading is delayed beyond the period that has been contracted for as determined in the charter agreement.¹¹

The grain for this contract sale was planned to be sourced from six different country elevators each of which was served by the same railway. Based on an expected vessel arrival date of November 18th, the grain company planned to load rail cars in the country during a four week period from late October to mid November with all rail cars expected to arrive at Vancouver no later than November 25th. This estimate assumed an average transit time to Vancouver of between 4 and 6 days thus providing a 5 day buffer for unanticipated problems or delays.

The grain company placed orders with the railway for 310 cars to be spotted for loading at the six designated origins during the four week period. The railway failed to supply the full allotment of empty cars ordered in each of the four weeks during the planned loading period resulting in 60% of the cars incurring a one week delay in loading. Furthermore the final allotment of cars supplied by the railway, representing 50% of the total volume, was not spotted for loading at the country elevator until the week following the last planned loading week. This delay effectively eliminated the 5 day buffer the grain company had included in its logistics plan. Due to the late supply of cars by the railway, the final block of cars was released loaded for movement to Vancouver 7 days prior to the end of the contract period. While the cars moved to Vancouver within the range of expected transit times they incurred delays of up to 6 days in being placed for unloading at the port terminal. Despite repeated daily communication between port terminal personnel and local railway operations personnel, the railway failed to execute its switching plan for these cars on three consecutive days. The last cars required to complete the sale were spotted by the railway and loaded to the vessel 5 days after the expiry of the contract period.

Financial and Operational Impact

The delays in supplying empty cars for loading at the country elevator locations, combined with the delays in local switching at the destination terminal were directly responsible for delays incurred in vessel loading. In addition the failure of the railway to supply rail cars as planned during the four week loading period caused congestion in the country elevator network and disrupted other elevator operations.

These service failures resulted in the grain company exceeding the defined contract period for vessel loading. As a result, the grain company incurred penalties totaling more than \$175,000 consisting of contract extension penalties (30%) and vessel demurrage charges (70%).

Delays to individual shipments, such as is illustrated in this example, can result in downstream impacts on other traffic flowing through a port terminal. The terminal in this example loads 1.5 vessels weekly, with a total average loading of

¹¹ Depending on the demand for ocean vessel capacity demurrage charges can exceed \$40,000 per day and as a result vessel charter contracts between shippers and ocean carriers will often calculate demurrage charges in hours and minutes.

45,000 tonnes weekly¹². When traffic planned for one vessel is delayed enroute to the terminal, it requires the work plan for all traffic to be adjusted. When the railway fails to meet planned times for placement of loads at the terminal on multiple occasions, as was the case in this instance, it can result in continual rescheduling of plans for individual ship loading. While not included here, the shipper estimates the delays incurred in the loading of this particular vessel contributed to delays on two other vessels.

¹² Vessel loading estimates are based on an average for the Port of Vancouver grain terminals for the 2007-08 crop year.

6. Railways

Railways can incur additional operating costs or incremental investment costs as a result of failures in the rail logistics system or the operating practices and behaviours of other system stakeholders. The examples discussed below describe the operational and financial implications for railways resulting from three issues: five versus seven day per week unloading operations; cancellation of confirmed car orders by shippers; and disruptions to unloading operations at bulk commodity terminals. For some of these examples the discussion of financial impacts does not reflect direct short term operating costs associated with a single event but rather looks at the investment cost of assets that railways would need if they were required to, or decided to, add additional capacity to compensate for such disruptions to operations.

6.1 Five versus seven day operations

CN and CP, as well as many of their customers, operate seven days per week and in many cases twenty-four hours per day. Some of the railways' customers however only operate five days per week – typically Monday to Friday. The following example describes a situation where the normal five day per week operations of the customer creates problems for the railway and results in additional operating costs and higher levels of investment than would otherwise be required.

Description of Event

This example looks at a recent 30 day period for shipments of pulp destined to the Greater Vancouver area. A number of rail served trans-shipment facilities in the Vancouver lower mainland receive and trans-load pulp from highway trucks and railway box cars into export ocean containers or load to ship in breakbulk, in order size lots. These facilities receive their product from a number of different pulp mills owned by multiple shippers. Whereas the producing mills ship to these facilities seven days per week many receivers only operate five days per week.

When trans-load facilities do not accept and unload railcars on weekends the cars that arrive between Thursday and Saturday will incur longer destination dwell times than do cars arriving on other days of the week and disrupt the normal flow of empty cars moving back to pulp producers. Spread across a number of shippers and receivers, this “stop/start” effect creates “day of week” peaking in the railway’s operation, causing low capacity utilization on some days, and overcapacity situations on others. In addition cars that arrive on Saturday, Sunday and Monday generally must be stored temporarily waiting final placement. While cars arriving on Saturday and Sunday are stored because receivers are closed and cars cannot be delivered, cars arriving on Monday often must be stored waiting for the weekend backlog to clear.

Financial and Operational Impact

For the 30 day period included in this example the railway calculated that dwell times, as measured from train arrival to empty car release, were highest for cars arriving on Thursdays and Fridays - as much as 30% higher than for cars arriving on other days of the week. This finding is consistent with QGI's analysis of destination railway times that determined that traffic arriving at railway destination terminals on Friday and Saturday during the service review period took 23% longer to be placed at receivers' facilities than traffic arriving on all other days of the week.¹³

The need to temporarily store cars arriving from Saturday to Monday results in congestion in the railway's yard that can impact the fluidity of terminal operations. It also creates additional switching work and operating costs for the railway as a result of having to double handle cars that are first placed in temporary storage and then switched from storage to be placed at the receiver facility for unloading. During the 30 day period examined the railway estimates that it had to double handle 43% of pulp cars arriving in Vancouver resulting in incremental switching costs of \$22,000.¹⁴

In addition to these incremental operating costs, the railway estimates that the lack of seven day operations for this particular business flow results in higher levels of investment in rail cars than would be necessary if all receivers worked seven days per week. The railway estimates that delays incurred at destination increase the average car cycles for its box car fleet to handle pulp in this corridor by approximately 12 - 24%. This leads to an equivalent increase in the fleet size required to handle these volumes. The investment cost associated with the additional cars is estimated at approximately \$ 4 - 8 million dollars.¹⁵

6.2 Customer Car Order Cancellations

As is described in QGI's report on railway car ordering and distribution processes both CN and CP have defined processes for shippers to order rail cars.¹⁶ For each railway's merchandise customers, orders are submitted and confirmed weekly by prescribed cut-off times using the railways' Internet based car order systems. Railway car distribution and fleet managers use the order data submitted by shippers to plan the distribution of empty cars to shipper facilities. The management of empty rail car fleets to meet orders on a week to week basis is a dynamic process. Fleet managers are continually assessing their ability to meet demand in various geographic regions by estimating the capacity expected to be available in each region each week based on cars currently moving under load and cars being made empty by receivers both on their own and the networks of other railways.

¹³ Analysis of Railway Fulfillment of Shipper Demand and Transit Times, QGI Consulting March 2010.

¹⁴ The railway may be able to defray some portion of the incremental switching costs through extended asset use charges if cars are not unloaded and released within the allowable free time subject to the railway's specific conditions for determining the start of the allowable unloading time.

¹⁵ A range of incremental investment value is provided as it is not known what percentage of the traffic would see an improvement in cycle times based on some receivers shifting from 5 to 7 day per week operations.

¹⁶ Railway Car Order and Car Supply Processes, QGI Consulting March 2010.

Description of Event

In the example provided a single railway customer cancelled 10% of total cars ordered after the railway's prescribed cut-off time during a five week period in 2009.¹⁷ Orders were reduced by the customer on 8 separate occasions in three of the five weeks.

Financial and Operational Impact

While it might generally be thought that a reduction in customer demand at one location may provide the railway with the opportunity to satisfy demand for another customer this is not necessarily the case. As was noted in QGI's report on car supply performance "*...the increases and decreases to car orders may not be in the same locations or for identical rail car types, the off-setting impact on demand may not be relevant to the railway from a car distribution perspective as the supply available in one area may not in a short time period be available to satisfy a shortage in another area.*"¹⁸

There are operating costs to the railway of directing empty cars to a specific shipper location and subsequently having the shipper cancel the request. These include costs associated with train movement, terminal switching in the railway's classification yard, and switching of cars to and from the customer's siding. The magnitude of these costs will depend on where empty cars are when orders are cancelled, the opportunities for redirecting the cars to other customers located nearby and whether the orders have been cancelled prior to the cars being delivered to the shipper's facility. For instance, in cases where a customer is located in an industrial area with other customers that use the same rail car type, a last minute cancellation may provide the railway with an opportunity to redirect empty cars to meet the needs of another customer without incurring significant cost. On the other hand, if a customer is located in a remote location and is served by way-freight train service, the railway's flexibility and opportunities to redirect cars to meet other customer demand will be significantly more limited.

In this instance the railway estimates that it incurred incremental switching costs of \$1200 – \$1500. The railway indicates this situation is not unique and occurs repeatedly across a large number of customers. The railway estimates that over the 24 month service review period that it incurred more than \$700,000 in incremental switching costs directly related to customer car orders cancelled after cut-off.

It is important to note that both CN and CP have implemented penalties for merchandise shippers that cancel car orders after the prescribed cut-off time. These penalties would defray to some extent the costs incurred by the railway in this example.

¹⁷ The rate of order cancellation is calculated on the basis of the total number of cars cancelled after cut-off against the total number of cars initially allocated by the railway to meet the customer's orders.

¹⁸ Analysis of Railway Fulfillment of Shipper Demand and Transit Times, QGI Consulting March 2010.

6.3 Unloading Delays at Grain and Coal Terminals

The Canadian rail based freight logistics system will on occasion incur disruptions to service caused by unexpected events. These events, which can be caused by outside factors such as weather or by the operating decisions of a supply chain partner, can result in traffic delays and operational and financial impacts on multiple supply chain partners. Weather related disruptions can disrupt the rail movement of traffic, however for some commodities such as grain and coal moving through port terminals at the Port of Vancouver, weather can also disrupt terminal operations impacting the efficiency of the entire supply chain. The example below describes the operational and financial impacts that can be faced by railways when weather based events at unloading terminals disrupt the normal flow of rail movements. In this particular case the financial implications for the railway are examined in the context of the investment in assets that would be required in order to maintain reserve capacity to compensate for the loss in fleet productivity resulting from these terminal disruptions.

Description of Events and Impacts

Coal terminals can face delays in both the unloading of rail cars and the loading of ocean vessels due to weather related issues. Rail car unloading can be hampered by extremely cold weather resulting in coal being frozen in rail cars or unloading chutes while vessel loading operations can be delayed due to high winds at the terminal location. This can result in delays to entire trains of several hours and sometimes more than a day. With multiple trains typically processed through a coal terminal each day a delay to one train will impact the trains that follow.

In the example provided, coal unloading operations at a Vancouver terminal were disrupted due to weather related and mechanical issues over a two month period in 2009. This resulted in the terminal taking an average of 12 additional hours to unload each train. Based on existing train cycles this represented a 12.5% reduction in railway capacity for this movement and the loss of more than 50,000 tonnes of coal shipments per month. If it is assumed that the railway cannot recover the lost volumes over time with the existing level of railway assets (rail cars and locomotives), then it must either forego the associated revenue or introduce additional assets to recover this volume.¹⁹ Introducing incremental short term capacity to recover from such occurrences can be done either through short term leasing of coal cars and redeployment or leasing of locomotives or by maintaining reserve capacity. The railway estimates the annualized cost of one coal unit train, including the locomotives, to be approximately \$3 million.

¹⁹ It is assumed for the purposes of this illustration that the demand is not perishable but can be deferred for a period of time and recovered later in the year.

7. Summary

The Canadian railway logistics system is large and complex in nature. The efficiency of the system as a whole relies on a high degree of collaboration amongst system participants and a high level of awareness of each participant's capabilities, strategies and limitations. Failures within the rail logistics system will impact both railways and their customers. For railway customers, service failures, depending on the nature of the specific supply chain, result in negative impacts on downstream logistics processes such as trans-loading, inventory management, and vessel scheduling and loading. Moreover, frequent or systemic service failures that affect the reliability of service can also impact a shipper's ability to market his or her product. For railways, customers' failure to properly communicate their demand requirements and to perform rail car loading and unloading activities efficiently can add to the congestion on railways, particularly at destination terminals. When customers do not coordinate rail car shipments to their facilities to match their loading or unloading capacity or planning, they create the requirement for railways to stage this traffic, which adds to railway congestion. This congestion can reduce railways' effective capacity and can impair their ability to provide service to other customers.

The examples discussed in this report highlight the fact that problems in the Canadian rail freight logistics system occur for several reasons and can impact system participants differently.

Non performance of system participants

Performance issues can occur with either shippers, receivers, railways, or other transportation partners including shipping lines and terminal operators. They can result in a variety of consequences including delays in transit, car supply shortages, extended loading and unloading time, and vessel delays or bunching at port terminals. It is important to note that identifying performance issues of a single logistics partner without clearly understanding the underlying causes of such a problem does not necessarily provide a full assessment of the problem or identify the range of solutions that can be considered to improve system performance. Often, the performance of an individual stakeholder is directly related to other supply chain issues that are not necessarily within an individual stakeholder's direct control.

Interface disconnects between partners

The efficiency of the rail freight logistics system in Canada is highly dependent on the effective interface between railways and their customers and supply chain partners for both operational and planning processes. Whether stemming from incompatible operating practices between partners or poorly defined supply chain processes inefficiencies at critical operational interface points can result in problems that directly impact the individual stakeholders involved as well as having a broader impact on the logistics system as a whole.

Poor coordination or communication between stakeholders

Because of the interdependent nature of shipper and railway planning and operations, effective communication between railways and shippers regarding current operational issues and future demand requirements are essential. In both areas, failures in the sharing of information can result in serious problems for both partners. The inability to communicate priorities and coordinate activities, particularly when a service failure occurs will frequently lead to increased workload and incremental costs for the logistics system as a whole.

Extraordinary system disruptions

While disruptions in the rail freight logistics system are often seen as “railway problems”, and some indeed are, there are many types of network disruptions that can negatively impact system performance that are beyond the control of any system participant. Weather, as illustrated in this report, can significantly impact the operational capabilities and capacity of both terminal operators and railways. Similarly labor disruptions experienced by the railways or other significant system stakeholders such as port terminals are largely beyond the control of the parties but can have serious ramifications for the broader logistics system. The severity of the impact on all stakeholders in such cases will be influenced by the time required to return the system to a state of normal operations.

Depending on the nature of service failures or network disruptions, impacts on stakeholders can materialize in the form of direct short term operating costs or longer term impacts on economic performance and market opportunities. While this analysis focuses primarily on short term operating and financial implications there is little doubt that there can be longer term implications to repeated or systemic problems within the rail based freight logistics system.