Economics and Planning of Short Haul and Short Line Railway Intermodal Rail Service: Lessons from Past and Current Operations

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ABSTRACT

In order to develop a more competitive and efficient transportation system, railroads have engaged in intermodal freight transportation of both containers and trailers. Though intermodal rail operations have increased dramatically since the 1950s, traffic trends have also evolved with shipper demands, improved rail infrastructure, and enhanced operational strategy. With many former main railroad lines now operated by short line and regional carriers, industrial centers that were once home to intermodal terminals, both large and small, have lost their intermodal connectivity since short line and regional railroads did not handle intermodal traffic. With local terminals lost, shippers were forced to increase drayage distances to centralized Class I railroad intermodal terminals. With the economies of scale afforded by recent record levels of intermodal rail traffic, opportunities have arisen to revitalize short haul intermodal service. In many instances, progressive short line and regional railroads have recognized this opportunity as a means to increase traffic and revenue on their own lines as well as increase traffic on existing intermodal lanes and bring relief to over-capacity centralized intermodal terminals. In most instances, Class I railroads remain involved through operations and marketing of the short haul service as part of their larger national network. This report summarizes ongoing research that, through examination of current and discontinued short haul intermodal operations and communication with rail carriers of all sizes, aims to identify ways the strengths of short line and regional railroads can be leveraged to improve the efficiency of the Class I railroad intermodal network.

INTRODUCTION

Intermodal traffic on Class I railroads in the United States has increased steadily since 2009 and set an all-time record of 13.7 million containers and trailers in 2015 (*1*). To satisfy this primarily long haul demand, railroads have made capital investments to improve existing intermodal terminals, add new terminals, increase capacity and increase clearances on routes (*2*). Further expansion of intermodal traffic will require innovative approaches for railroads to become more competitive with trucks for short and medium-length hauls (*3*). In these markets, short line and regional railroads have partnered with shippers for intermodal container and trailer service with varying levels of success (*4*). This report summarizes ongoing research that, through examination of current and discontinued short haul intermodal operations and communication with rail carriers of all sizes, aims to identify ways the strengths of short line and regional railroads can be leveraged to improve the overall Class I railroad intermodal network.

SHORT HAUL INTERMODAL

In general, "short haul intermodal" refers to intermodal trailer or container moves between terminals at a distance of less than 500 miles (*5*). This definition works well for single-line service. However, for service with interchange or handling at intermediate terminals, the term can be interpreted differently. For these movements, the overall transit distance could be well over 500 miles but consist of two or more train runs with at least one run covering a shorter-length route less than 500 miles.

For the purpose of this report, short haul intermodal is defined as follows:

Short haul intermodal is a rail operation that seeks to optimize the transportation of containers and trailers by reducing truck drayage and allowing for en route efficiency by means of establishing strategically planned shorter routes that may or may not connect with other existing intermodal lanes. Through use of these shorter routes that inject into or lay within the network with smaller intermediate terminals, additional traffic may be generated in both long haul and short haul markets.

Short Haul Intermodal Network Topology

Short haul and long haul intermodal rail are two components of the operationally diverse intermodal transportation network (Figure 1). Although depicted as separate operational categories, short and long haul intermodal contribute to each other's success and lead to an efficient transportation system. The role of short haul intermodal in four different types of intermodal networks is described in the following sections.

Hub-and-Spoke Network

A hub-and-spoke operation allows satellite terminals to be linked to one or more centrally located hub terminals by short haul routes (Figure 2a). Truck drayage is still involved between the satellite terminals and local industries, but the over-the-road drayage is significantly reduced with shorter distance rail lanes that serve as feeder routes for the hub(s). If the satellite terminals

and feeder routes are cost competitive with longer truck drayage to the hub(s), the short haul operation can help attract "high hanging fruit" that may otherwise follow an all-truck route.

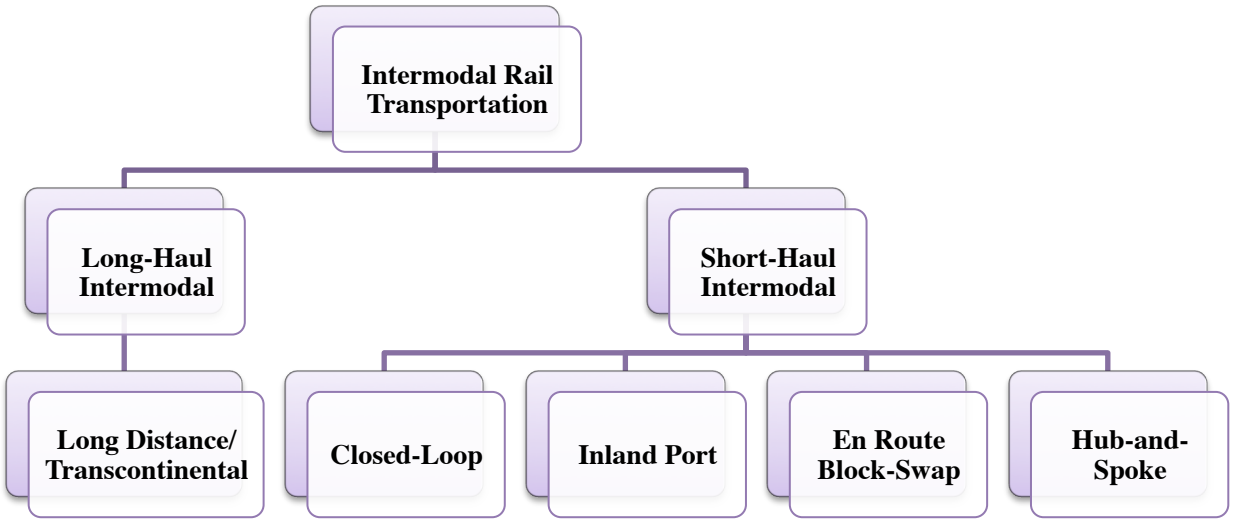

FIGURE 1 – Taxonomy of intermodal rail transportation

En Route Block Swap Operations

En route block swaps involve the set-out and pick-up of blocks of intermodal equipment at terminals or interchanges along a longer distance route (Figure 2b). Other short haul trains then take a block of equipment from the terminal or interchange to a satellite terminal. This model presents an opportunity for short line and regional railroads that serve industrial centers but do not interchange with a Class I railroad at a centralized intermodal terminal. The smaller satellite terminals allow for additional volume grains by making intermodal terminals more accessible and potentially lower costs to shippers by reducing drayage. A drawback to this model is reduction in average train velocity due to additional en route switching.

Inland Port Intermodal Service

Inland port short haul intermodal service acts as a rail drayage operation carrying containers from an inland terminal to a seaport for loading onto ocean-going vessels. These services may be part of the national intermodal rail network or isolated routes. This model has been of interest for many east and west coast short line and regional railroads.

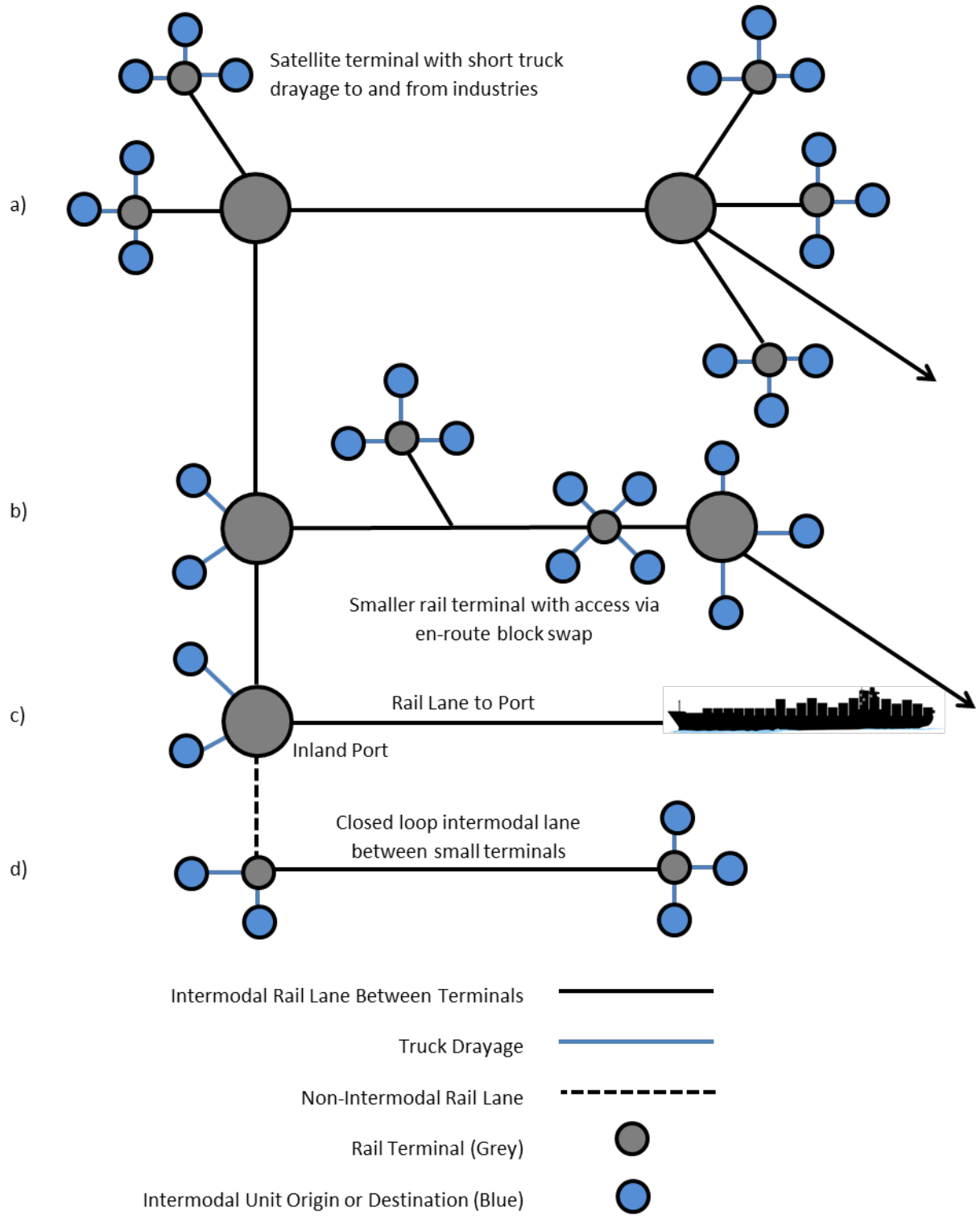

FIGURE 2 Comparison of intermodal network topologies for (a) "Hub-and-Spoke" Intermodal Rail System (b) En Route Block-Swap Intermodal Rail System (c) Inland Port Intermodal Rail System and (d) Closed Loop Intermodal.

Closed-Loop Operations

There may be opportunities for railroads to operate intermodal service for one or more select shippers over a single short haul lane. A typical situation is where two facilities involved in subsequent steps of a production process require routine shipments between them. The facilities are located apart from each other and lack direct rail service but are both relatively close to intermodal terminals (or potential sites for terminals). A short line or regional railroad could develop these terminals and establish a dedicated short haul intermodal service between them for the shipper.

Historical Changes in Intermodal Service

Transition from Short Haul to Long Haul Intermodal

The streamlined, long haul operations that are characteristic of modern intermodal rail service have evolved considerably from the earlier era of intermodal rail operations. Originally, to give customers convenient access to the intermodal network, closely spaced, lower capacity terminals were established and hauls were short. However, developing business at multiple small terminals did not yield the efficiencies the railroads desired. As long haul intermodal traffic from larger industrial centers grew, the capital requirements of smaller terminals were seen as a hindrance. Smaller terminals were shut down, the remaining primary terminals became more widely spaced and mechanized, and length of intermodal hauls increased (*6*).

Revival of Short Haul Intermodal

With existing long haul intermodal traffic secured, efforts to expand further into short and medium haul traffic have been prevalent on eastern carriers (CSX and Norfolk Southern) (*7*). Railroads have made efforts to increase capacity and decrease transit times on lanes that fall into this short to medium distance range that trucking has recently been dominating. New regulations within the trucking industry, such as maximum driver hours-of-service and truck size and weight restrictions, have helped railroads become competitive in these markets (*8*). Both CSX and Norfolk Southern (NS) list multiple short haul origin-destination pairs in their public intermodal service schedules that are available online.

Short haul intermodal has also been promoted by short line and regional railroads along with states and local municipalities as a way to increase freight on lighter density rail lines and preserve rail access in regions with a lower density of industrial development (*9, 10, 11*). An example of these efforts is the work of the Wisconsin Central Group (WCG), an ad hoc rail freight stakeholders coalition dedicated to increasing economic opportunity and competitiveness throughout Wisconsin and the Great Lakes Forest Region. WCG uses the term “local intermodal” to describe their approach to reducing drayage miles and providing sustainable rail intermodal access at locations that will not, or are not ready to, sustain a traditional intermodal terminal (*12*). For local intermodal to be successful, WCG found that inbound and outbound traffic flows needed to be balanced, support 40-50 loaded lifts per day, 5 days per week and have sufficiently short drayage distance such that a truck driver could make 4-8 loaded trips per shift. WCG

found that the approach was most successful when a large anchor customer became involved and close communication was maintained with the connecting Class I railroad for efficient connections to manifest and intermodal trains.

Intermodal Traffic Metrics

Representation of traffic and revenue data is of major interest for this research, as the success of the service is dependent on the a) competitive rate per unit that can be charged and b) annual volume of revenue units. Intermodal traffic statistics can be confused because railroads may report volumes in carloads or units. Double stack and articulated intermodal railcars can lead to different interpretations for the number of intermodal units that comprise a carload. For example, a single well car has a capacity ranging from a single trailer (1 unit) or a 53-foot container stacked upon two 20-foot units (3 units total). AAR data from 2015 reported that Class I railroads transported approximately 11 million carloads of intermodal freight comprised of 13.5 million containers for an average of 1.23 container or trailer units per carload (*1*). This statistic is used in certain the case studies of this paper for determination of revenues per unit.

CASE STUDIES OF SHORT HAUL INTERMODAL SERVICE

The following sections detail a selection of past and current short haul intermodal operations, often involving short lines (Table 1 and Figure 1). Although only a limited number of these services can be examined in depth within this paper, this research reviewed all of the identified services for lessons that can be applied to planning future corridors as reflected in the conclusion.

Norfolk Southern and Pan Am Southern

Service Overview

One of the first modern short line intermodal efforts began in 1995 as a joint venture between Guilford Rail System (GRS) (now Pan Am Railways) and Conrail. With GRS being one of the prominent carriers. In a region previously devoid of intermodal rail access and with considerable drayage distance, GRS and Conrail developed direct intermodal rail service linking Maine to Chicago, Kansas City, St. Louis, and Atlanta. The GRS terminals were established at Waterville, ME and Ayer, MA. Waterville traffic was consolidated with traffic originating at the Ayer terminal and then interchanged at the Conrail Mechanicville, NY terminal (Figure 3c). Traffic then moved on long haul intermodal trains within the Conrail and Norfolk Southern network.

Coordination with Class I carriers allowed shippers access to the national trailer and container pool and TTX intermodal equipment access. Benefits to shippers included value-added services such as single point-of-contact for marketing and customer service, electronic availability of shipping orders, transit status reports, and pre-notification of arrivals.

When Conrail assets were split between NS and CSX in 1999, NS remained the interchange for GRS but the intermodal service was retracted to Ayer and more stringent operating plans to improve equipment availability were implemented.

TABLE 1 Short Haul and Short Line/Regional Railroad Intermodal Service Case Studies

Servicing Railroad(s)/ Service	Drayage Reduction Using Short-Haul (mi.)	Intermodal Service Type	Interchange Type	Status
Norfolk Southern/ Pan Am Southern	Mechanicsville: 150 Portland: 115 Waterville: 190	Hub-and-spoke	Steel-wheel	Active
Chippewa Falls (CN/WC)	100	Hub-and-spoke/ Block Swap	Steel-wheel	Active
Ashley Furniture – Arcadia (CN/WC)	130	Hub-and-spoke	Steel-wheel	Active
St. Lawrence & Atlantic/ Canadian National	250	Hub-and-spoke	Steel-wheel	Inactive
Indiana Rail Road/ Canadian National	180	Hub-and-spoke	Steel-wheel	Active
Chicago, Ft. Wayne & Eastern/Norfolk Southern	To be determined	Early stages of development		Proposed
Indiana & Ohio Railroad	75	Hub-and-spoke	Steel-wheel	Active
Florida East Coast	Varying between 150-750	Hub-and-spoke/ Inland Port	Steel-wheel	Active
Iowa Interstate Railroad	460	Hub-and-Spoke	Rubber-tire/steel-wheel	Active
Twin Cities & Western/ Canadian Pacific	140	Hub-and-spoke	Steel-wheel	Inactive
Canadian Pacific Expressway Service	360	Closed Loop	-	Active
Wisconsin Central Ltd.	Green Bay: 200 Neenah: 190 Stevens Point: 240	Hub-and-spoke/ Block Swap	Steel-wheel/Rubber-tire	Inactive
Vermont Rail System	460	Hub-and-spoke	Rubber-tire/Closed-Loop	Inactive
Heart of Georgia/ Georgia Central	260	Inland port	Steel-wheel	Active
Escanaba & Lake Superior	210	Closed Loop	-	Inactive

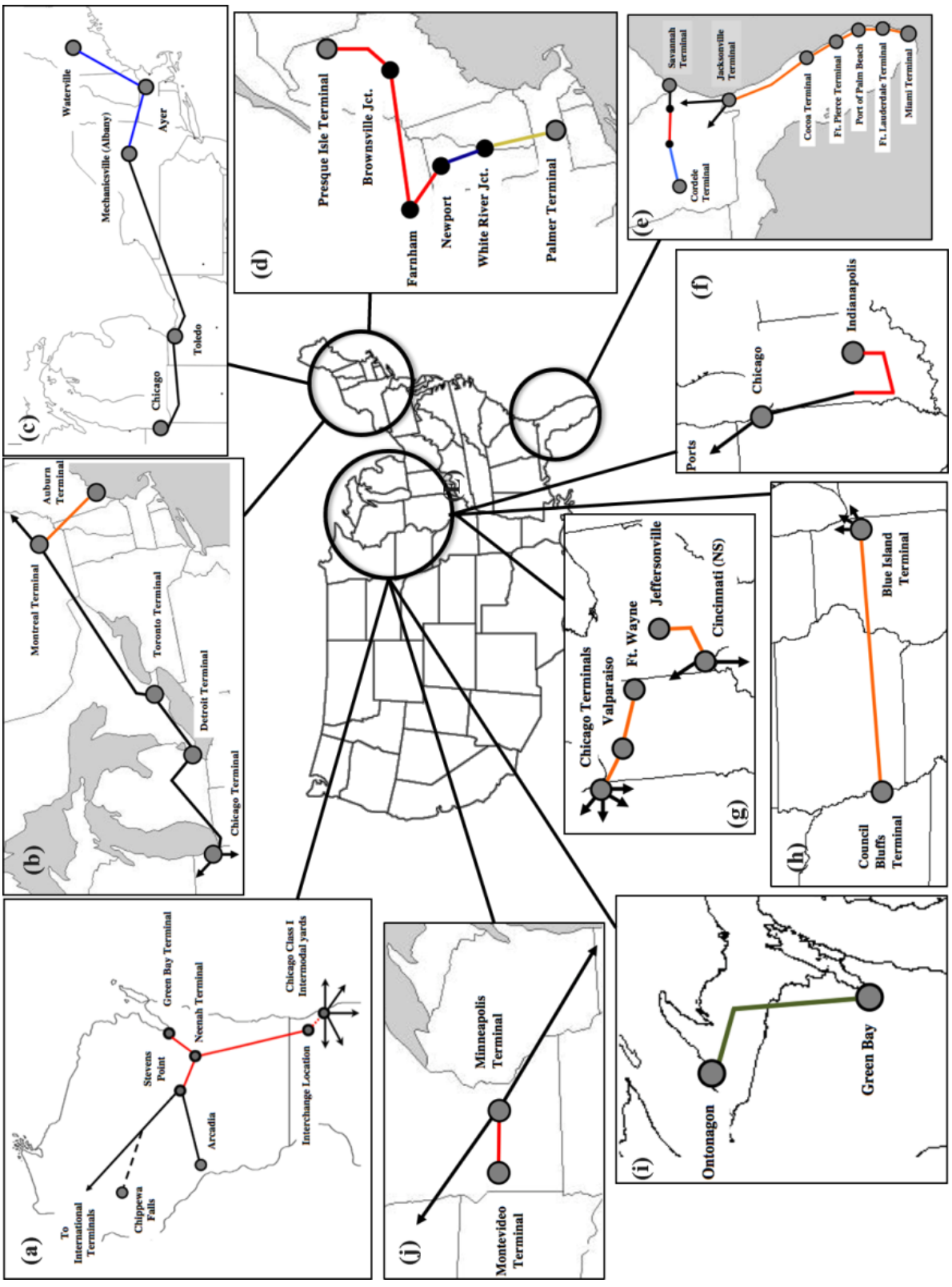

FIGURE 3 Maps of short haul intermodal lanes including a) Wisconsin Central and successor Canadian National b) St. Lawrence & Atlantic c) Pan Am Railway and Pan Am Southern d) Vermont Railway System e) Florida East Coast and Heart of Georgia/Georgia Central Railroad f) Indiana Rail Road g) Indiana & Ohio and Chicago, Fort Wayne, and Eastern h) Iowa Interstate i) Escanaba & Lake Superior Railway and j) Twin Cities & Western

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In 2006, GRS underwent reorganization and became Pan Am Railways (PAR). In 2008, a joint venture between NS and PAR established Pan Am Southern (PAS) with improved rail routes between Albany, New York and Boston. Currently PAS operates westbound intermodal service between Ayer and the NS 47th Street Terminal in Chicago. The eastbound operations originate at 47th Street terminal as well, but also incorporate traffic at Toledo.

Additional short haul intermodal development began in 2015 with containerized bottled water shipped through the newly developed Portland Intermodal Terminal in South Portland, Maine. In 2013, an Icelandic shipping company, Eimskip, began container service from Europe to the new Portland International Marine Terminal (IMT) that included 1,500 feet of port-side track operated by PAR. Executives from Poland Springs, a Maine-based bottled water producer with plants in Poland Springs, Kingfield, and Hollis (the largest bottled water facility in North America), sought to reduce transportation costs through multimodal shipments of bottled water to Massachusetts for distribution. In the established partnership, intermodal containers are leased from Eimskip for a short haul rail service between the Portland IMT and Ayer. Regular service began in January 2016 with containers drayed 20 miles from the Hollis plant to the Portland IMT. Approximately 45 containers are loaded in Portland three times per week (Friday-Sunday). In April 2016, the operation expanded north 75 miles to the reactivated PAR Waterville terminal where containers are drayed 45 miles from the Kingfield plant. The Waterville-Portland intermodal shuttle train brings an additional 60 containers to Ayer.

Terminal Operation and Equipment

In the creation of PAS, the intermodal terminals at Ayer and Mechanicville were upgraded. The Ayer terminal is listed as a NS terminal while the terminal is operated by PAS/PAR. The intermodal terminal at Portland was upgraded by the Maine Port Authority and served by PAR while the Waterville terminal is owned and operated by PAR.

The Waterville-Portland-Ayer service is restricted to single stacking due to clearance limitations. Since PAR is a member of TTX, intermodal railcars are available for the PAR and PAS service. Containers for the Polar Springs intermodal service are rented from Eimskip while those for the PAS service are from other IMCs. This partnership is vital because nearly all revenue traffic is outbound from Waterville and Portland. Supplying containers from the Eimskip marine service allows the rail component to avoid the container repositioning costs normally associated with unbalanced traffic flows

Business Relations, Marketing, and Profitability

In 2007, 82,476 revenue containers were shipped from Ayer. As built, the Ayer terminal had capacity for 75,000 units per year with the capability for expansion to 175,000. In September 2016, PAS received a $464,172 grant to increase annual container capacity by 29,500 units. The success and continuity of PAS intermodal has led to expansion in even shorter haul and lower volume services such as Waterville-Portland-Ayer.

Canadian National and the Saint Lawrence & Atlantic Railway

Service Overview

The St. Lawrence & Atlantic Railway (SLR) is a 260-mile short line railroad operated by short line railroad holding company Genesee & Wyoming. The railroad operated between Portland and St. Rosalie, Québec, connecting with CN at Richmond, Québec. In the 1990s, SLR and CN partnered to provide intermodal service to Auburn, Maine, located 35 miles north of Portland, Maine and 135 miles north of Boston (Figure 3b). International ports served from Auburn included Vancouver, Prince Rupert, and Halifax, along with various domestic CN terminals.

Terminal Operations and Equipment

The State of Maine partnered with SLR, the Auburn/Lewiston Metropolitan Area and the FHWA to build the Maine Intermodal Terminal in Auburn. The 35-acre terminal opened in 1994 at a cost of $2million. The terminal consisted of a double-track, gravel-yard facility with parking and container storage, a weighing and freight-control operations center, and a lift provided by the railroad. It was estimated that the facility needed to move between 10,000 and 12,000 containers a year to break even. In its first year of operation, the Maine Intermodal Terminal handled 6,000 containers. In 2001, it handled a volume of 15,000 containers. Additional parking capacity was added in 2001 and the facility expanded to over 50 acres with capacity of the terminal increased to 48,000 lifts per year. Volumes subsequently declined to 4,000 to 5,000 loads per year. In 2009, the volume at Auburn was only 800 containers.

Business Relations, Marketing, and Profitability

SLR leased the intermodal terminal from the city of Auburn and operated it as a terminal in the CN intermodal network. Containers transported to and from Auburn moved on CN authority, waybills and rates. The intermodal railcars and containers remain in the CN equipment account.

From the 1997 annual report from then-owner and operator Emons Transportation, SLR intermodal revenue was $1.6 million for 13,000 intermodal units, or revenue per unit of approximately $123.

Despite decreases in traffic, the Auburn terminal remained viable for many years due to its double stack container service capability, balance of inbound and outbound loads and connection to the CN transcontinental intermodal system. The primary issues limiting traffic at this terminal were a combination of noncompetitive pricing and lack of direct service to major U.S. destinations. CN is positioned well for international traffic but connections to, CSX and Norfolk Southern would be preferred for domestic service. CN announced it would discontinue intermodal service to a rail hub at Auburn, Maine, effective Nov. 15, due to insufficient freight volume and strong competition from other intermodal terminals in Massachusetts, such as Ayer (NS/PAS) and Worcester (CSX).

Canadian National and the Indiana Rail Road

Eric Powell, Manager of Economic Development at the Indiana Rail Road (INRD), provided input for this paper on the INRD intermodal service partnership with CN where INRD acts as the operator and carrier for the Indianapolis terminal. Overall, the term short haul intermodal is somewhat misleading for the INRD service as INRD is just one 155-mile segment of a 2,600-mile haul from Prince Rupert or Vancouver. INRD is also moving some container traffic to/from Europe via Halifax and Montreal, and Asia and South America via the Mobile, AL. The bulk of the traffic is imports. No INRD traffic moves the short distance to Chicago with the exception of empty containers being repositioned for export loads in Chicago.

To establish the service, the INRD marketing team met with Chicago-based CN marketing personnel in November 2011. INRD presented CN with market data and in early 2012 and the Toronto-based CN intermodal marketing team became involved. INRD made dozens of shipper and freight forwarder visits with CN personnel, and based on the potential volume and shipper support, the idea moved forward. INRD is the primary sales and marketing contact in the area and also handles customer service for the intermodal operation; the CN account manager in central Indiana is primarily focused on carload traffic.

An important characteristic of the service is that INRD purposefully established it as a haulage agreement from Newton, IL, to Indianapolis (Figure 3f), meaning the cars stay within CN billing and care hire all the way to Indianapolis. CN collects the billing for each container and then pays INRD per box hauled. Customers are only billed once and CN online tracing tools are available all the way to Indianapolis. Although INRD owns and manages the operations of the Indianapolis terminal, to the customer, it is just like any other terminal on the CN system.

Canadian Pacific and the Twin Cities & Western Railway

The Twin Cities & Western Railway (TCW) is a short line railroad in Minnesota, that operated an intermodal container service with Canadian Pacific Railway (CP) and North Star Intermodal LLC. North Star (a firm providing containerized transportation and marketing services for grain in the upper Midwest) approached TCW, CP, and steamship lines to move containerized identity preserved grain from Minnesota by rail. The traffic had been previously moved in bulk railcars to ports for reloading or by truck to intermodal terminals in the Twin Cities. A short haul service was devised to shuttle intermodal containers by rail from a terminal located on the TCW in Montevideo to the CP Shoreman Yard in Minneapolis for interchange to connecting intermodal trains (Figure 3j). TCW/North Star operated seven outbound trains every two weeks, or about 182 trains annually. TCW/North Star's traffic mix is nearly an even split between 20-foot and 40-foot containers with an estimated 7,280 loaded containers per year or 14,560 outbound and inbound lifts.

Initially, a unique aspect of this service was the use of bimodal RailRunner equipment. The specially designed RailRunner container chassis with detachable bogies could be easily transformed from over-the-road use to a container-hauling railcar. However, manufacturing issues resulted in use of standard intermodal railcars allocated from the TTX pool by CP. The

service was ultimately discontinued for unknown reasons but it is likely that the reliance on steamship company partnerships led to equipment pooling issues.

A 2008 Minnesota Department of Agriculture report detailed this intermodal operation and quoted rates of $10 per ton for the 130-mile short haul rail operation (*9*). Estimating a loaded container at 14 tons, this figure is consistent with traffic statistics of the Wisconsin Central case study discussed below.

Wisconsin Central Ltd.

Wisconsin Central Ltd. (WC) was a regional railroad operating approximately 2,850 miles of track in the upper Midwest. Prior to WC operations, the predecessor railroad (Soo Line) operated intermodal terminals at Green Bay and Neenah, WI but they closed prior the change in ownership of the railroad. With a lack of terminals in the region, shippers were left with a considerable dray to terminals in the Twin Cities or Chicago for intermodal shipments. The opportunity existed to develop a short haul intermodal service that could be competitive with trucks while increasing volume on the railroad and enabling economic development.

When planning the intermodal service, railroad executives were aware of industries in the region that were currently served by railroad carload traffic but had the ability to also use intermodal. It was expected that other prospective customers could be attracted to the intermodal service and help it become profitable but there was risk associated with the capital investments and operational costs.

Service Overview

For its short haul intermodal operation, WC established terminals at Green Bay, Neenah, and Stevens Point (Figure 3a). Dedicated intermodal trains operated five days per week and contained a unique mix of equipment and loading styles as dictated by customer needs. Instead of operating uniform consists of double stacked containers or trailers on flatcars, WC trains often operated with a mix of loading configurations.

On a given operating day, a train would be dispatched for the Green Bay terminal with a block of cars spotted en route at Neenah for reloading. Upon arrival at Green Bay in the early morning, the inbound intermodal units would be swapped with the outbound units and the train would depart for Neenah. At Neenah, a similar loading and unloading process had taken place with the equipment set out earlier. Also at Neenah, a shorter shuttle train would arrive from the Stevens Point terminal. Following the addition of the Neenah and Stevens Point equipment to the train that had originated in Green Bay, the train would depart for Chicago.

Like the other services noted in this paper, Class I railroad partnership was vital to this operation. The intermodal traffic was almost exclusively non-local interline movements and WC did not have a yard or terminal in the Chicago area. Thus at a Class I intermodal yard was essential. Although WC had direct connections to various Class I railroads in the Chicago area, the intermodal traffic was not easily decomposed for interchange since containers or trailers sharing the same railcar may be bound for different railroad connections. To alleviate this

problem, WC established one primary steel-wheel interchange railroad for which a majority of the traffic was destined. WC would exchange equipment with the primary connecting carrier who would then route the cut of railcars to their own terminal and reload the containers to outgoing trains. To cover this handling cost, the connecting carrier charged WC a fee per lift. This operation was time consuming and would often be delayed, resulting in missed connections.

During the years of WC operations, the primary connecting carrier varied, beginning with the Burlington Northern Santa Fe and ultimately involving CSX, Conrail, and Illinois Central. Changes in the primary connecting carrier were prompted by evolving traffic flows to and from the WC network. When traffic was not bound for the connecting carrier but another railroad, the railcars carrying the containers bound for other railroads would still be interchanged to the terminal of the primary connecting carrier. The traffic would then be lifted to trucks for rubber-tire over-the-road drayage to other railroad terminals.

Terminal Operations and Equipment

At each terminal, a one-person crew was responsible for all aspects of the terminal operation, including loading and unloading containers with a reach-stacker, positioning trailers and containers with the shuttle truck, associated paperwork and local customer service activity. The one-person crew kept operating costs low and capital investment was minimal. At the Green Bay and Neenah terminals, the remnants of the original Soo Line terminals were still intact. At the Stevens Point terminal, compacted gravel and treated soil was used as a staging and lifting area. The largest investment at each terminal was the reach-stackers used to load and unload intermodal equipment.

Since WC was not a member of TTX, intermodal flatcars had to be requested from the primary connecting railroad. The level of cooperation between WC and the connecting railroads regarding equipment allowed for a reliable supply of intermodal equipment.

Business Relations, Marketing, and Profitability

The transportation velocity of the WC short haul intermodal service was significantly slower compared to trucking. The time elapsed from loading containers at the northern-most terminals to arrival and repositioning of equipment at the Chicago terminals was typically 12 hours, significantly longer than an over-the-road truck haul. However, the management of the WC was skilled at reducing costs and was able to offer truck-competitive rates.

WC found the Class I railroads to be quite receptive to accepting intermodal traffic. Although larger railroads tend to avoid operating services that have a lower profit margin and require excessive marketing or operational work, the WC intermodal service imposed little work on the Class I carriers. Any Class I efforts were compensated via fees that were absorbed by the WC, resulting in lower revenue per container but allowing for considerable volume. The WC was the primary marketer of the intermodal service but the primary Class I railroad connection would include the WC terminals within their own intermodal network. Rates were established like ordinary carload service using interline settlement carrier agreements or Rule 11.

WC developed relationships with the trucking firms in the region, most notably Schneider National and J.B. Hunt. The trucking firms not only operated the trailers, containers, and tractor-trailers, but also managed the logistics for shippers. By reducing the costs of long-haul over-the-road transportation, these trucking firms took advantage of the short haul rail drayage while still profitably managing the traffic.

WC took a well-calculated risk in establishing the intermodal service but it ultimately proved to be successful. Though there were anticipated traffic levels at start-up, the "build it and they will come" mentality was a major component of justifying the service on the basis of traffic that had not been guaranteed. As the service proved itself to be viable and reliable, more shippers migrated to the WC short haul operation.

To examine the profitability of the short haul intermodal service, data from two documents were reviewed: the 1993 Wisconsin Central Transportation Corporation Annual Report and the 1991 Wisconsin Central Transportation Prospectus, both of which were retrieved from faculty working papers through the Sam Houston State University Center for Business and Economic Development (*13, 14*). Important statistics for carload and gross revenue comparison by commodity groups were detailed for 1991 to 1993. From 1988 to 1993, the revenue per intermodal unit gradually decreased from approximately $178 to $113 as traffic increased from 13,013 to 31,710 units per year.

When CN absorbed WC, the serviced was continued for only a brief period of time. Because of the marginal profitability of intermodal service, CN had little interest to develop business in territory. Many companies and communities were impacted by the discontinuance of intermodal service and the disinvestment of other marginal rail operations in the region.

Northeast Intermodal Rail Development

The Vermont Rail System (VRS) operates over 350 miles of track with connections to NS, CP, and CSX along with various other short line and regional railroads. VRS started operating intermodal trains via TOFC in 1965 and had grown through the early 2000s with the purchase of an extensive fleet of 53-foot trailers. Together with the existing fleet of 45-foot and 48-foot trailers, the VIPZ trailers comprised the largest fleet of TOFC trailers nationwide.

In addition to closed-loop TOFC operation on the Vermont Rail System, collaboration was developed with CSX and Florida East Coast Railway (via CSX) to provide a shared equipment pool. Intermodal TOFC lanes were provided to off-line terminals at Chicago, St. Louis, and Memphis via CSX (*15*).

With the existence of several short line and regional railroads in the region, a short haul intermodal service (Figure 3d) was established through collaboration between the VRS, the Montreal, Maine, and Atlantic (MMA, now the Central Maine and Quebec Railway), the New England Central Railroad NECR, and the Massachusetts Central Railroad (MCER). The intermodal service was comprised of the following operations:

- Trailers originated on the MMA at Presque Isle; MMA subsidiary Logistics Management Services (LMS) arranged drayage to the Presque Isle intermodal facility where trailers were loaded into VRS TOFC flatcars.
- The MMA manifest train operated from Presque Isle with the addition of the TOFC traffic to Brownville Junction where the cars were interchanged to the Brownville Junction-Montreal manifest train.
    - En route, the TOFC equipment was interchanged again at Farnham, Quebec to yet another MMA manifest train form Farnham to Newport.
- The TOFC equipment was interchanged to the VRS at Newport and moved in manifest service to White River Junction.
- At White River Junction, the equipment was interchanged to the NECR and transported to Palmer Yard in manifest train service.
- At Palmer Yard, a MCER switch engine transported the TOFC equipment a short distance to the MCER Palmer intermodal terminal.
- MCER unloaded the trailers and either grounded them or positioned them for truck haul.
    - VRS facilitated trucking to final destinations in New York, Connecticut, or Massachusetts. Another truck route option was drayage to the Quaboag Transfer in Bondsville Massachusetts for product storage or product transfer for furtherance on over-the-road carriers looking for backhauls.

Beyond this service, the railroad examined interchange to CSX so that trailers could move beyond New England. Any possible container traffic would be restricted to single stack due to lack of double-stack clearances. VRS assumed marketing of the Palmer ramp and the lane connecting to the Presque Isle terminal with the potential for adding other lanes in the future.

Both the VIPZ trailer fleet and Presque Isle-Palmer short haul intermodal service have been discontinued.

Escanaba & Lake Superior Railroad

The Escanaba & Lake Superior Railroad (ELS) is a short line railroad operating in the Upper Peninsula of Michigan and northeastern Wisconsin. Smurfit-Stone is a global producer of paperboard and paper-based packaging materials. The firm had a large plant at the end of the ELS line in Ontonagon that received inbound coal, wood pulp, and binding chemicals and shipped outbound finished paperboard and cardboard products. The plant closed in 2009, leaving no large anchor customers on the already light density line. In September 2010, the ELS was given permission to end rail service from Sidnaw to Ontonagon and was ultimately given permission to abandon the northernmost 16 miles of the corridor between Ontonagon and Rockland. The track from Rockland to Sidnaw remained part of the ELS system, primarily for railcar storage and potential low volume traffic.

Prior to the closure of the mill and the abandonment of the rail segment, the ELS experimented with short haul intermodal rail service for the outbound shipments of finished product, primarily corrugated paperboard, from the plant in Ontonagon to Green Bay, Wisconsin

(Figure 3i). Several unique conditions existed that led to the development of this service. First, the destination of the finished product in Green Bay was not directly served by rail. In order to get the product to the warehouse, railcars would need to be transloaded near Green Bay and shipments trucked the remaining distance. This carload service option was unacceptable because of the short transit distance from the Ontonagon plant to Green Bay not generating enough revenue to offset the costs of handling material during transloading. Additionally, weather-sensitivity of the product required an enclosed transloading facility. Since carload service was not seen as a favorable option over an all-truck route, intermodal options were explored. Since there are no intermodal rail terminals near or within the Upper Peninsula of Michigan, the only option for intermodal service was through the ELS. Using the ELS route, with either carload or intermodal, to Green Bay would avoid costly interchanges with other railroads.

The intermodal service operated by the ELS for the cardboard producer required very little capital investment. The car shops of ELS, located in Wells, Michigan, modified 89-foot flatcars for use in roll-on/roll-off service. At Ontonagon, a circus-style ramp was built on the property of Smurfit-Stone and an identical ramp was built on a parcel of land owned by the ELS at the Howard Industrial Park. The trailers for the service were provided by a local over-the-road trucking firm.

The intermodal railcars did not leave the ELS system. The service was approximately 240 miles in length between the origin and destination, allowing for cost-competitive and efficient service. The service did not last long enough to evaluate the feasibility of such a service in low traffic volume regions. However, it can be noted that intermodal service ended as a result of the Smurfit-Stone mill closure, not necessarily because of intermodal service issues.

CONCLUSIONS AND FUTURE WORK

Although this research is ongoing, several conclusions on how the strengths of short line and regional railroads can be leveraged to improve the overall Class I railroad intermodal network can be drawn from the literature review, presented case studies, communication with railroad officials and responses from questionnaires distributed to Class I, short line and regional railroads involved in the case study operations. Specific lessons that can be applied to planning future corridors are summarized below.

- There is no “one size fits all” approach to short haul intermodal.
    - If the service is a Class I operation, it must fall within their own profit goals and operational strategy. Collaborative operations between Class Is and short line or regional carriers and closed loop operations require a case-by-case analysis.
    - Class I railroads are naturally hesitant to partner with small carriers for intermodal service due to operational stability concerns associated with equipment turn times, service reliability and velocity.
    - Traffic flows can be the largest limiting factor to successful operation. Directional traffic with no loaded revenue back-haul requires costly equipment repositioning.

Partnerships with IMCs, trucking firms, and steamship lines may help address this concern by providing alternate sources of containers and trailers.

- Short lines can partner with Class I railroads to develop a service to:
  - Reduce truck drayage to terminals.
  - Increase traffic on existing lanes.
  - Create new traffic by accessing markets where intermodal becomes more economical compared to an over-the-road modal option
  - Free up capacity at existing terminals.
  - Penetrate new markets at a lower cost.
- Short lines and regionals can develop a closed loop intermodal system or short haul partnership with other local carriers.
  - The intermodal traffic tends to be local and acts as a drayage reduction service between production facilities and distribution centers in a geographic region.
  - Service schedules can be tailored to specific shipper needs.
  - Equipment acquisition can be an issue since the railroads will not have access to the TTX pool.
- Important considerations for a Class I partnership with a short line or regional railroad on short haul intermodal include:
  - Assignment of marketing and customer service. The short line, regional carrier or an external intermodal marketing company typically act as the terminal operator with marketing split between the carriers. Customer service responsibilities vary between the local carrier and the connecting Class I.
  - Desired Class I traffic volumes are typically a minimum of three days per week service carrying a minimum of 100 revenue containers per train. However, consistency in traffic volumes and ease of interchange may lower the required volume for a given service.
  - Interchange location and operating procedures. Class I carriers tend to prefer interchange of intermodal equipment at existing terminals to be added or removed from existing trains as opposed to en-route block swaps. Required switching for en-route blocks swaps can potentially lower train velocity between terminals.
- A single anchor customer, or a group of two or three high traffic volume anchor customers are a requirement for any short haul intermodal container service. Additional traffic can be built from smaller customers.
- Marketing a single-line service through partnership with a Class I railroad can be key to securing long haul traffic that incorporates a short haul movement at the origin or final destination.
- For terminals on short line and regional railroads, costs for operation and capital improvement are very low and contribute little to the rate. Operators of these types of services note that costs associated with terminal operation and initial investment typically

range no higher than 20% of the cost. The major costs come from the line-haul operation itself.

- Since intermodal is a premium service, the revenue per ton is higher than for carload service, but must remain low enough to remain truck competitive. For the rates and revenues estimated from the TCW, WC, and SLR case studies, a 40-50% higher rate per ton compared to carload traffic was evident. Given the similar distances of the rail service, the split between terminal and line haul costs were not easily distinguishable.
- Interaction with trucking firms can be collaborative as opposed to being competitive.

Future work in this field of short haul and short line intermodal rail service is to finish the full report featuring detailed traffic data and service plans of existing operations, and summarize full length correspondence and communication with industry representatives.

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