



# Approaches to Optimizing Rail and Truck Freight Movements



**October 2014**

# **Approaches to Optimizing Rail and Truck Freight Movements**

October 2014

This White Paper is one in a series developed as part of the Tampa Bay Regional Goods Movement Study. The purpose of this series of White Papers is to provide background and information for the freight community in the Tampa Bay Region.

## Approaches to Optimizing Rail and Truck Freight Movements

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## INTRODUCTION

This White Paper discusses considerations and opportunities for optimizing truck and rail freight modal options within the context of current and emerging trends that are reshaping goods movement. The topic has often focused on shifting freight activity from trucks to rail. However, changing shipper and customer requirements, along with the changing availability of truck and freight rail capacity have altered conditions and considerations for agencies and companies.

Over the last decade, public agencies and organizations have assessed to what extent freight movements in their regions could be shifted from trucks to rail. The objectives for investigating the potential for shifting freight movement are wide ranging. A 2008 Report by the Center for Urban Transportation Research (CUTR) at the University of South Florida articulated potential benefits including “reduced highway congestion, improved air quality, reduced pavement preservation costs, improved safety, offsets to trucking labor short-falls and improved rail service improvements, as well as better utilizing existing infrastructure.”<sup>1</sup> A 2013 US Department of Energy report reviewed modal selection within the framework of prompting “modal choices that reduce energy use and greenhouse gas emissions.”<sup>2</sup>

Private businesses have long considered their modal options, as well as the optimal placement of facilities (such as production facilities and distribution centers). **Figure 1** details some of the factors typically considered by shippers in modal selection.

**Figure 1: Shipper Modal Choice Considerations**

Factor Category	Factor
<i>Modal Characteristics</i>	Capacity
	Trip Time
	Reliability
	Equipment Availability
	Customer Service and Handling Quality
<i>Commodity Characteristics</i>	Shipment Size
	Package Characteristics
	Shipment Shelf Life
	Shipment Value
	Shipment Density
<i>Shipper and Receiver Characteristics</i>	Access to modes
<i>Logistics Costs</i>	Order and Handling Costs
	Transportation Charges
	Capital Carrying Cost in Transit
	Intangible Service Costs, i.e., Billing Processes
	Inventory Costs
	Loss and Damage Costs
	Service Reliability Costs
<i>Additional Factors</i>	Length of Haul
	Shipment Frequency
	Environmental/Sustainability

Source: US Department of Energy, *Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future*, March 2013, p. 20.

<sup>1</sup> Center for Urban Transportation Research at the University of South Florida, *Analysis of Freight Movement Mode Choice Factors*, prepared for Florida Department of Transportation Rail Planning and Safety, 2008, p. 4.

<sup>2</sup> US Department of Energy, *Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future*, March 2013, p. 1.

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The key modal change considerations include the characteristics of the shipment which include value, size and weight, time sensitivity, and handling requirements (such as the need for temperature control, hazardous materials, etc.). In general, more valuable and time sensitive shipments (such as pharmaceuticals, electronics and retail items, perishable food, etc.) can accept more costly modal options. Less valuable and time sensitive shipments (such as bulk products) seek the least expensive modal options that meet customer requirements.

Modal choice also reflects the cost, available supply of freight options, and customer service provided by the transportation companies.

As will be discussed in this paper, shipper requirements and supply availability have changed. With these changes, goals are evolving from shifting freight to optimizing the availability of freight choices consistent with public objectives.

This White Paper includes four sections:

- Changing Shipper Requirements and the Evolving Supply Chain – summarizes the key dynamic changes that are altering the level and characteristics of the demand for truck and rail services. Several simultaneous emerging trends are occurring, resulting in an evolving context for modal choice decisions.
- Truck Movements and Trends – examines the types of truck movements, the growing driver shortage, the impact of operating costs (including fuel and federal hours of service regulations) and the emerging restructuring of the industry.
- Rail Movements and Trends – examines the types of rail service, the increased demand for rail services, the growing capacity shortage and emerging services.
- Approaches to Optimizing Truck and Rail Options – summarizes approaches that have been advanced in the public and private sectors for influencing modal choice.

Cost competitive and effective freight modal options constitute a key decision factor in site selection for production and distribution activities and are equally important in retaining existing businesses and serving communities. At the same time, the truck and freight rail industries are facing new and important challenges. This paper articulates the dynamic context and a range of strategies for optimizing truck and rail options. Accordingly, this White Paper provides a foundation for considering freight investments and strategies in a radically changing supply chain environment.

## CHANGING SHIPPER REQUIREMENTS AND THE EVOLVING SUPPLY CHAIN

This section summarizes key trends that are rapidly reshaping the characteristics of shipments and the modal services required. These trends include:

- Accelerating reformulation of retail commerce.
- Realization of near- and reshoring of production facilities.
- Emergence of new domestic products and impact on rail capacity.

Each of these developments alters longstanding industry conditions. The fact that so many changes are occurring simultaneously underscores the need to understand the emerging context for considering modal shifts and modal optimization.

In the sections that follow, each emerging trend is described and then characterized by the modal choice factors summarized in **Figure 1**.

These factors include:

- Commodity and shipment characteristics.
- Modal characteristics.
- Shipper and receiver characteristics.
- Cost considerations.
- Environmental and other considerations.

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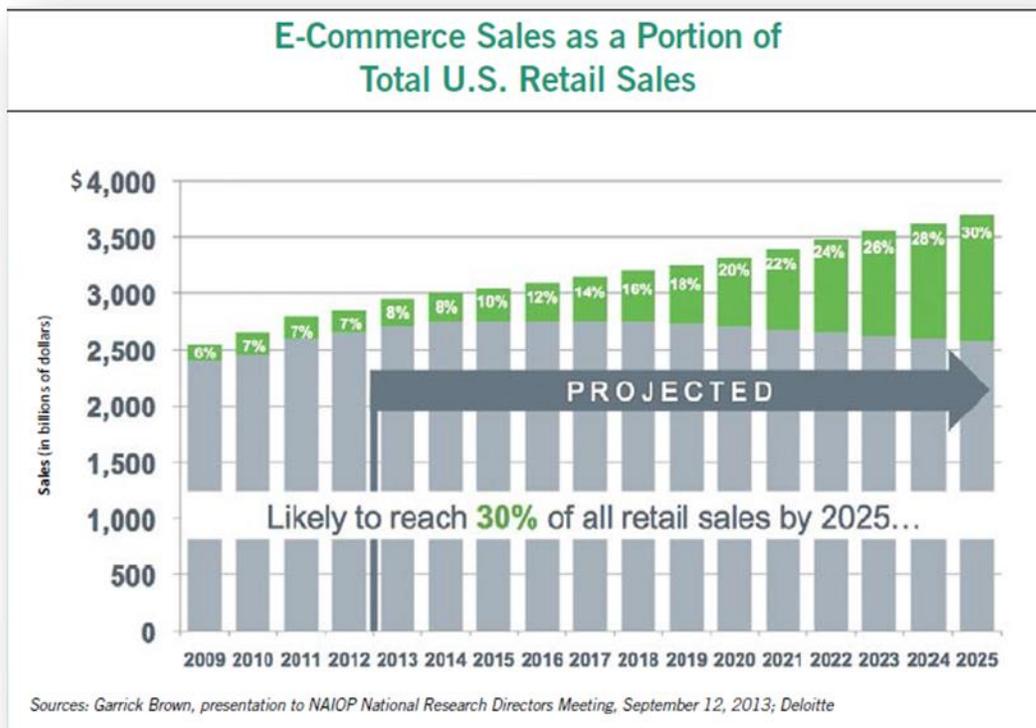
Identifying these characteristics provides a foundation for understanding how the emerging trends are revising the framework for modal choice decisions.

### Accelerating Reformulation of Retail Commerce

The retail industry has been rapidly reformulating itself. The changes are so profound that they are completely reshaping how consumers purchase and receive products; the location, purpose and physical characteristics of distribution centers and stores; and the use of freight modes.

As the United States has emerged from a recession, e-commerce has been growing far faster than overall retail sales. The rapid and anticipated growth of e-commerce as a percentage of total US retail sales is shown in **Figure 2**. As noted, e-commerce is anticipated to approach one-third of all retail business by 2025.

**Figure 2: The Rise of E-Commerce**



Source: Garrick Brown as cited in *Development*, Winter 2013, p. 8

The increase in e-commerce is consistent with the growth in the use of tablets and smart phones and expanding Internet access. Consumers shopping for the greatest selection and the lowest cost increasingly avail themselves of these new channels. New terminology has emerged to reflect the trends:

- **Omni-Channel Retailing**– defined as retail merchants that use multiple channels to reach and serve their customer base. The channels include traditional brick and mortar stores, e-commerce and catalogues. The individual channels are used separately and in combination. For example, in-store pick up and returns of e-commerce orders may be offered. Stores, such as Bed, Bath and Beyond and Home Depot, also offer in-store ability to access additional merchandise not in stock in the store for home delivery.
- **M-commerce** – defined as mobile commerce and refers to the increased use of tablets and smart phones in retail trade. In addition to ordering online, malls and stores may access Global

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Positioning System (GPS) information of smart phones to send specialized messages to potential customers within a certain distance buffer of their brick and mortar facilities.

- Social commerce – defined as the use of social media sites such as Facebook and Pinterest to market products, build awareness and increase demand.

The growth in e-commerce has been accompanied by shortened delivery times for online purchases. Amazon may have been in the forefront of increasing consumer expectations of rapid delivery of online purchases, but other retailers have quickly responded by similarly offering same-day and next-day delivery options to retain or expand market share. An October 15, 2014 *Money* article regarding the entry of Google into the same day delivery market noted, “Thus far, the phenomenal success of Amazon Prime has most clearly demonstrated the power of shipping when it’s not only reliably free but speedy as well. Prime subscribers receive free two-day shipping on most orders placed via Amazon.com, and the service has proven so popular and indispensable that enrollment numbers have continued to climb even after prices rose recently from \$79 to \$99 annually.”<sup>3</sup>

The approaches to achieving the expedited delivery goal vary. Target, Macy’s, Best Buy and Barnes & Noble are using their existing brick and mortar stores to achieve this objective. These stores, already located within core consumer markets, provide an existing local platform. As one news report noted, “After piloting shipping from stores in Minneapolis, Boston and Miami, Target has begun rolling it out to about 140 stores in 38 markets. Target executives have said that will position the retailer to be within a one- to two-day ground transit of 91 percent of the U.S. population.”<sup>4</sup>

Amazon, without physical stores, has built 38 new fulfillment centers in North American, including three in the Tampa Bay Region in the cities of Ruskin, Lakeland, and Davenport; and an additional 15 sortation centers across the country.<sup>5</sup> The sortation centers classify packages from the fulfillment centers by zip code, which in turn, bypasses the sortation hubs of UPS, FedEx and the USPS and enables Amazon to use its own delivery fleet or alternative services if desired.

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<sup>3</sup>Tuttle, “3 Reasons Google’s Same Day Shipping Looks Like a Game Changer,” *Money*, October 15, 2014. Available at: <http://time.com/money/3507668/google-express-amazon-same-day-shipping/>

<sup>4</sup> Kumar, “Target shows big improvement in shipping times research finds,” *Star Tribune*, September 26, 2014. Available at: <http://www.startribune.com/business/277132681.html>

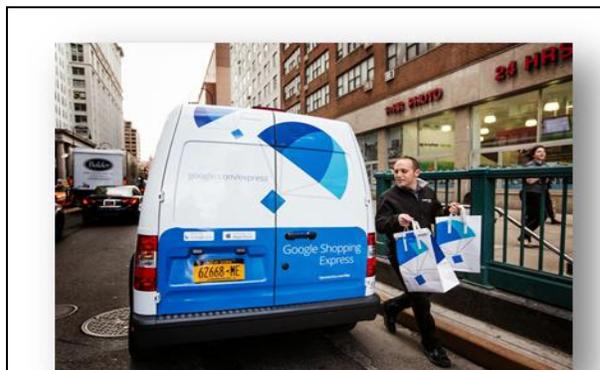
<sup>5</sup> Businessweek, [op.cit.](#)

### Implications for Modal Choice Factors

Commodity and shipment characteristics: The norm is becoming small, frequent shipments delivered in a much broader range of addresses, there is an increasing emphasis on offering quick delivery of two days and less. Amazon and other vendors also now offer pick up locations at neighborhood stores as alternatives for those customers who do not have someone at home to accept deliveries.

Modal characteristics: Reliability, trip time and customer service are paramount.

Shipper and receiver characteristics: The vast majority of e-commerce shipments are going to individual stores and residences, which translates into increased truck movements. Access is typically via handling services such as UPS, FedEx and the US Postal Service. Amazon is advancing use of their own services through dedicated zip code level sort facilities and experimentation with their own truck fleet (which is being tested for home supermarket deliveries).<sup>6</sup> Google is also testing the market in a joint program with Barnes & Noble in New York and San Francisco to offer same day delivery.<sup>7</sup>



Source:

[http://www.nytimes.com/2014/08/07/business/media/google-and-barnes-noble-unite-to-take-on-amazon.html?\\_r=0](http://www.nytimes.com/2014/08/07/business/media/google-and-barnes-noble-unite-to-take-on-amazon.html?_r=0)

While end user deliveries require trucks and in the future may involve drones, shipments between the production locations and the distribution centers of e-commerce companies do represent a range of modes geared towards cost effectiveness. Intermodal rail for long distance movements and use of international ocean containers are commonly found.

Cost considerations: Free shipping has become the new normal. A May 2014 comScore presentation stated this conclusion, which has been similarly reached by many industry experts, and noted that 53 percent of customers consider free shipping to be most important in their online shopping decisions.<sup>8</sup>

While retailers may factor the cost of shipping into product pricing, their mandate to transportation companies is to be as low cost as possible within the specified delivery parameters. This mandate factors both into end user deliveries and to suppliers shipping products to retailers' facilities. Advanced packaging and information technologies are often used to optimize costs.

Environmental and other considerations: Environmental programs have included reductions and composition of packaging material and use of more sustainable technologies in distribution centers. Seasonal peaking and the ability of existing supply chains to handle the increased shipments within customer expectations is of particular concern, particularly after the 2013 holiday season overwhelmed UPS and other carriers.

<sup>6</sup> Bloomberg Businessweek, *Amazon's Grand Plan to Avoid Delivery Snafus Again*, September 26, 2014. Available at: <http://www.businessweek.com/articles/2014-09-26/amazons-grand-plan-to-avoid-holiday-delivery-snafus-again>

<sup>7</sup> Alter, "Google and Barnes & Noble Unite to Take On Amazon," *The New York Times*, August 7, 2014. Available at: [http://www.nytimes.com/2014/08/07/business/media/google-and-barnes-noble-unite-to-take-on-amazon.html?\\_r=0](http://www.nytimes.com/2014/08/07/business/media/google-and-barnes-noble-unite-to-take-on-amazon.html?_r=0)

<sup>8</sup> comScore, *State of the US Online Retail Economy in Q1 2014*, May 2014.

### Realization of Near- and Reshoring of Production Facilities

**Reshoring** refers to companies developing domestic manufacturing facilities either as additional production capacity or as replacements for production previously overseas. Similarly, near-shoring refers to developing production capacity closer to US customer markets, typically in Mexico, Central America, South America and Canada.

Production facilities are typically located where the combination of transportation of raw materials, transportation to market, labor costs and availability, business costs and other factors are most favorable. For the past several decades, overseas locations, particularly in Asia, have been the lower cost sites, contributing to a loss of manufacturing in the US and a lengthening of supply chains.

However, as noted in a National Public Radio (NPR) report, manufacturers have been increasingly returning to the US:<sup>9</sup>

"In the beginning of 2011, for the most part, most people thought that this was just impossible, that there would be no reshoring to the U.S., that everything was going to China, manufacturing was leaving the country and will never come back," says Sirkin. "And I think the striking thing is how much that's changed in the last three years."

Sirkin says at least 200 companies have already returned, and there's been a dramatic jump recently in the number of companies saying they're seriously thinking about it. Sirkin says a huge factor has been rising wages overseas. Pay in China has risen at least 15 percent annually for the past few years. Wages in China are still comparatively low compared with the U.S., but there are other important factors."

Cost factors such as rising wages overseas and higher transportation expenses (particularly driven by rising fuel costs) have contributed to changing the equation. The longer transit times also are increasingly inconsistent with faster product cycles and real-time response to customer demands. Quality control concerns, as well as the increasing productivity of US facilities have also been cited as reasons to use domestic locations. A 2013 Boston Consulting Group Survey found that, "More than half of U.S.-based manufacturing executives at companies with sales greater than \$1 billion are planning to bring back production to the U.S. from China or are actively considering it."<sup>10</sup>

Reshoring started with heavier products, such as appliances and furniture, and is now becoming more evident in lighter weight retail products. For example, according to a Department of Commerce article,<sup>11</sup> K'NEX, a toy manufacturer, reshored most of the company's production from China to Pennsylvania starting in 2009 and now produces 90 percent of its own parts and 80 percent of its finished goods in the US. The cost saving elements are summarized in **Figure 3**. According to the article, "The reason the savings were so large is that when the product was coming from China, K'NEX had to guess up to 22 weeks ahead what its customers might demand. Not wanting to risk losing a sale, K'NEX ordered a lot of extra product that might not ever be sold. Now, K'NEX can wait to commit production until it has full knowledge of demand."<sup>12</sup>

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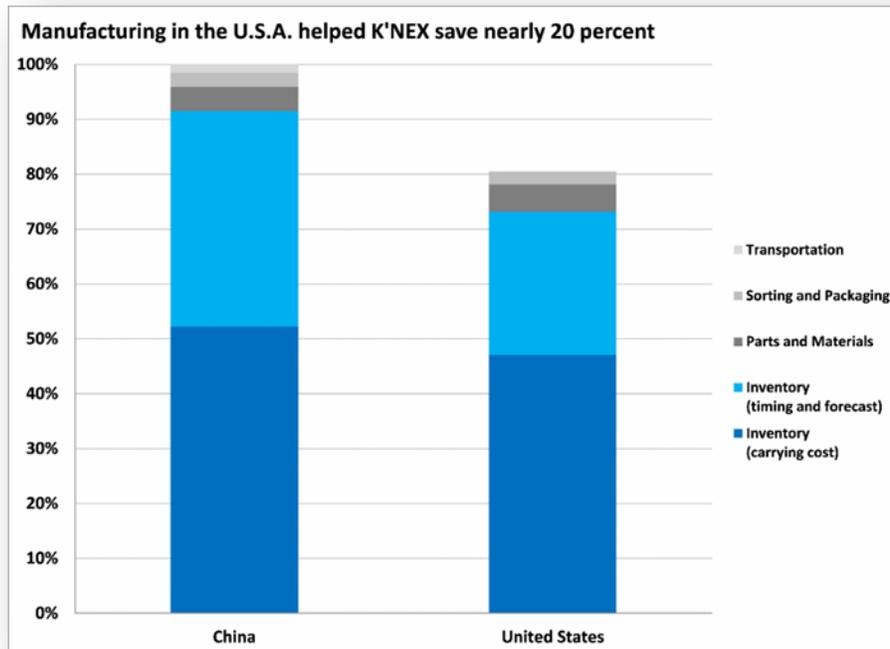
<sup>9</sup> Northam, *As Overseas Costs Rise, More US Companies are 'Reshoring,'* January 27, 2014. Available at: <http://www.npr.org/blogs/parallels/2014/01/22/265080779/as-overseas-costs-rise-more-u-s-companies-are-reshoring>

<sup>10</sup> Boston Consulting Group, *Majority of Large Manufacturers Are Now Planning or Considering 'Reshoring' from China to the US,* September 24, 2013. Available at: <http://www.bcg.com/media/pressreleasedetails.aspx?id=tcm:12-144944>

<sup>11</sup> <http://www.commerce.gov/blog/2014/10/01/new-tool-shows-manufacturing-america-carries-huge-potential-savings-reshoring-success>

<sup>12</sup> *Ibid*

Figure 3: K'Nex Savings through Reshoring



Source: US Department of Commerce, <http://www.commerce.gov/blog/2014/10/01/new-tool-shows-manufacturing-america-carries-huge-potential-savings-reshoring-success>

Near-shoring is also accelerating as a new global supply chain model emerges – regional sourcing, production and marketing. The North American Free Trade Agreement (NAFTA) has improved the flow of goods between Mexico, the US and Canada. The advantages of near-shore locations were articulated in a 2011 Accenture report, “In the case of Mexico and South America, these moves serve a dual purpose: the ability to serve growing markets near customers there as well as being nearshore to the large, US-based demand.”<sup>13</sup> *The Journal of Commerce* confirmed these considerations:

“Auto manufacturers have moved production to Mexico for competitive labor prices and accessibility to the North American market. Japanese automakers are also drawn to the country because of the favorable exchange rate between the peso and the yen. Auto suppliers have followed the auto plants in setting up shop. White goods makers and electronics producers, such as Whirlpool and Foxconn, respectively, are also increasingly producing in Mexico for the North American market. Manufacturers in Mexico can also tap the country’s growing middle class and export to Latin America, thanks partly due to the country’s numerous free trade agreements.”<sup>14</sup>

Based on a 2014 survey of the chief executive officers of the world’s largest third party logistics providers, the near-shoring trend is anticipated to continue:<sup>15</sup>

<sup>13</sup> Accenture, *Manufacturing’s Secret Shift: Gaining Competitive Advantage by Getting Closer to the Customer*, 2011, p. 12. Available at: [http://www.accenture.com/sitecollectiondocuments/PDF/Accenture\\_Manufacturing\\_Secret\\_Shift.pdf](http://www.accenture.com/sitecollectiondocuments/PDF/Accenture_Manufacturing_Secret_Shift.pdf)

<sup>14</sup> Szakonyi, “KCS Sees Delay in Mexican Auto Shipment Growth,” *JOC.com*, January 29, 2014. Available at: [http://www.joc.com/rail-intermodal/class-i-railroads/kansas-city-southern-railway/kcs-sees-delay-mexican-auto-shipment-growth\\_20140129.html](http://www.joc.com/rail-intermodal/class-i-railroads/kansas-city-southern-railway/kcs-sees-delay-mexican-auto-shipment-growth_20140129.html)

<sup>15</sup> Penske Presents: Surveys Find 3PLS Hitting Stride Amid Economic Uncertainty, September 22, 2014. Available at: [http://www.gopenske.com/newsroom/2014\\_9\\_22\\_pl\\_3pl\\_study.html](http://www.gopenske.com/newsroom/2014_9_22_pl_3pl_study.html)

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“In the North American region, the survey revealed that near-shoring activities -- e.g., customers shifting manufacturing activities from China to Mexico -- is growing, with over 75 percent of North American CEOs reporting that some of their customers have shifted some of their operations from China to Mexico. This is impacting the revenue streams of 3PLs with nearly one-third of North American respondents reporting increased volume and revenues as a result of near-shoring. Rising Chinese wages, the benefits of a shorter supply chain from Mexico to the U.S., and increasing transportation costs have driven this near-shoring trend. In addition, several CEOs also remarked that Mexican government incentives have contributed to the movement.”

### **Implications for Modal Choice Factors**

Commodity and shipment characteristics: Commodity characteristics remain the same but the origin/destination pairs shift.

Modal characteristics: Reshoring and nearshoring replace longer distance movements with shorter distance movements. The trend results in additional demand for trucking and freight rail services, both domestically and cross-border. The increased demand for rail services is evident in the revenue growth of the Kansas City Southern Railway (KCS) – “As a result of rising U.S.-Mexico trade, the railroad saw total cross-border revenue in the fourth quarter increase 30 percent year-over-year to \$161 million, and cross-border intermodal revenue jumped 64 percent in the same period.”<sup>16</sup> Vessel and air cargo movements between the Americas also grow with this trend.

Shipper and receiver characteristics: Reshoring and nearshoring companies often seek locations that historically have worked for their businesses and have existing transportation infrastructure. As demand has grown, transportation companies have been making investments. For example, the KCS is investing extensively in repurposing existing infrastructure, expanding yards and building sidings in Mexico.<sup>17</sup> Norfolk Southern reported, “This reshoring trend is fundamentally a plus for us. We operate in a service territory where industrial development is highly prized, in the Southeast in particular, but in the Midwest, too.”<sup>18</sup>

Cost considerations: Cost considerations are paramount. Rising fuel and transportation costs are among the key factors that are promoting reshoring and nearshoring.

Environmental and other considerations: Shorter supply chains and the development of new production facilities offer opportunities to reduce the environmental impacts associated with manufacturing and transportation.

### **Emergence of New Domestic Products and Impact on Rail Capacity**

The US has long been a major source of agricultural products to feed domestic and world populations. According to the US Department of Agriculture, the US is the world’s leading producer of soybeans and corn. The nation is also a major exporter of wheat and rice and the leading exporter of cotton.

The US is also experiencing a renaissance of domestic production of raw materials. From a transportation viewpoint, the most profound changes relate to domestic oil production. According to information from the US Energy Information Administration (EIA), domestic production of crude oil is approaching the peak period of the early 1970s as shown in **Figure 4**.

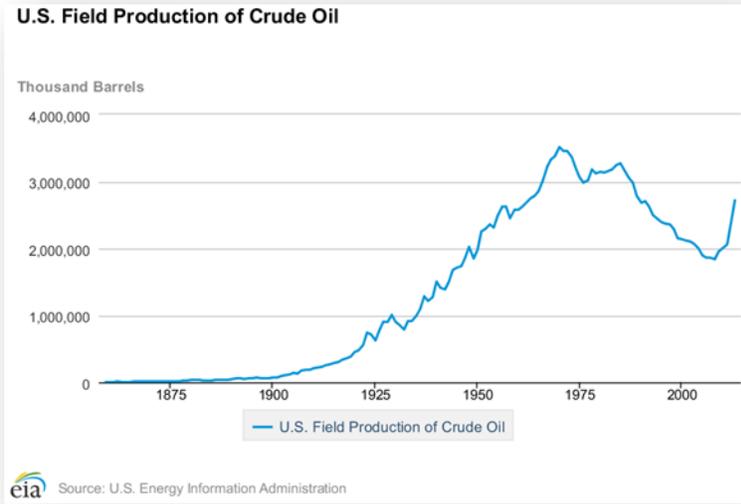
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<sup>16</sup> Szakonya, *op cit.*

<sup>17</sup> *Ibid*

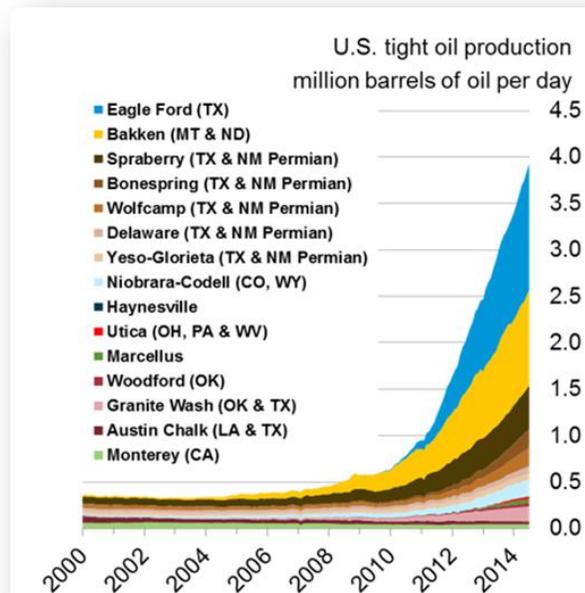
<sup>18</sup> BizNS, January-February 2013, Volume 5, Issue 1, p. 2. Available at: [http://www.nscorp.com/content/dam/nscorp/bizns/archive/BizNS\\_Vol5\\_Issue1.pdf](http://www.nscorp.com/content/dam/nscorp/bizns/archive/BizNS_Vol5_Issue1.pdf)

Figure 4: Domestic Oil Production Rebounds



In 2014, the US was the world’s largest oil producer. The latest production fields are in the Bakken Shale Formation, an area that includes Montana and North Dakota in the US and Saskatchewan and Manitoba in Canada. The magnitude of Bakken production in comparison to the existing fields in such locations as Texas is shown in **Figure 5**.

Figure 5: Locations of US Oil Production



Source: US Energy Information Administration, The US Oil and Natural Gas Production Outlook, Presentation by Adam Sieminski, Administrator, September 22, 2014.

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The rail capacity conundrum arises from how the Bakken crude is transported; rather than the pipeline and waterborne movements more commonly used for transport of US crude, Bakken crude oil moves primarily by rail. The quantities being moved are substantial and affecting the availability of rail to handle such major commodities, including domestic agricultural products. The National Broadcasting Company (NBC) news summarized the situation:<sup>19</sup>

“Predictions of a second year of record grain harvests in the U.S. should seem like a cause for celebration. But for grain farmers and grain elevator operators in states like Minnesota and the Dakotas, it's a near disastrous crisis that could continue to cost them tens of millions of dollars. The reason: A lack of available railroad service—from rail cars to track lines—to ship the grain to market. While there are various explanations for the difficulties—from severe weather to the enormity of the grain harvest—some suspicion lies with the increase in oil and gas rail shipments at the expense of commodities. ‘In 2009, there were 11,000 rail carloads of crude oil but in 2013 there were 400,000 carloads,’ said Mike Steenhoek, executive director of the Soybean Transportation Coalition.”

*The New York Times* highlighted the implications for US food companies: “The furious pace of energy exploration in North Dakota is creating a crisis for farmers whose grain shipments have been held up by a vast new movement of oil by rail, leading to millions of dollars in agricultural losses and slower production for breakfast cereal giants like General Mills...General Mills, the Minnesota-based maker of Cheerios, told investors in March that it had lost 62 days of production – as much as 4 percent of its output – in the quarter that ended in February because of winter logistics problems, including rail-car congestion.”<sup>20</sup>

The rail capacity crisis has been so severe that governmental actions have been taken. In both March and August 2014, the Canadian government required the nation’s two major railroads to ship a minimum of more than one million metric tons of grain a week to address backlogged shipments.<sup>21</sup> The US Surface Transportation Board has conducted hearings on the subject and legislative actions are under consideration.

### **Implications for Modal Choice Factors**

Commodity and shipment characteristics: Agricultural and petrochemical products are bulk, heavy commodities that generally move by transportation modes suitable for volume movements – railroads and water transport (e.g., barges and vessels). The volatility of Bakken crude is of particular concern and actions have been taken after several severe accidents, including the oil train explosion in Lac Mégantic, Quebec that killed 47 people in 2013. Agricultural movements are subject to federal regulations, and, while not as time sensitive as other commodities, do have a limited live span.

Modal characteristics: Raw bulk products are generally moved via pipelines, water transport and railroads. Perhaps inconceivable a decade ago, vast amounts of domestic and Canadian crude are now moving on North America’s rail system, with safety and capacity concerns. Hazardous material handling is required. Specialized equipment, including rail cars, is needed. Ownership of the rail cars may be with the petrochemical companies and third parties rather than the railroads.

Shipper and receiver characteristics: Specialized bulk loading and offloading facilities are needed at shipper and receiver locations.

Cost considerations: As high volume, heavy and unit commodities, transportation cost is of particular concern. US crude has replaced imported crude because of cost considerations. The competitiveness of raw materials is generally based on the cost of producing the materials and the cost of delivering the resultant products to customers in the US and overseas.

Environmental and other considerations: Environmental considerations are paramount in the movement of petrochemical products, similar to other hazardous materials. Shipment frequency is also a concern as highlighted by the availability of rail capacity to handle grain movements.

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<sup>19</sup> <http://www.nbcnews.com/business/economy/food-or-fuel-rail-car-shortage-conundrum-n209781>

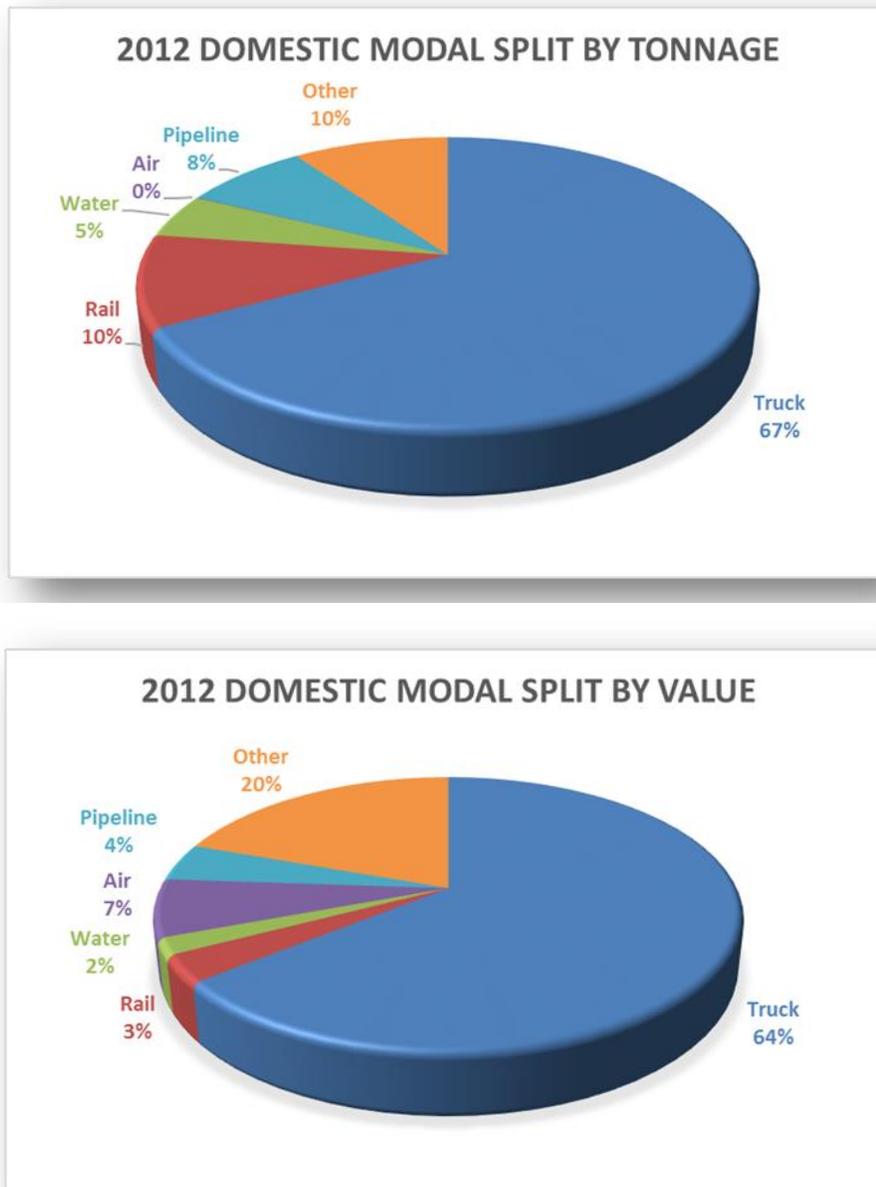
<sup>20</sup> Nixon, “Grain Piles Up, Waiting for a Ride, as Trains Moves North Dakota Oil,” *The New York Times*, August 25, 2014.

<sup>21</sup> <http://www.bloomberg.com/news/2014-08-01/canada-to-require-railways-to-increase-grain-shipments-this-fall.html>

## TRUCK MOVEMENTS

This section provides an overview of truck use and industry trends, as well as the issues facing the industry. Trucks move the vast majority of freight domestically in the US, both by weight and value as shown in **Figure 6**.

**Figure 6: 2012 US Modal Shares by Weight and Value**



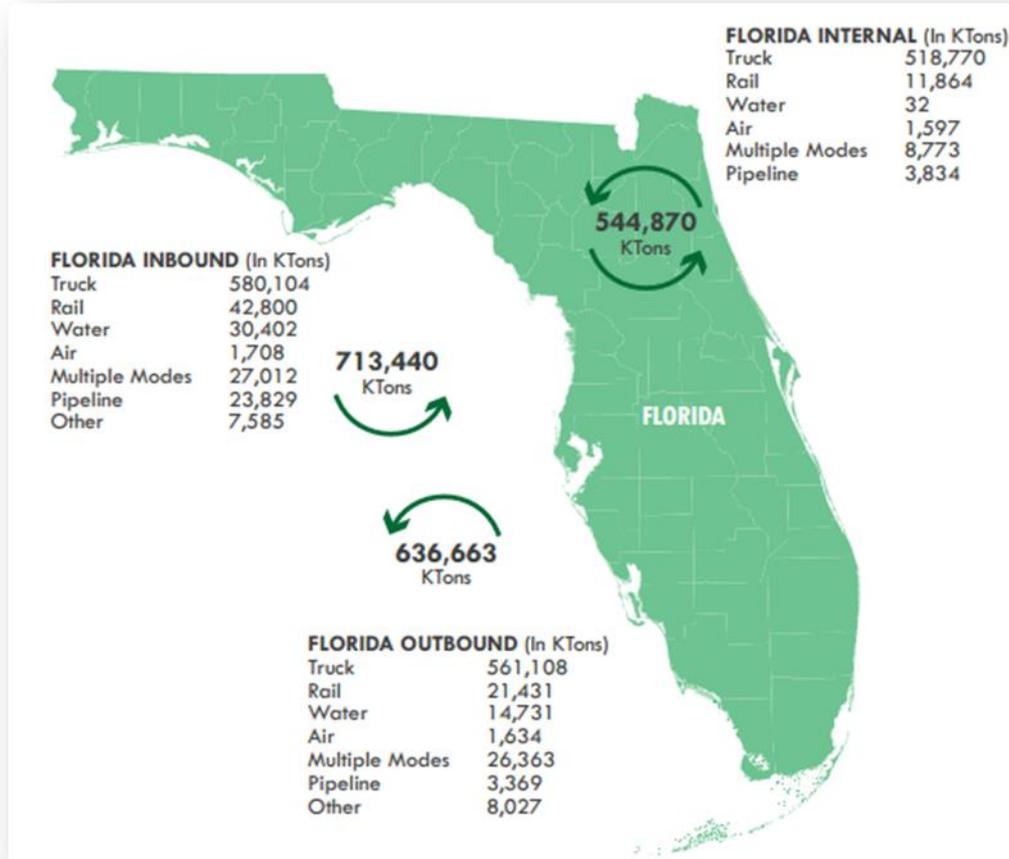
Source: Data from US Department of Transportation Federal Highway Administration. Other is multiple modes and unknown.

The dominant role of trucks in goods movement arises from their flexibility – their ability to serve the broadest range of origins and destinations with the broadest range of vehicle types to handle a broad

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range of commodities combined with their ability to meet specific timelines. Consistent with national statistics, the majority of freight moves by truck in Florida as shown in **Figure 7**.

**Figure 7: 2009 Modal Split in Florida**



Source: Tampa Bay Regional Strategic Freight Plan, p. 2-3

## Ownership and Services Provided

Ownership structures, the types of services offered, and the types of equipment used are extensive and diverse. Ownership structures include:

- Owner-operators are independent truck drivers who may contract directly with a shipper or may work with a trucking firm or third party company to provide transportation services.
- Trucking businesses (also known as “for hire carriers”) may own one or more trucks using their own drivers, independent drivers or a combination of their own and independent drivers.
- Private fleets are owned and operated by businesses for the transport of their own products. In general, the business’ primary activity is not transportation (i.e., food and beverage company fleets).

The types of services may be defined by the distance involved and include:<sup>22</sup>

<sup>22</sup> Some of these definitions are based on the American Trucking Associations’ *Glossary of Trucking Terms*.

## Approaches to Optimizing Rail and Truck Freight Movements

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- Drayage - final mile pick up and drop off of shipments that traveled long distance by another mode such as railroads, air cargo carriers and ocean carriers. Such movements include moving containerized cargo.
- Local truck service - involves pick-up and deliver packages along a specified route in a specified local area (such as a city or multi-stop route in a localized area). These drivers typically handle the same route daily and return home each evening.
- Regional service - involves a set line haul route between cities. The drivers typically return home each evening.
- Over-the-road service - involves one driver or a team of two drivers who travel long distances, including cross-country. These drivers generally do not return home in the evening and may sleep in special berths built into the truck cab.

Services may also be defined as the size and characteristics of the shipments involved. These include:<sup>23</sup>

- Truckload (TL) trucking typically dedicate the entire trailer to a single customer with a load that often exceeds 10,000 pounds. The shipment may be dropped off at a single location or involve multiple stops.
- Less-than-truckload (LTL) trucking companies consolidate shipments from multiple customers in their trailers. The consolidated shipment may be destined to a single location or may involve multiple drop offs.
- “Reefer” trucks refer to temperature controlled trailers with their own refrigeration unit to meet the transport requirements of specific commodities (such as food and some pharmaceuticals).
- “Hazmat” refers to trucks that transport products that have been classified by the US Department of Transportation and other public agencies as hazardous materials. Placards are generally attached to the trailers of these loads which identify potential dangers. The drivers require special training and licensing.
- Over-dimensional trucks handle exceptional large shipments, including utility components, transit cars, yachts, etc.

## Key Issues Affecting the Trucking Industry

Many issues currently affect trucking. It is important to understand those issues that may affect ***the supply of trucking services*** as well as affect the ***cost of truck services to potential shippers***. Both of these considerations factor into modal choice decisions.

### Trucking Cost Considerations

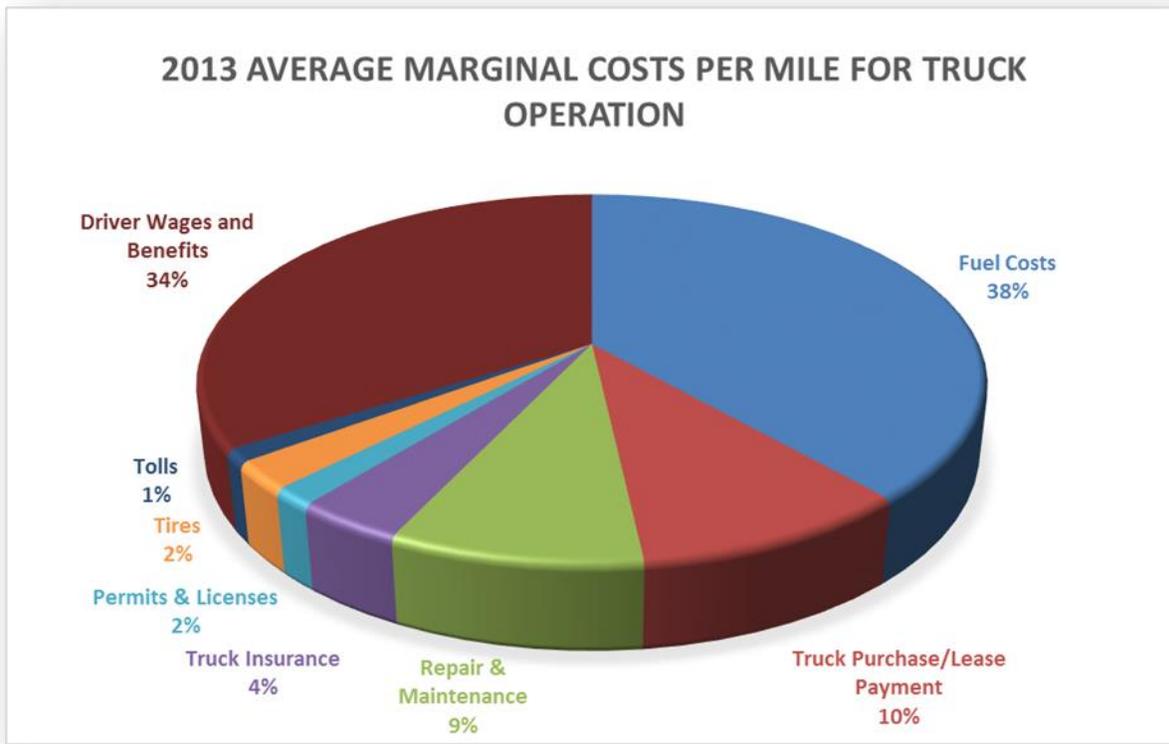
The trucking industry has always been a low margin operation. As such, trucking companies are deeply affected by changes in costs and on the availability of drivers. **Figure 8** summarizes the major cost elements.

Fuel and drivers are the leading cost components, with fuel representing nearly 40 percent of the per mile cost of operating a truck. Driver costs represent nearly 35 percent of the costs. Toll costs represent one percent of cost on average, but can be considerably higher in certain regions of the US. The cost elements also do not include tickets and fines that may accrue during a trip (including parking tickets).

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<sup>23</sup> ibid

Figure 8: Costs in Truck Operations



Source: American Transportation Research Institute, *An Analysis of the Operational Costs of Trucking: 2014 Update*, September 2014, p. 12.

Fuel costs rose considerably and unexpectedly in 2008. Diesel costs exceeded \$4.00 per gallon at the peak. While fuel costs eventually declined that year, fuel costs have continued to rise in the interim such that fuel prices have risen in recent years to near or above the 2008 peak. To offset the fuel uncertainty, most trucking operations add a fuel surcharge to the price charged to customers.

Trucks are becoming more fuel efficient and alternative fuels, such as compressed and liquefied natural gas and electric local trucks, are being tested. However, fuel is anticipated to remain a high cost element for trucking companies and their customers.

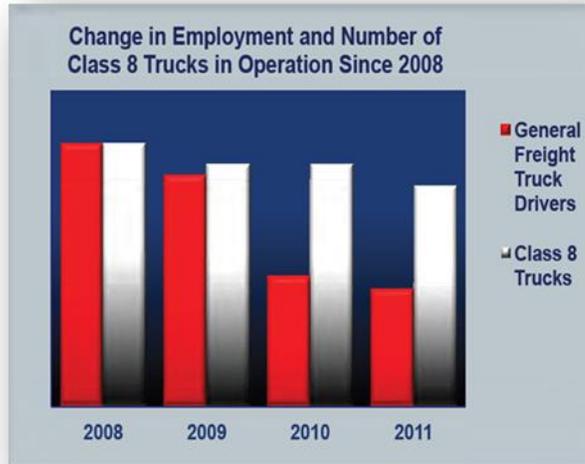
### **Truck Driver Shortage**

Without drivers, the trucking industry cannot operate. Capacity available for shippers is diminished. For years, concerns about an impending driver shortage were voiced. In the last five years, the driver shortage has become profound and is affecting the trucking industry and its customers. The *Journal of Commerce* noted, “Five years into the U.S. economic recovery, trucking companies say finding and hiring drivers is harder than ever. This driver shortage is a roadblock to expansion, limiting incremental growth in truck capacity, and a prime reason truck rates are set to increase at a faster pace in 2014.”<sup>24</sup>

**Figures 9 and 10** provide quantitative detail of the driver shortage. **Figure 9** compares the number of larger trucks with available drivers. **Figure 10** shows the number of these drivers annually between 1997 and 2013. During this time period, demand for truck services increased.

<sup>24</sup> Cassidy, *Truck Drivers by the Numbers*, *Journal of Commerce*, May 12, 2014.

Figure 9: Comparison of Number of Large Trucks and Drivers



Source: Council of Supply Chain Management Professionals (CSCMP) 2011 State of Logistics Annual Report

Figure 10: Trends for Drivers Available for Larger Tractor Trailers



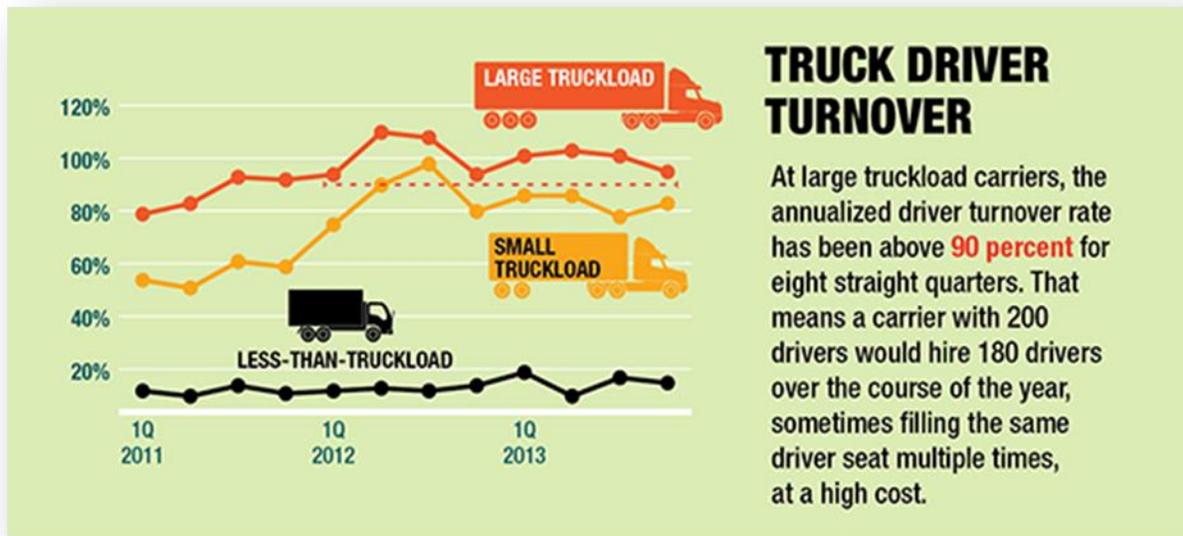
Source: Journal of Commerce, Truck Drivers by the Numbers, May 12, 2014

## Approaches to Optimizing Rail and Truck Freight Movements

The difficulties of attracting and retaining drivers became particularly evident during the Great Recession which began in 2008. Previous recessions generally saw workers from other industries including construction migrate to trucking jobs. However, while this migration initially happened at the start of the Great Recession, within a year, most of the drivers had left the industry.

The reasons for driver turnover and difficulties in attracting drivers include relatively low pay – the average tractor-trailer driver makes \$40,940 annually compared to a US average wage of \$46,440.<sup>25</sup> Over-the-road truckers are also often away from home, which is a deterrent in attracting drivers. The higher turnover for these drivers compared to other forms of trucking is shown in **Figure 11**.

**Figure 11: The Driver Shortage is Most Evident in Long Distance Trucking**



Source: *Journal of Commerce, Truck Drivers by the Numbers, May 12, 2014*

The driver shortage has become a major concern for trucking companies and many shippers, particularly during peak seasons. In July 2014, with peak shipping season underway, *The Journal of Commerce* reported:<sup>26</sup>

“Over-the-road shippers worried about peak-season capacity this fall need to focus on the front of the truck, not the back. There will be trailers available ready to receive freight, and enough trucks to pull them. What may be missing is the key ingredient in truck capacity: the driver.

The escalating driver shortage has become the leading check on over-the-road truck capacity, and if freight demand continues to stay above 2013 levels, the shortage is likely to lead to sharp increases in transportation pricing, as carriers pull out all stops to recruit and keep drivers.

Swift Transportation, the nation’s largest truckload carrier, already has signaled it will look to shippers to help finance a significant boost in driver pay, raising rates by higher percentage levels than Swift was able to gain from customers in the first half of the year...

The driver shortage is now a concrete cap on truck capacity and a prime reason U.S. domestic transportation costs are rising at a faster pace in 2014.”

<sup>25</sup> *Ibid.*

<sup>26</sup> Cassidy, *Shortage of drivers may spark higher peak-season truck rates*, *The Journal of Commerce*, July 31, 2014.

## Approaches to Optimizing Rail and Truck Freight Movements

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The difficulties of earning a living also affects other segments of the trucking industry and, in turn, intermodal supply chains. With a shortage, truck drivers migrate to those segments of the business that offer the best wages and work conditions. The migration within the trucking industry is most pronounced in the port drayage communities. Several major ports have experienced extreme congestion, with truckers waiting hours to obtain a container. In the drayage segment, drivers (many of whom are owner operators) are paid by the trip. With port congestion, drivers may only be able to accomplish one trip a day rather than four – a dramatic decrease in earnings. *The Journal of Commerce* reported the situation in October 2014: “Shirley Roebuck, president of Gilco Trucking in Portsmouth, Virginia, said her owner-operator drivers sometimes spend all morning picking up a load, ‘five hours into a workday, and we’ve accomplished absolutely nothing, not made a dime.’ George Berry, an owner-operator from Chesapeake, Virginia, said drayage drivers are leaving the business because of increasing difficulty earning a living. ‘Driver shortage? Duh! There’s a driver shortage because there’s a driver pay shortage,’ he said.”<sup>27</sup>

Shipper response to the driver shortage including modal shifting and revising of supply chains. Modal shifting has primarily consisted of replacing over-the-road trucking with use of intermodal rail services. Accordingly, the demand for domestic intermodal rail services has been growing.

This modal shift is used where intermodal rail can deliver consistently and at a cost lower than over-the-road trucking. Some commodity shipments, particularly high value and time sensitive shipments, cannot be shifted to intermodal rail. Examples include pharmaceutical shipments that can be valued in the millions of dollars, shipments where greater control over the move is required, and shipments that are more time sensitive.

Changes in supply chains that address the driver shortage also reflect the new requirements for quicker delivery. As a result, companies are increasing the number of distribution centers in consumer markets, as well as locating facilities near major customers that they are supplying. The closer proximity enables more drivers to return home in the evening.

### Hours of Service Regulations

Federal “Hours of Service” (HOS) regulations, control the number of hours that workers may drive. According to shippers and transportation providers, HOS regulations have increased the demand for truck drivers in order to comply with the permissible hours that each worker can operate the truck. Hours of Service is listed as one of the “Top Hot Issues” on the website of the Owner Operator Independent Driver Association website.<sup>28</sup>

The Federal Motor Carrier Safety Administration (FMCSA) describes the objectives of the regulations as:<sup>29</sup>

“The goal of this rulemaking is to reduce excessively long work hours that increase both the risk of fatigue-related crashes and long-term health problems for drivers. A rule cannot ensure that drivers will be rested, but it can ensure that they have enough time off to obtain adequate rest on a daily and weekly basis. The objective of this rule, therefore, is to reduce both acute and chronic fatigue by limiting the maximum number of hours per day and week that the drivers can work. The rule reduces a driver’s average maximum allowable hours of work per week from 82 hours to 70 hours, a 15% reduction. The 15% reduction in the average maximum allowable hours of work based on the new rule results from the restrictions on the use of the restart period.”

Nearly all over-the-road and many line haul drivers are subject to these regulations as these are the drivers most likely to work 70 hour weeks. Provisions of the regulations include:<sup>30</sup>

- Limits the maximum average work week for truck drivers to 70 hours, a decrease from the current maximum of 82 hours;

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<sup>27</sup> Bonney, *Port Congestion: ‘You get what you pay for,’* The Journal of Commerce, October 2, 2014.

<sup>28</sup> <http://www.ooida.com/IssuesActions/>

<sup>29</sup> <http://www.fmcsa.dot.gov/fag/why-hours-service-rule-being-issued>

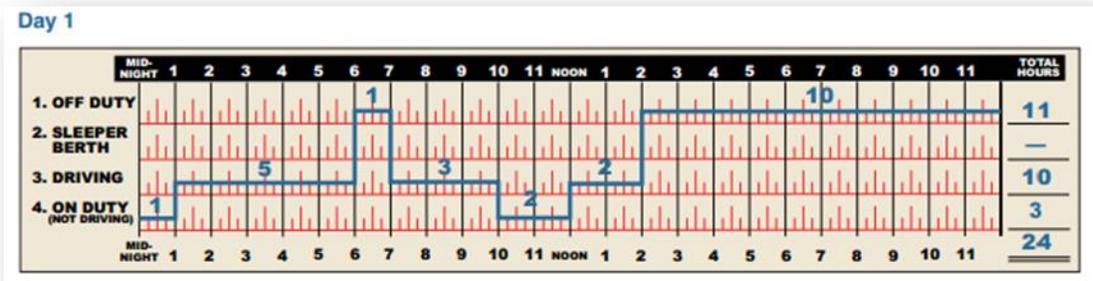
<sup>30</sup> <http://www.fmcsa.dot.gov/newsroom/new-hours-service-safety-regulations-reduce-truck-driver-fatigue-begin-today>

## Approaches to Optimizing Rail and Truck Freight Movements

- Allows truck drivers who reach the maximum 70 hours of driving within a week to resume if they rest for 34 consecutive hours, including at least two nights when their body clock demands sleep the most - from 1-5 a.m., and;
- Requires truck drivers to take a 30-minute break during the first eight hours of a shift.
- Retains the current 11-hour daily driving limit and 14-hour work day.
- States that companies and drivers that commit egregious violations of the rule could face the maximum penalties for each offense. Trucking companies and passenger carriers that allow drivers to exceed driving limits by more than three hours could be fined \$11,000 per offense, and the drivers themselves could face civil penalties of up to \$2,750 for each offense.

Drivers are mandated to carry a log book which records when they are driving, on-duty but not driving, in the cab's sleep berth, or off-duty in 15 minute intervals. The log books must be available for law enforcement officers to inspect. Some companies are moving towards electronic versions of the log book. An example of a log book entry is shown in **Figure 12**.

**Figure 12: Example of Hours of Service Log Book Entry**



Source: Federal Motor Carrier Safety Administration, *Hours of Service Log Book Examples*, April 2014 p. 2.

Failure to comply with the Hours of Service (HOS) rules can have significant impacts on drivers and trucking firms. In addition to monetary penalties, hours of service violations impact drivers' and carriers' federal Compliance Safety Accountability (CSA) score. The Compliance Behavior Analysis and Safety Improvement Category (BASIC) score specifically includes noncompliance with HOS regulations.<sup>31</sup> CSA scores can affect the ability of carriers to obtain work from shippers.

## RAIL FREIGHT MOVEMENTS

The freight rail industry has seen a renaissance occur and accelerate over the last 20 years. From an industry on the verge of extinction, freight railroads and their customers now have demands that exceed the available capacity of the rail system. This section provides an overview of the industry and several of the key trends relevant to the discussion of potential modal shift.

Freight rail generally focuses on lower cost long distance shipments and bulk movement of products. However, freight rail has become more important for both long and shorter distance movements as trucking costs and drivers shortages increase.

<sup>31</sup> <https://csa.fmcsa.dot.gov/FAQs.aspx>

### Industry Structure and Services Offered

Freight railroads are privately owned and generally responsible for owning, developing, operating and maintaining their own rights-of-way and equipment.

The US Surface Transportation Board classifies railroads by revenue for accounting and reporting purposes:<sup>32</sup>

- Class I: Carriers with annual carrier operating revenues of \$433.2 million\* or more
- Class II: Carriers with annual carrier operating revenues of less than \$433.2 million\* but in excess of \$34.7 million\*
- Class III: Carriers with annual carrier operating revenues of \$34.7 million\* or less, and all switching and terminal companies regardless of operating revenues.

\* These threshold figures are adjusted annually for inflation using the base year of 1991.

The industry also uses a set of definitions that reflect the geographical scope of railroad operations:<sup>33</sup>

- **Class I railroads** account for 67% of the industry's mileage, 89 percent of its employees, and 93 percent of its freight revenue. They operate in 44 states and the District of Columbia and concentrate largely on long-haul, high-density intercity traffic lanes. There are seven Class I railroads: BNSF Railway, CSX Transportation, Grand Trunk Corporation (owned by Canadian National), Kansas City Southern, Norfolk Southern, Soo Line (owned by Canadian Pacific), and Union Pacific.
- **Regional railroads** have revenue of between \$40 million and the Class I threshold or operate at least 350 miles of road and have revenues of at least \$20 million. There were 23 regional railroads in 2009. They typically operate 400 to 650 miles in two or three states and have 100 to 350 employees.
- **Local railroads** are line haul railroads that do not qualify as a Class I or Regional railroad. Seventy-five percent of those railroads operate fewer than 100 miles of railroad line. There were 339 local line haul railroads in 2009.
- **Switching and Terminal (S&T) Railroads** primarily provide switching and/or terminal services. Rather than point-to-point transportation, they usually perform pick-up and delivery services within a port or industrial area, or move traffic between other railroads. In 2009, there were 194 S&T railroads.

In Florida, the Association of American Railroads (AAR) reports that the State has:<sup>34</sup>

- Two Class I railroads – CSX and Norfolk Southern
- Two Regional railroads – Alabama & Gulf Coast Railway and Florida East Coast Railway
- Nine Local railroads – AN Railway LLC, Bay Line Railroad, First Coast Railroad, Florida Central Railroad, Florida Midland Railroad, Florida Northern Railroad, Georgia & Florida Railway, Seminole Gulf Railway and South Central Florida Express
- One Switching and Terminal Railroad – Talleyrand Terminal Railroad Co.

Florida's rail network is shown in **Figure 13**. The Tampa Bay area is one of the key rail freight clusters in the State.

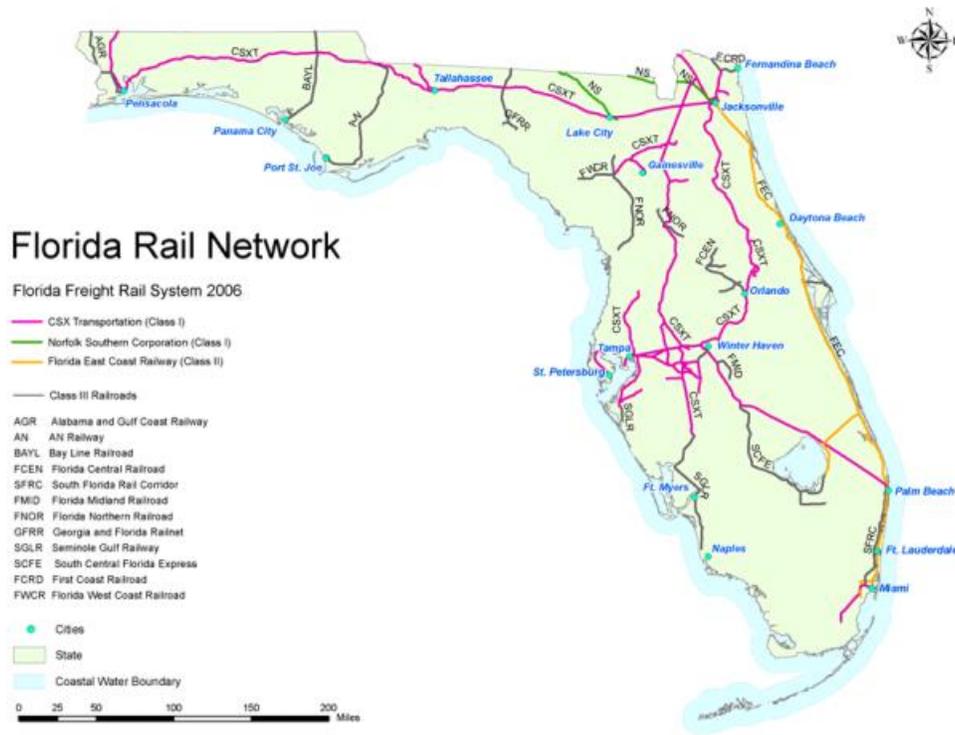
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<sup>32</sup> [http://www.aslrra.org/about\\_aslrra/FAQs/](http://www.aslrra.org/about_aslrra/FAQs/)

<sup>33</sup> <https://www.aar.org/aboutus/Pages/Industry-Information.aspx#.VDFbbvldWEU>

<sup>34</sup> Association of American Railroads, *Freight Railroads in Florida*, June 2013.

Figure 13: Florida Rail Network



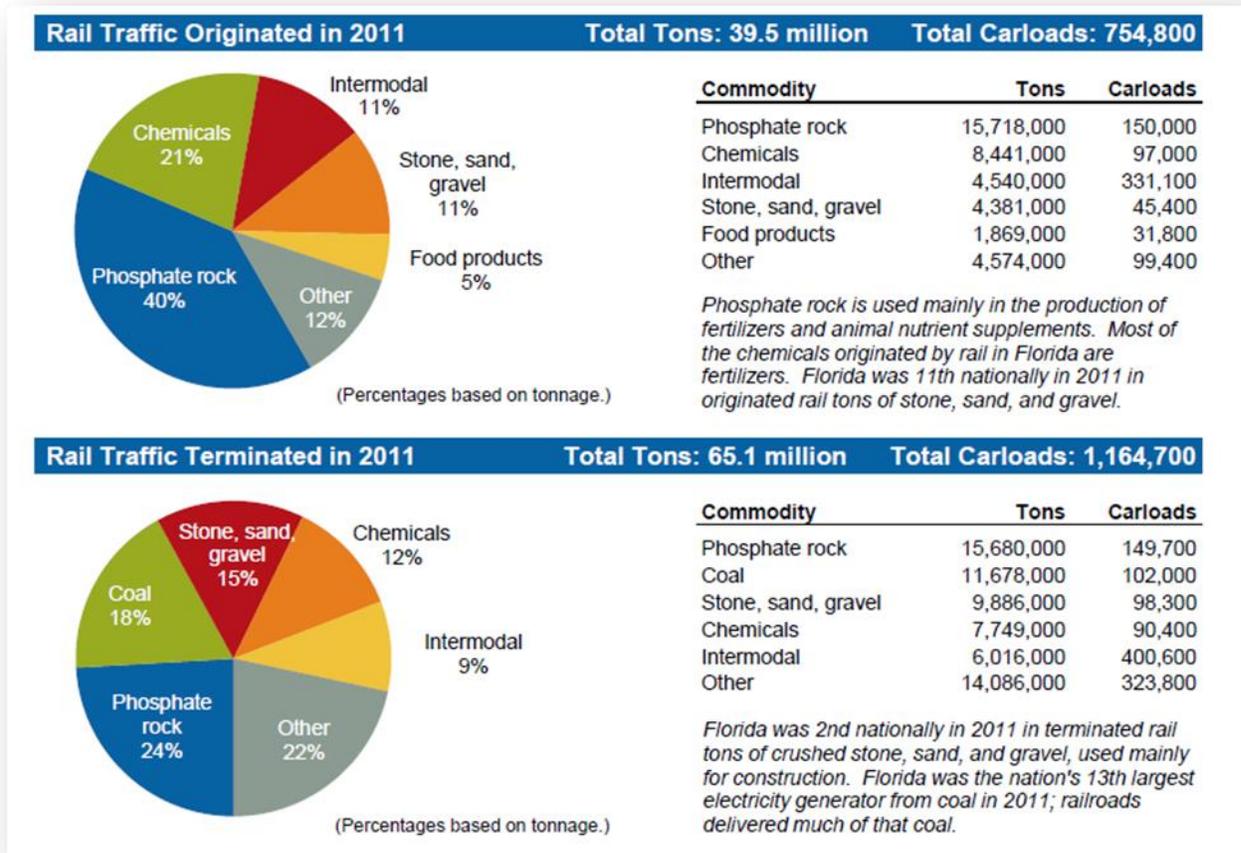
Source: Florida Department of Transportation, 2006 Florida Freight & Passenger Rail Plan, February 2007

The key commodities originating and terminating in the State are summarized in **Figure 14**. Phosphate rock, which is primarily used for fertilizer, represents that greatest volume moved by rail. Note that the phosphate rock is shown in **Figure 14** as originating and terminating, as the commodity moves from the quarries to the ports to then be shipped to other regions. The sources of this material are located in the Tampa Bay area and are a major economic contributor to the State and local economies. The Tampa Bay Regional Strategic Plan reports that:<sup>35</sup>

Phosphate mining occurs in central Florida’s “Bone Valley” region, which includes portions of Polk, Hillsborough, Manatee, Hardee, and DeSoto Counties. Phosphate is a key component of agricultural fertilizers and the region’s primary export. The phosphate is mined and fertilizer is manufactured in proximity to the mines. Approximately 8.3 million tons of phosphate products were shipped through the Port of Tampa in 2010. To a lesser extent, finished phosphate and fertilizer products are also shipped through Port Manatee.

<sup>35</sup> Tampa Bay Regional Strategic Freight Plan, p. 4-6

Figure 14: Key Commodities Moved by Rail in Florida



### **Growing Crude Oil and Intermodal Shipments' Impact on Capacity**

The impact of the substantial increase in domestic crude oil movements on rail freight capacity was discussed previously. From a railroad perspective, the boom in crude oil movements is welcome as demonstrated by this description in Norfolk Southern's magazine:<sup>36</sup>

"The biggest energy story for NS, however, may turn out to be the crude-by-rail market. Much of that business, launched in late 2011, has come through the Bakken Shale deposits in North Dakota, where NS works with interline partner BNSF... 'For Bakken crude there's no viable pipeline option to the East Coast, and rail offers speed to market, flexibility, and scalability,' said Garner. 'The crude business is going to grow.'"

The freight railroads have also seen continual increases in the volumes of intermodal shipments as customers have embraced this rail option as a cost efficient replacement for over-the-road trucking and as the part of the international merchandise supply chain. In July, *The Journal of Commerce* reported a six percent increase in intermodal rail movements in the first half of 2014 alone and the implications for shippers:<sup>37</sup>

"Railroads in western North America already got a taste of potential peak-season trouble when shippers accelerated imports through U.S. West Coast ports ahead of the July 1 expiration of the International Longshore and Warehouse Union's contract. BNSF Railway and Union Pacific Railroad have been accused of being caught flat-footed, with some terminal operators complaining the carriers were running two days late in providing locomotives and railcars to on-dock facilities at the Los Angeles-Long Beach port complex.

Surging intermodal volumes aren't the only reason for mounting delays, however. A restocking of coal after the harsh winter, healthy grain exports and the domestic energy boom are making it difficult for the railroads to dig out from cargo backlogged during the winter.

If transit times stretch too far, however, shippers will look to shift higher-priority loads back to trucking, he said. After convincing many shippers and third-party logistics providers that intermodal reliability had improved substantially, the railroads risk losing some of those perceived gains if service deteriorates further."

The article highlights how shippers consider consistent delivery and delays in their modal choice decisions. Intermodal rail is the most viable alternative to over-the-road trucking but service issues can shift the equation. In addition, railroad pricing for intermodal service combined with transit times, factors into modal choice.

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<sup>36</sup> BizNS, *op cit*, p. 3.

<sup>37</sup> Szakonyi, Intermodal shipper face rocky peak season, *The Journal of Commerce*, July 14, 2014.

### **Involvement in Logistics Centers and Freight Villages**

Freight villages are defined as locations that bring together multiple forms of freight movement and industrial development. Often referred to as Logistics Centers, the concentration of industrial uses helps create the critical mass needed to attract rail freight services, as well as the customer base for ancillary services (e.g., restaurants, banks, professional offices, day care), which can be useful to the surrounding communities. The freight village form of development is designed also to be community friendly, with the auxiliary services serving as “buffer land uses” between industrial and other land uses and the use of eco-friendly designs.

In the US, the railroads have been a critical component in logistics center developments of all sizes. Some of the largest examples include the 17,000 acre Alliance development in Texas, the Centerpoint development in Illinois, and the evolution of the Raritan Center industrial park in New Jersey. Generally, the railroads operate one or more major intermodal yards within or adjacent to the industrial component of the yard working synergistically with the critical mass of shipments generated by tenants. In Raritan Center, a shortline reinvigorated the industrial park and brought new carload tenants to the property. In both cases, rail movements replaced truck movements.

In Winter Haven, FL, Evansville Western Railway, an affiliate of CSX announced the commencement of intermodal rail operations at the new Central Florida Intermodal Logistics Center.<sup>38</sup> The new 318 acre intermodal terminal, will:<sup>39</sup>

- Serve as a centralized hub for transportation, logistics and distribution serving Orlando, Tampa and South Florida.
- Be surrounded by 930 acres of industrial development that can accommodate 7.9 million square feet of warehouse and distribution center space.
- Incorporate environmental initiatives including use of electric crane, use of exterior LEDs to save energy and reduce light pollution and LEED Silver Certification for the development’s administration building.

Freight villages and logistics centers encourage rail use through their proximity to rail infrastructure and through the creation of the threshold levels of activity sought by the freight railroads.

### **Shorter Distance Rail Movements**

The larger Class I railroads generally focus on the long distance aspects of the supply chain – moving large quantities of goods long distance between and origin and destination. However, the length of a viable haul from a Class I railroad perspective has dropped from several hundred miles to perhaps as little as 90 miles when sufficient traffic and rail capacity exists. Short haul shuttles connect inland intermodal yards with major container ports throughout North America. In addition, many regional railroads and shortlines have grown their business as customers seek more goods movement options and the freight railroads have developed new service offering.

The Florida East Coast Railway (FEC), a Class II 351-mile system located along the east coast of Florida, has pursued several strategies that have resulted in truck to rail modal shifts. The FEC serves the South

#### **Central Florida Logistics Center**



Source:

<http://blog.winterhavenchamber.com/wp-content/uploads/2014/04/20131219-CSX-LakeLand-Winterhaven98.jpg>

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<sup>38</sup> <http://csx.com/index.cfm/media/press-releases/state-of-the-art-terminal-begins-operations-in-winter-haven/>

<sup>39</sup> [Ibid](#)

## Approaches to Optimizing Rail and Truck Freight Movements

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Florida Logistics Center, a multi-modal hub located adjacent to Miami International Airport, worked with Wal-Mart to develop a new intermodal business, and worked with trucking firms to provide an alternative to the congested I-95 route.

In 2006, the FEC and Wal-Mart received the Argus Media's "Win-Win" Award, which is annually given to shippers and railroads that develop innovative partnerships leading to better service, better rates and other mutually beneficial improvements.<sup>40</sup> The winning service was described as:<sup>41</sup>

"FEC has developed what it terms a "valet service" for Wal-Mart. The railroad picks up motor carrier traffic from its intermodal ramp in Jacksonville, and runs it about 240 miles to Fort Pierce. At that point, FEC uses its own drayage service to move containers about six miles to Wal-Mart's facility. At the same time, FEC picks up empty containers from Wal-Mart and ships them back to Jacksonville for motor carrier pick-up.

FEC's valet service has become a win-win opportunity not just for the carrier and shipper but also for motor carriers. FEC benefits from significant new business, and a growing relationship with one of the nation's largest companies. Wal-Mart benefits from scheduled deliveries, so it can schedule employees to handle the incoming traffic more efficiently. And motor carriers are benefiting by saving wear-and-tear on their equipment while getting more use out of tractors and drivers, scarce commodities in the current market."

## APPROACHES TO OPTIMIZING TRUCK AND RAIL MOVEMENTS AND MODAL SHIFTS

Discussions of modal optimization and shifting should begin with realistic expectations of what commodities and customers could shift their use of transportation modes. This section builds on the context set in the preceding chapters to outline some of the mechanisms that can be considered to optimize freight movement.

Much research has been conducted into modal shifting, and models for assessing the impacts are available (such as the Intermodal Transportation and Inventory Cost Model (ITIC) and ITIC-Intermodal (ITIC-IM) Model available from the Federal Highway and Federal Rail Administrations).

As previously discussed, the modal choice factors include:

- Commodity and shipment characteristics.
- Modal characteristics.
- Shipper and receiver characteristics.
- Cost considerations.
- Environmental and other considerations.

High value, time sensitive products such as pharmaceuticals, perishables, smaller electronics and replacement parts will use those modes that can deliver the products as quickly and securely as possible with complete visibility throughout the move. Businesses with these shipments will likely use expedited trucking and air cargo services. Modal shifting has already occurred in this market segment, with expedited trucking replacing domestic air cargo services.

High weight, less time sensitive, lower value commodities, such as petrochemicals, agricultural products, coal and scrap metal will seek to use those modes that can provide lower cost freight service.

The market segments with potentially more flexibility in modal choice include slightly less time sensitive general merchandise, "breakbulk" products (such as paper, lumber and steel) and certain construction materials. General merchandise can move in international or domestic containers. Breakbulk, bulk and construction material can generally move in carload service.

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<sup>40</sup> Bloomberg, *Florida East Coast Railway and Wal-Mart Receive Argus Media's Annual Win-Win Award*, June 8, 2006. Available at: [http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a.me\\_jGp3yTc](http://www.bloomberg.com/apps/news?pid=newsarchive&sid=a.me_jGp3yTc)

<sup>41</sup> *Ibid*

## Approaches to Optimizing Rail and Truck Freight Movements

For these market segments, modal, cost and other considerations (such as customer service and availability of shipment information visibility) become decision factors. Do the railroads or trucking companies have the capacity to handle the service? Will travel times be consistent? Will the service level be comparable to the use of trucking services? How great is the cost savings? Can damage and theft occur?

The preceding chapters summarized some of the issues that are affecting truck and rail capacity. The driver shortage has affected truck availability. Increased Bakken crude and intermodal shipments have strained railroad capacity. Thus, even if the potential exists with some shippers to consider alternative modes, the capacity may not be present to do so.

A variety of potential strategies exist to assist customers, transportation providers and regions to optimize and, if desired, encourage the modal shifting. These strategies address specific triggers in modal decision making within the contexts established in this White Paper:

Identify transportation requirements and challenges: This strategy is a foundation step for both public and private sector entities. The specific transportation requirements, challenges and options are articulated and prioritized for a business' commodities and shipments. The result is a data driven analysis of modal options for specific companies with specific goods in specific locations. Shippers undertake such analyses as part of their transportation planning and site selection for facilities. Transportation providers undertake this analysis to identify potential customers. Public agencies may undertake this assessment to understand the freight transportation needs of the existing businesses in their area, as well as the needs of industries that could be attracted to their region.

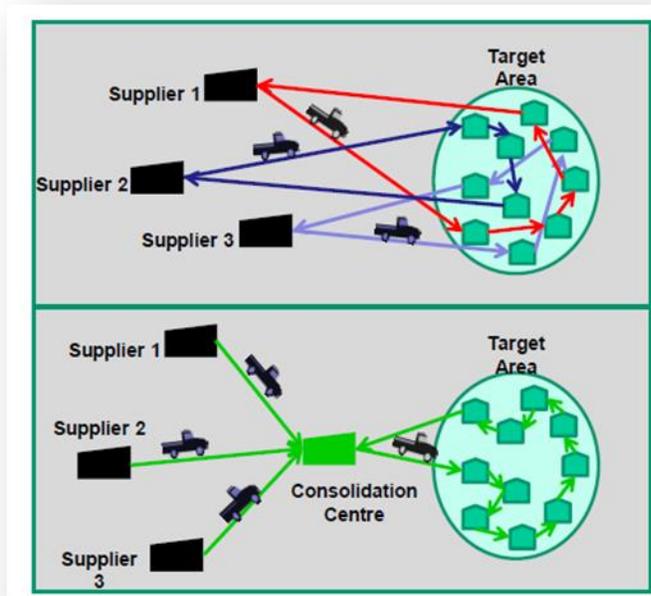
Consider urban consolidation centers in congested areas to reduce truck trips: This strategy focuses on reducing truck traffic to optimize roadway usage; the strategy does not generate a mode shift. The urban consolidation center (UCC) concept

originated primarily in Europe. European cities have roadways and buildings that developed over centuries, stores with little backroom space, and multiple user demands for roadways and curb space. The UCC facility enables the trans-shipment and consolidation of shipments for urban delivery.

As shown in **Figure 15**, the multiple direct truck trips made by suppliers to individual stores are replaced with deliveries to a consolidation center. At the consolidation center, the supplier trucks are offloaded, sorted and consolidated into the shipments for each store. The third party logistics (3PL) company that operates the UCC then delivers the consolidated loads to the stores. The stores are charged a fee for this service.

The Bristol/Bath UCC in the United Kingdom was launched in 2004, is operated by DHL through a city contract, and serves more than 100 customers using electric vehicles. A 2013 DHL press release noted significant truck traffic impacts: In June 2013, 97 trucks travelled into the

**Figure 15: The UCC Truck Movement Reduction Concept**



Source: *Urban Consolidation Centers: The UK Experience*, RPI Sustainable Urban Freight Systems Peer-to-Peer Exchange Program Webinar, May 6, 2014

## Approaches to Optimizing Rail and Truck Freight Movements

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consolidation centre carrying deliveries for retailers. Once the deliveries were consolidated, only 20 trucks made onward deliveries into the city centre, reducing the number of trucks by 80%.<sup>42</sup>

Pursue freight village/logistics center development: Freight village/logistics center development, as noted in the previous chapter, provides several benefits for shippers, transportation providers and regions. Freight villages and logistics centers are a form of *smart growth planning*. Similar to transit-oriented development, freight village development concentrate industrial development in a manner that provides multimodal freight access in a setting that is both environmentally and community friendly.

Freight villages include businesses that serve the daytime workforce, such as restaurants, banks, professional offices, daycare, wellness centers, personal care and shopping. Generally, these support businesses are located at the perimeter of the freight village development, creating a transitional land use and a set of functions that can serve the rest of the community.

By co-locating industrial development with freight rail facilities, companies in the logistics center can avail themselves of readily available intermodal or carload rail for long distance movements, with minimal dray between the intermodal yard and their facility. At the same time, the massing of customers in one location can support the threshold levels of shipments needed to financially support railroad investment and operations.

For example, the CenterPoint Intermodal Center (CIC) - Joliet/Elwood, IL is the largest master-planned inland port in North America. Situated on more than 6,500 acres just 40 +/-miles southwest of downtown Chicago, CIC - Joliet/Elwood is strategically positioned at the epicenter of the region's immense transportation infrastructure. Adjacent to the I-55/I-80 interchange and anchored by the BNSF Logistics Park-Chicago and Union Pacific-Joliet Intermodal Terminal.<sup>43</sup> **Figure 16** provides an aerial of the development and identifies the customers attracted. As a result of the freight access provided, this former arsenal and superfund site, is now the location of distribution centers for major US companies, such as the 3.4 million square foot Wal-Mart distribution center complex.

Encourage use of services that reduce empty truck movements: This strategy focuses on reducing non-revenue movements, which is beneficial to trucking companies and in terms of reducing truck trips. With increased fuel prices and the driver shortage, multiple efforts have been advanced. These include:

- VICS Empty Miles program which matches freight loads with empty trucks. VICS is, a non-profit industry organization, runs the program.<sup>44</sup> Macy's is one of the companies using the program and stated: "It is important for us to implement business practices that are sensitive to the environment. The Empty Miles Program greatly supports that premise while continuing to drive operational efficiency."<sup>45</sup>
- On-line truck capacity and demand matching services such as Transfix, an Internet startup. Barnes & Noble, a Transfix customer, noted, "Transfix is by far our favorite broker. With their real time tracking and alerts our efficiency and performance have improved dramatically. I would highly recommend them."<sup>46</sup>
- Shippers seeking customers for their backhaul capacity of their private fleets. Wal-Mart has a backhaul program. The program uses its own fleet to pick up products from its vendors after the company's trucks have made deliveries to Wal-Mart stores and distribution centers.<sup>47</sup>

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<sup>42</sup> [http://www.dhl.co.uk/en/press/releases/releases\\_2013/local/091813.html](http://www.dhl.co.uk/en/press/releases/releases_2013/local/091813.html)

<sup>43</sup> <http://www.centerpoint-intermodal.com/overview.html>

<sup>44</sup> Andraski and Galli presentation on VICS Empty Miles Program, *FHWA Talking Freight*, February 17, 2010.

<sup>45</sup> Matheys, "The Macy's/Schneider National Case Study," *FHWA Talking Freight*, February 17, 2010.

<sup>46</sup> <http://transfix.io/>

<sup>47</sup> [http://www.scdigest.com/ASSETS/ON\\_TARGET/10-05-25-1.php?cid=3485](http://www.scdigest.com/ASSETS/ON_TARGET/10-05-25-1.php?cid=3485)

Figure 16: Centerpoint Intermodal Center, Joliet, IL



Source: <http://www.centerpoint-intermodal.com/interactive.html>

Work with railroads to offer scheduled priority service: Third party companies have developed new services that combine use of priority long distance rail service with local truck deliveries for temperature controlled products, such as food. By facilitating an integrated multi-modal service with shipment visibility, these companies have shifted over-the-road truck trips into rail movements. Scheduled priority rail services have originated as a *private sector initiative* to optimize rail freight use and reduce supply chain costs.

For example, Railex was among the first companies to offer this service. Their service model is shown in **Figure 17**. Railex, which began service in 2006, specialized in temperature-controlled, national shipping services and full-service 3PL solutions for perishable, frozen fragile and high value goods. Their industry expertise includes alcoholic and non-alcoholic beverages, fresh foods, frozen goods and pharmaceuticals.<sup>48</sup> These are commodity segments that have typically not used freight rail previously. The Railex model demonstrates that this strategy can be viable.

<sup>48</sup> <http://railex.com/about/>

Figure 17: The RailEx Transportation Model



Source: <http://railex.com/services/>

Work with railroads and shippers to address equipment availability and service: As discussed previously, reliability and customer service are key considerations in modal selection. Shippers have experienced difficulties with the railroads, and service issues are often first discussed between the railroads and their customers. However, in some instances, the difficulties have been so severe, as in the case of grain movements, that shippers have called for governmental actions to rectify the situation. For this strategy to work with modal optimization and shifting, the railroad capacity, equipment and service need to be sufficient to meet customer expectations. When the service and equipment are considered insufficient, less optimal use of the freight network can result.

Work with port authorities to investigate short-haul rail shuttle services and inland port terminals: Inland port terminals enables shippers to pick up and drop off international maritime shipments without having to travel directly to the port. This strategy can increase the market reach of a port, as well as consolidate shipments to support a rail connection between the inland terminal and the port. Accordingly, the strategy can both reduce truck traffic and shift those shipments to rail.

The Virginia Inland Port (VIP), located in Front Royal, was one of the first such developments. The Port of Virginia describes the development as follows:<sup>49</sup>

“VIP occupies 161 acres of land and is approximately 60 miles west of Washington, D.C. The terminal brings The Port of Virginia 220 miles closer to inland markets and enhances service to the Washington D.C. / Baltimore Metro Region by providing rail service to the terminals in Hampton Roads. VIP also consolidates and containerizes local cargo for

<sup>49</sup> <http://www.portofvirginia.com/facilities/virginia-inland-port-vip/>

## Approaches to Optimizing Rail and Truck Freight Movements

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export. The terminal is serviced by 17,820 feet of rail track that runs adjacent to Norfolk Southern's Crescent Corridor. Intermodal rail cars arrive at VIP and gain access via Norfolk Southern rail to Harrisburg, PA and New York/New Jersey region. The facility is a U.S. Customs-designated port of entry, and the full range of customs functions is available to customers. Containerized rail service is provided five days a week to VIP from both Norfolk International Terminals and the APM Terminals in Portsmouth. Well-known companies such as Home Depot, Kohl's, Rite Aid and Red Bull have opened up new distribution centers in the Front Royal area to utilize VIP, bringing jobs and economic benefits to the region."

Florida ports, railroads and industrial developers are building similar facilities. For example, Port Canaveral is working in September of 2014 to finalize a deal to use a 240,300 square foot industrial building that is being constructed as part of the 230 acre Titusville Logistics Center.<sup>50</sup> Flager Global Logistics, a subsidiary of the Florida East Coast Railway, is developing the Center.

Review truck size and weight limits: The amount that can be moved via truck is a consideration when choosing between truck and rail use. Federal and state regulations dictate the permissible truck sizes, configurations and weights on roadways and bridges. On the Interstate Highway System, the federal weight limits for commercial vehicles are:<sup>51</sup>

- Gross vehicle maximum weight – 80,000 pounds.
- Single axle maximum weight – 20,000 pounds.
- Tandem axle maximum weight – 34,000 pounds.

The Federal Highway Administration notes<sup>52</sup> that while the federal government does not impose height or trailer length limitations, no state can impose a length limitation of less than 48 feet. State height limits are noted as ranging from 13.5-to-14.5 feet.

These limits, particularly those that regulate permissible gross vehicle maximum weight, affect the loads that can be legally transported by trucks without a permit. Some states and municipalities issue overweight permits but may limit the number. Agencies are also considering the feasibility of allowing triple trailers and longer double trailers to address volumetric capacity issues.<sup>53</sup>

Review road and rail infrastructure in terms of height and/or weight restrictions: In addition to a region's roads being capable of handling standard truck fleets, the ability of the region's infrastructure to accommodate national standard rail equipment heights and weight can also determine the modal choice. On November 21, 1994, the Association of American Railroads (AAR) issued a new standard for rail freight cars ("S-259") which increased the standard weight that a rail freight car should be capable of carrying from 263,000 (263K)pounds to 286,000 pounds (286K).<sup>54</sup>

The 286K standard became effective on January 1, 1995 and has been the national standard ever since that date. However, many passenger rail services, including Amtrak, restrict freight cars using their rights-of-way to the lower 263K limit. Similarly, older rail infrastructure may not support the 286K standard. Height and width issues can also exist with older rail infrastructure, restricting national standard "Plate F" cars and doublestack train movements. Plate F cars have become the de facto national standard sized rail cars used by customers as seen in **Figure 18**. Plate F cars are higher (17 feet) and wider (10 feet 8 inches) than the older cars and may require that "legacy" freight rail lines (including bridge clearances) be modified to accommodate the additional dimensions. Similarly, doublestack rail platforms – train cars that handle containers stacked two high require higher clearance of over 20 feet.

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<sup>50</sup> <http://www.floridatoday.com/story/news/local/2014/09/22/port-canaveral-seeking-lease-titusville-warehouse/16056679/>

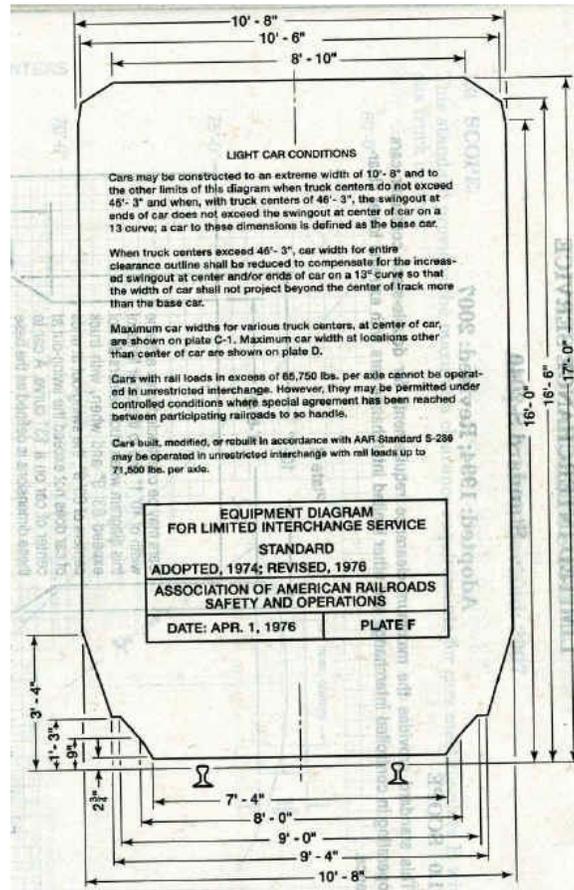
<sup>51</sup> <http://ops.fhwa.dot.gov/Freight/sw/overview/index.htm>

<sup>52</sup> *Ibid*

<sup>53</sup> Walmer, "Longer loads: Legislation would allow triple tractor-trailers on federal highways," *Sentinel*, May 6, 2014. Available at: [http://cumberlink.com/news/local/longer-loads-legislation-would-allow-triple-tractor-trailers-on-federal/article\\_2edf390e-d572-11e3-9e2c-001a4bcf887a.html](http://cumberlink.com/news/local/longer-loads-legislation-would-allow-triple-tractor-trailers-on-federal/article_2edf390e-d572-11e3-9e2c-001a4bcf887a.html)

<sup>54</sup> Rader and Gagnon, *Maximizing Safety and Weight: A White Paper on 263K+ Tank Cars*, September, 1999 (available on the Federal Railroad Administration website).

Figure 18: “Plate F” Rail Car



Source: Association of American Railroads

**Invest in freight rail improvements:** Especially in regions with older, legacy rail networks, the public sector can work with the freight railroads to invest in improvements enable the movement of national standard railcars and/or enhance rail capacity and operations. Similarly, investments can improve rail access for potential shippers and receivers. Such investments can help optimize the use of rail freight assets similar to how roadway improvements can help improve truck access and operations.

States, including Florida, have programs that identify and help with rail improvements. Florida's program was described in a February 2014 news article:<sup>55</sup>

“We’ve had what I would categorize as a very aggressive, proactive and robust relationship with private freight rail,” says Fred Wise, who manages the rail arm of the Florida Department of Transportation. While the state has for the past two decades worked with railroads, Wise says the partnership really began rolling in 2003 when Florida developed its first strategic intermodal system improvement plan, covering airports, seaports, highways and rail.

The emphasis is on strategy because Wise has his eye on the newly widened Panama Canal, which has set off a national and international arms race to upgrade the capacity of

<sup>55</sup> Walters, “States Reinvest in Once-Abandoned Freight Lines,” *Governing*, February 2014. Available at: <http://www.governing.com/topics/transportation-infrastructure/gov-states-reinvest-in-rail.html>

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ports. Florida has invested millions along with private railroads to improve rail access to its ports, including tracks to the Port of Miami. It's a \$500 million investment in rail freight capacity statewide by CSX Transportation, using \$432 million from the proceeds of a Central Florida rail corridor purchase by the state for commuter rail service in the Orlando area. Additionally, the Florida DOT partnered with the Florida East Coast Railway, Port of Miami and U.S. DOT in a \$49 million project to restore on-dock rail service to the port.

"There's just no way that project would have happened" without the high level of intergovernmental cooperation, capital and other assistance provided by the state, says Bob Ledoux, head of governmental affairs for the Florida East Coast Railway...

Florida's Wise says that the state's formula for providing grants includes a clear public benefits test. "We do the metrics. You take 260 trucks off the road for every train. Highway maintenance cost avoidance is huge." The environmental and economic development advantages can be calculated as well. "You can move a ton of freight 100 miles on one gallon of fuel, which means shippers can look to savings with rail versus trucks. All those factors come into play when we calculate the benefits of a specific project." The key, says Wise, is to understand the industry and to be hard-nosed about the deals states cut.

Demonstrate how intermodal rail can replace over-the-road trucking and truck movements on congested roads: Shippers and transportation providers often prefer to go with proven modes and routes. Fuel cost increases, driver shortages and increasing congestion on major routes have caused companies to seek alternatives. Some of these alternatives, as discussed previously, may involve mode shifting for at least a portion of the goods movement.

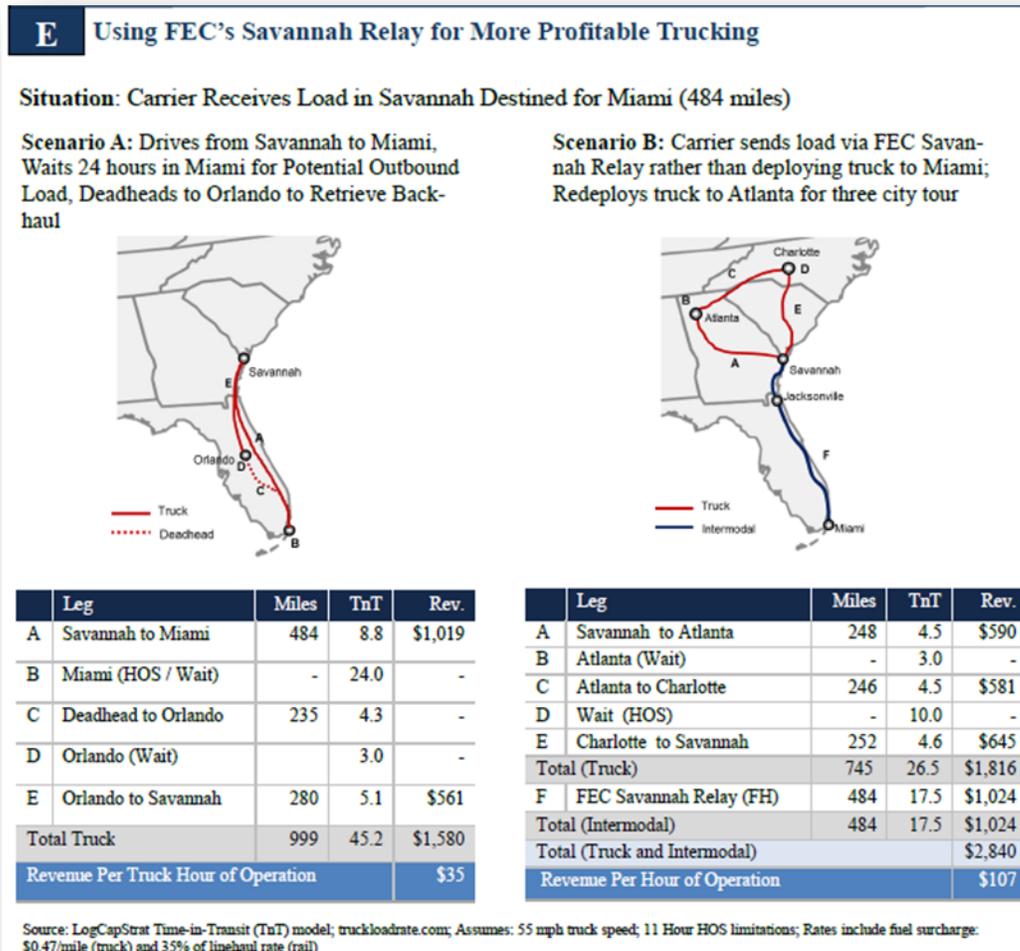
The ability to quantify costs and time savings can be essential in considering such options. In a June 2013 white paper, several of these mode shift alternatives were highlighted specific to the South Florida area. As shown in **Figure 19**, the example demonstrates to trucking companies how they can improve their revenue flows by using rail for part of the customer movement.

Review fuel tax: Taxes are never a popular topic. However, taxes can affect the cost equation and ultimately modal choice, as well as provide revenue streams for infrastructure improvements. Fuel is currently a larger cost item for trucks than for railroads. Accordingly, an increase in fuel taxes potentially more adversely affects trucking costs. It should be noted that the truck manufacturers are improving engine efficiency as well as experimenting with alternative fuels and electric vehicles. Further, some commodities and shipment types are relatively captive to truck or rail use.

Investigate tolling on roadways and other user fees: Similar to fuel taxes, tolls and other user fees can affect the costs charged to customers and may affect modal choice. It should be noted that many trucking companies separately charge customers for the tolls incurred on a route.

Consider demonstration projects to test the viability of shorter haul rail routes: The Florida East Coast Railway arrangement with Wal-Mart demonstrates the feasibility of shorter haul rail movements for some customers. Similar demonstration projects, perhaps partially underwritten by public agencies, may encourage customers and railroads to experiment with the viability of shorter distance rail movements.

Figure 19: Demonstration of Revenue Impacts to Trucking Firm of Mode Shifting for Part of Trip



Source: Logistics Capital & Strategy, *The Case for Intermodal in South Florida*, June 2013, p. 4.

Encourage or mandate green practices in the supply chain: Customers and companies are increasingly seeking greater use of environmentally sustainable processes in goods movement. Use of low emission trucks has become mandated at several US ports. Environmental considerations are becoming part of the modal and carrier choice decisions of companies.

The US Environmental Protection Agency (EPA) launched the SmartWay Program in 2004. The program is a public-private initiative between EPA, trucking companies, rail carriers, logistics companies, commercial manufacturers, retailers, and other federal and state agencies. Its purpose is to improve fuel efficiency and the environmental performance (reduction of both greenhouse gas emissions and air pollution) of the goods movement supply chains.<sup>56</sup> Companies proudly display their SmartWay certification on their equipment, and the certification can be a consideration for companies in carrier selection.

Some companies have gone further in terms of incorporating environmental practices into their modal use. IKEA was one of the first major shippers to actively use rail and barge modes for their product

<sup>56</sup> <http://www.epa.gov/smartway/about/index.htm>

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movement. For example, in 1994, the company started a dedicated train service between Sweden and Germany, with one fully loaded train in each direction running five days a week and estimated to have replaced 2,500 truck moves.<sup>57</sup>

### SUMMARY

Given the enormous growth in anticipated freight movements, it may be necessary to maximize the capacity of all freight resources. This White Paper has describe a range of factors influencing the choice of mode for freight movement. To the extent it is desirable to promote one mode versus another, this White paper has suggested a number of strategies that can affect the respective roles of trucks and rail. These strategies involve both the public and private sectors; however, ultimately decisions on choice of freight mode will be made by businesses optimizing their individual shipping needs.

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<sup>57</sup> *IKEA Environmental and Social Issues*, 2001, p. 21.