Commission Briefing Paper 4B-09

Driving Factors and Potential Impacts of Future Increases in Short Sea/Inland Waterway's Share of Total Freight Movements

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Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents information on likely future developments in domestic maritime transportation services within the Short Sea and Inland Waterway segments and their projected impact on the proportion of the nation's total volume of freight moving within those segments. For purposes of this analysis of future potential impact on highway traffic volumes, Short Sea Shipping (SSS) operations are defined as the movement of freight on an intermodal basis that combines a relatively short overland "drayage" move by truck to transport goods from their origin to a nearby port from which a vessel would carry the freight in a trailer or container to another port from which a second truck transports the load over another relatively short distance to its ultimate destination. Currently, such types of movements are common in domestic traffic with noncontiguous states and territories and less common in coastal traffic. Inland Waterway traffic moves primarily in barges within the nation's system of rivers and lakes. While the vast majority of freight moving on the inland waterway system is in bulk form, there has been a notable increase in containerized freight being moved by barges to ocean ports for transfer to international trading cargo vessels.

Background and Key Findings

A significant market opportunity exists for considerable volumes of freight currently moving over the highway system to be diverted to short sea shipping (SSS) services as driven by factors such as increasing highway congestion, high fuel prices, and driver shortages. The potential competitiveness of SSS services lies primarily in lower cost (35 to 42 percent less than door to door trucking on long-haul routes). While SSS transit times may be 30 percent longer than trucking, a number of truckload operators have indicated that this would not be a disadvantage for significant volumes of freight given the SSS cost advantage. However, a key constraint on the development of SSS services is the very high cost of suitable newbuilding vessels from U.S. shipyards that make them unemployable in any other service thereby creating a significant business risk for any investor contemplating such a start-up service.

The following are key findings concerning the projected degree to which SSS services may be able to penetrate the highway freight market:

- The total volume of highway freight subject to potential SSS penetration was 78.2 million truckloads in 2003.
- Of this total, 12.5 million loads moved over specific lanes that had sufficient density to support an economically viable SSS service with at least twice weekly service frequency (necessary to compete even at a discount) with daily truck frequency.
- Economic modeling suggests that a 13 percent penetration rate for SSS is achievable given its "best case" cost and service characteristics versus trucking in these high density lanes – probably achievable within three to four years from start-up assuming the high-cost vessel issue is successfully addressed. Consequently, in base 2003 market size terms, a total of 1.63 million truckloads of highway freight could be diverted to SSS services along coastal corridors.
- SSS services are unlikely to achieve significant penetration of highway freight moving in corridors served by the inland waterway system, except potentially in the Great Lakes.
- In the event that government policy action does not effectively address the high-cost vessel constraint, projected penetration levels for SSS services using the 2003 base would be around 300,000 to 400,000 truckloads annually.

Staff Comments

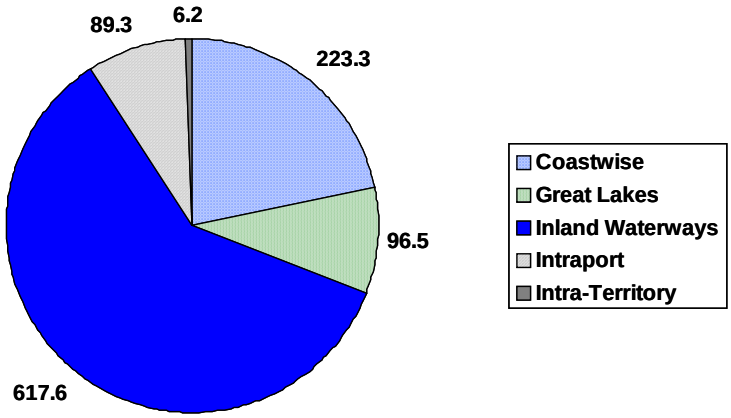
This commission briefing paper is one of several that examine trends and consequences of commodity flows. Paper 01 reviews trends in international trade and trading partners. Paper 02 estimates shifts of trade through West Coast Ports to East Coast ports if trading partners change. Paper 03 investigates the role of Canadian and Mexican ports in handling U.S. foreign trade. Paper 09 considers the role of short sea shipping in foreign and domestic trade. Paper 10 outlines forecasts of future commodity flows by geography and mode, and paper 06 describes economic forecasts that underlie the commodity flow predictions. Forecasts presented in these papers are based on common methods, but in some cases use different years, commodity classification systems, and geography.

The Potential Market

The total volume of U.S. domestic cargo (as governed by the "Jones Act") that moved by maritime transport in 2004 measured 1.03 billion short tons.[1] As shown in the table below, 59.8 percent of this freight moved on the nation's inland waterways and an additional 21.6 percent was transported in "coastwise" services that include cargoes moving to and from noncontiguous states and territories such as Alaska, Hawaii, Puerto Rico and Guam.

[1] U.S. Army Corps of Engineers, *Waterborne Commerce of the United States*.

Table 1
U.S. Domestic Waterborne Cargo by Route Segments
(Millions of Short Tons)



Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States. Data for 2004.

The vast majority of this domestic waterborne freight consists of bulk cargoes such as liquid fuels and chemicals, coal, crude materials, and grains. Manufactured goods make up only 6.7 percent of the total by weight and typically consist of such heavy and large items as steel fabrications and other outsized and heavy manufactured goods.[2] Only a very small portion of domestic waterborne cargo is of a type and form that would be consistent with freight moving over the nation's highways. The vast majority of the highway compatible freight that does move by waterborne mode is in the "coastwise" noncontiguous segment that includes general cargo carried in containers and trailers. Approximately 920,000 trailer loads of freight moved in these domestic noncontiguous trades in 2004, accounting for an estimated 11.03 million short tons – i.e. 1.1 percent of the nation's domestic waterborne commerce by weight.[3] In addition, a few thousand containers per year are carried in coastwise and inland waterway trade by such companies as Columbia Coastal and Osprey Lines (recently acquired by Kirby Marine) that operate primarily as feeder services for international containerized cargo. For example, prior to Hurricane Katrina in 2005, Osprey Lines provided a weekly short sea service in the U.S. Gulf between Houston, New Orleans, and Tampa. This one-vessel service had a theoretical maximum capacity of 6,448 FEU[4] in each direction, or roughly 13,000 trailer loads overall. The total volume of highway compatible freight carried annually in these contiguous coastal and inland waterborne freight services is estimated at 275,000 FEU, including international feeder cargoes and empty containers.

Despite the relatively small size of the current contiguous short sea/inland waterway market for highway compatible freight, a great deal of attention has been focused recently on the potential for new short sea services to be developed that may divert additional highway traffic to the short sea mode, in effect creating new highway capacity on the sea.

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[2] *Ibid*

[3] Reeve & Associates, *Economic Impact of the U. S. Jones Act*, prepared for the U.S. Maritime Administration, 2006

[4] FEU denotes "Forty-Foot Equivalent" container unit – roughly equivalent to a highway trailer load

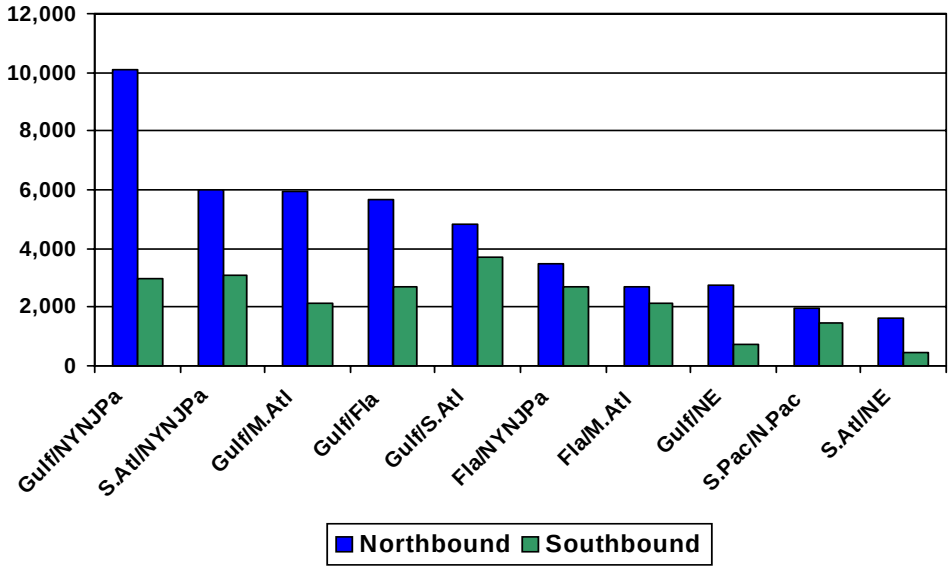
The potential market for coastwise short sea shipping operations is composed of freight movements that have origins and destinations relatively close to coastal ports. Around 78.2 million trailer loads of ground freight moved between coastal origins and destinations over 500 miles apart along the U.S. contiguous coasts in 2003 and beginning and ending within 200-miles of a port.[5] This volume constituted approximately 15 percent of the total U.S. intercity truck and rail intermodal freight market.

As shown in the following table, the potential short sea shipping market is significantly imbalanced:

- Northbound flows: 51.8 million trailer-loads
- Southbound flows: 26.4 million trailer-loads

As shown in Table 2 below, the major potential traffic lanes for SSS services are between the Gulf region and the Northeast and Mid-Atlantic States and between the South Atlantic and Northeast.

Table 2
Truck and Rail Intermodal Traffic
Volumes in Major Domestic Coastal Corridors
(Truckload equivalents in thousands in 2003)



Source: Global Insight, Inc.

When the potentially divertible traffic flows are analyzed on a specific port-pair basis, the largest traffic lanes that might support an SSS service have in excess of a thousand truckloads per day[6] moving on the headhaul northbound leg between the hinterlands of the two ports within a 200-mile drayage distance. The largest volumes move out of Gulf port hinterlands. The data has also been adjusted to minimize "backtracking" – the actual hinterlands are based on counties that include those that extend only fifty miles in the direction towards the ultimate destination while

[5] *Global Insight*, TRANSEARCH database.
[6] Volumes are distributed over a five day working week – assumes a maximum of five sailings per week on particular lanes.

truckloads originating in counties up to 200-miles in the direction away from the destination are included. Note that the volumes on specific lanes may overlap with neighboring lanes, particularly at the 200-mile drayage level.

Analysis of the economics of short sea shipping suggests that a roll-on/roll-off (roro) vessel of around 150-trailer capacity can be effectively employed on voyages of 800 to 1,000 nautical miles such as along the Atlantic Seaboard. Larger vessels up to 300-trailers may be deployed on the Gulf routes where the potential volumes are greater. Consequently market penetration levels of approximately ten percent would be necessary for the SSS service to achieve high utilization on the headhaul leg on these major lanes.

Table 3. Major Potential Short Sea Shipping Corridors Between Ports on U.S. Gulf and Atlantic Coasts (Truckloads per Day*)

	100-mile Hinterland	200-mile Hinterland
Gulfport to Camden/Philadelphia:	786	3,568
Gulfport to New York/New Jersey:	817	3,532
Lake Charles to New York/New Jersey:	396	3,529
New Orleans to New York/New Jersey:	1,642	3,525
New Orleans to Camden/Philadelphia:	1,661	3,510
Gulfport to Bridgeport, CT:	798	3,496
New Orleans to Bridgeport, CT:	1,425	3,471
Gulfport to Wilmington, DE:	654	3,456
Lake Charles to Camden/Philadelphia:	449	3,405
New Orleans to Wilmington, DE:	1,417	3,390
Lake Charles to Bridgeport, CT:	280	3,390
Mobile to Camden/Philadelphia:	159	3,367
Mobile to New York/New Jersey:	125	3,355
Mobile to Bridgeport, CT:	206	3,327
Lake Charles to Wilmington, DE:	311	3,254
Gulfport to New Haven, CT:	550	3,148
New Orleans to New Haven, CT:	955	3,142

Between Ports on U.S. Atlantic Coast (Truckloads per Day*)

	100-mile Hinterland	200-mile Hinterland
Savannah to New York/New Jersey:	205	2,009
Savannah to Bridgeport, CT:	184	1,998
Savannah to Camden/Philadelphia:	234	1,799
Savannah to New Haven, CT:	155	1,788
Charleston to Bridgeport, CT:	277	1,739
Brunswick, GA to Bridgeport, CT:	382	1,738
Savannah to Wilmington, DE:	182	1,722
Charleston to New York/New Jersey:	259	1,691
Brunswick, GA to New York/New Jersey:	432	1,683
Charleston to New Haven, CT:	219	1,600
Brunswick, GA to Camden/Philadelphia:	345	1,572
Brunswick, GA to New Haven, CT:	286	1,548
Jacksonville to Bridgeport, CT:	259	1,519
Fernandina Beach to Bridgeport, CT:	261	1,498
Brunswick, GA to Wilmington, DE:	240	1,476
Jacksonville to New York/New Jersey:	283	1,471
Jacksonville to New Haven, CT:	201	1,414
Fernandina Beach to New Haven, CT:	203	1,397

Source: Global Insight, Inc. *TRANSEARCH* database

Competitiveness of the Short Sea Mode

Recent analysis of the potential for SSS intermodal services to be competitive with long-haul trucking on both a cost and service basis for a door to door movement between a cargo origin within the Florida Port of Jacksonville's hinterland and a cargo destination in Northern New Jersey demonstrates the following:

- Total transit time for a door-to-door truck move with a single driver is 55 hours versus 70 hours estimated for a short sea intermodal move.
- Total costs for the short sea move including all elements for vessel, port, and drayage operations are likely to be between 35 and 42 percent lower than the costs of a truck move on the same route.[7]

Given current trends in highway congestion, increasing fuel costs, and driver shortages (particularly in long-haul lanes), the competitiveness of SSS services is likely to increase. This finding is supported by market research that has been conducted recently with potential users of SSS services.[8] Seventy interviews were conducted with shippers, truckers, and intermodal third party service providers between 2005 and 2006 to identify potential acceptance of SSS as an alternative traffic mode to pure trucking as well as rail intermodal services. The following were the key findings from the interviews:

- Almost all respondents had some knowledge of the short sea shipping concept and were willing to consider it as an alternate mode provided certain standards for service reliability, transit time, and cost were met.
- The primary likely users were long-haul truckload operators – LTL operators generally indicated that were not likely users due to SSS's longer transit times and multiple steps in the intermodal process.
- SSS was generally not competitive in relatively short-haul routes such as between the New York/New Jersey area and New England but was competitive in long-haul routes of around 800 miles and higher.
- Generally lower value shipments as well as hazardous materials (particularly out of the U.S. Gulf) were viewed as offering significant potential to be diverted to SSS.
- SSS should provide a complementary service to over-the-road trucking rather than compete with it.
- Roll-on/roll-off (roro) vessels provided the most effective SSS service platform as the roro mode enabled truckers to use road-trailers for the entire movement and the cost-savings from reduced port cargo-handling costs as well as service advantages in faster vessel and trailer turn-times more than offset the more effective vessel utilization provided by containerships versus roro vessels.

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[7] Global Insight and Reeve & Associates, *FOUR CORRIDOR CASE STUDIES OF SHORT-SEA SHIPPING SERVICES*, prepared for U.S. Department of Transportation, August 2005. The cost analysis takes into account the directional balance of loads in specific lanes and specifically addresses the greater ability of trucking to increase utilization through such means as "triangulation" that are not likely to be afforded to short sea shipping.

[8] Ibid and Reeve & Associates and Global Insight, *Short Sea Shipping Market Opportunity for the Ports of Fall River and New Bedford*, September 2006

- Fast transit times for the SSS mode was likely to be less critical to its success than the provision of consistent reliable service – avoiding currently already congested international port areas and minimizing cargo dwell time in ports was seen as being important to achieving reasonably fast and reliable service.
- SSS service was likely to be retailed by truckers and Intermodal Marketing Companies (who control the freight today) rather than vessel operators who would more likely wholesale ocean transport and terminal services to the truckers and Intermodal Marketing Companies – much as in the current rail intermodal business model.

In addition to the potential for diversion of coastal traffic, there also appears to be an opportunity for SSS service to capture some of the 300,000 truckloads of freight that move annually between origins and destinations on each side of Lake Michigan[9] requiring a highway transit through the congested Chicago greater urban area. A cross-Lake Michigan SSS service would bypass the Chicago area. Analysis of the economics and service performance for a prospective Lake Michigan SSS service indicates that such a service can be highly competitive with door to door trucking: the all-in cost for SSS service was estimated to be 12 to 18 percent lower than pure trucking and SSS transit time was actually calculated to be faster – an average of 7.5 hours versus 9.5 hours for the truck.

Other potential Great Lakes crossings do not appear to generate sufficient truck traffic to support an SSS service due to a lower scale of economic activity – particularly on the northern shores of the respective lakes. Although there is substantial mining and farming business activity in some of these regions, the large volumes of commodities generated by these industries such as iron ore and grain tend to move in bulk in vessels or barges, and are not suitable for the envisioned truck-water intermodal shipping service.

Constraints on Growth

Given the generally positive feedback from potential users of SSS services as referenced above, it could be inferred that the likelihood of a significant volume of long-haul highway traffic being diverted to the SSS mode in the near future was relatively good. That assumption, however, would be incorrect. Unfortunately, there is a major obstacle standing in the way of such an outcome – an obstacle that accounts for the lack of success of any SSS services on a major scale to date despite the evident market opportunity. This obstacle is the requirement under the U.S. Jones Act that any vessels employed in domestic SSS services be built in U.S. shipyards.

While U.S. shipyards are able to build tugboats and barges that serve the nation's inland waterways and harbor traffic on a globally competitive cost basis, their costs for constructing oceangoing cargo vessels may be up to four times those of foreign shipbuilders, including European yards.[10] Also, there are virtually no surplus U.S.-built container or roro vessels that

[9] Global Insight's *TRANSEARCH* database estimates approximately 208,000 westbound truckloads and 82,000 eastbound truckloads between hinterlands of the ports of Milwaukee, WI and Muskegon, MI – Source: Global Insight and Reeve & Associates, *FOUR CORRIDOR CASE STUDIES OF SHORT-SEA SHIPPING SERVICES*

[10] For example, a U.S. shipyard recently built four container vessels for Matson Navigation Company for operation in U.S. domestic trades at a reported cost of $140 to $150 million per vessel. Vessels of similar size and capabilities would currently cost around $40 million from foreign shipyards.

could be employed in new "start-up" SSS services on any significant scale.[11] Given the inevitable risk in any start-up venture such as the creation of SSS services that would require the investment of hundreds of millions of dollars, potential operators of U.S. SSS services have been reluctant to take on such a risk. In the case that the SSS service were to prove incapable of attracting sufficient traffic to be economically viable, the owners of the extremely expensive U.S.-built vessels would be unable to deploy them in any service where they would be required to compete with foreign-built vessels at a quarter of their cost. Current U.S. federal government programs such as the Title XI Ship Financing Program that provides a government guarantee for a major portion of the shipowner's debt do not provide a significant offset to the huge capital cost premium presently associated with U.S.-built vessels. This is a U.S. shipbuilding problem that regrettably has a serious impact upon the U.S. shipping industry, particularly when it must be cost-competitive with other modes such as trucking.

There are two possible approaches that may help to address such a risk: (1) removal of the Jones Act U.S.-build requirement; or (2) implementation of a program to enable U.S. shipyards to build ships on a more competitive basis. Both of these approaches would require policy decisions on the part of the federal government. The first approach is likely to have the greatest "degree of difficulty" as the failure of previous efforts during the Clinton Administration to change the Jones Act would attest. However, the second approach also contains a high degree of difficulty.

The high cost of U.S.-built ships appears to be due to a number of factors including the yards' overwhelming focus of U.S. shipyards on naval vessel construction. focus of U.S. shipyards on naval vessel construction. focus of U.S. shipyards on naval vessel construction.focus on naval vessel construction, the consequent lack of scale economies in producing merchant ships, a "premium-pricing" policy of both the yards and many of their suppliers (both domestic and foreign) that may be due to their focus on naval construction, and less than state of the art shipbuilding practices and technologies. Changing these well-entrenched practices and behaviors will likely take some time unless a new approach is vigorously pursued, possibly including the introduction of new participants on the commercial side and with the firm support of the federal government – such as occurred with Henry J. Kaiser's Liberty/Victory ship program before and during World War II.

Another constraint is the added cost of Federal Harbor Maintenance Tax (HMT) that would be applied to SSS shipments. This tax may amount to around 2.5 percent of the total cost of an SSS movement along the Atlantic Coast. While HMT is included in the cost differentials cited above that show a clear cost advantage for SSS service, it clearly adds to the cost of the short sea mode as well as introducing the "annoyance factor" of an additional layer of administrative paperwork that does not encumber a trucking movement.

The availability of sufficient port facilities and access should not pose a significant constraint to SSS operations. Given the model of a roll-on/roll-off vessel system, the primary requirement is for a paved trailer parking area of at least 5.5 acres to support a 150-trailer vessel operation and ramps either on the vessel or fixed to the shore that enable the fast loading and discharge of

[11] Among the U.S. Jones Act-qualified fleet, only a single roro vessel, American Shipping Group's *Westward Venture*, and possibly two very old containerships (over thirty years of age) of Horizon Lines are currently available for any SSS deployment.

trailers by stevedores using yard tractors. Typically the trailers would travel unaccompanied by road tractors. Vessels of the type considered have relatively shallow drafts (e.g. 5 meters) that will enable them to serve a large number of U.S. ports.

The Forecast

A high level of uncertainty is associated with any forecast of the level and pace of penetration of SSS into the ground freight market in view of the political factors concerning shipbuilding and the Jones Act noted above. The approach taken here is to forecast the likely rate of penetration in the most favorable conditions and then apply a risk assessment to reflect primarily the degree of political uncertainty and, to a lesser extent, market uncertainty. This forecast is based on the total potential market size of 78.2 million trailer loads estimated for 2003. Adjustments for future growth in the underlying base market over time as driven by expansion of the U.S. economy should be made in order to come up with specific traffic volumes. However, this will not impact the projected penetration rates as developed in this analysis.

The total potential market size for SSS is based on 2003 coastal truckload traffic. Although, limited volumes of truck freight compatible traffic do currently move on the inland waterway system, the potential for growth in such traffic is considered to be very limited with the exception of the Lake Michigan corridor. Relatively high-speed vessels (e.g. 25 knots) cannot operate on most of the length of the inland waterway system. Vessel transit times are also slowed by delays in negotiating the system's series of locks and dams. As a result, creating a truck-competitive SSS service on the Inland Waterways (with the exception of across the Great Lakes) is not likely. In addition, between 1994 and 2004 the volume of freight transported on the inland waterways showed no growth at all.[14] Consequently, any potential SSS growth in the inland sector is unlikely to impact the overall SSS penetration forecast to a significant degree.

Of the total 78.2 million long-haul truckloads moving along the coastal regions of the United States, approximately 12.5 million were in lanes of sufficient density to support at least twice weekly sailings of vessels of sufficient scale (150 trailer capacity roro vessels) to be cost-competitive with trucking services. Economic models of these high-density lanes indicate that a penetration rate of 13 percent is feasible under a set of assumptions that includes the successful resolution of the high-cost vessel issue raised above. Consequently, the "best case" scenario for penetration is for 1.63 million truckloads annually to be diverted to SSS services once the development of such services has achieved a mature state. It would probably require three to four years from implementation for such a level of development to be achieved.

In addition, a Great Lakes SSS/ferry service is estimated to be able to capture 20 percent of the trans-Lake Michigan trucking market that would add 60,000 truckloads to the SSS potential market for a total of around 1.7 million truckloads per year on a year 2003 base.

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[12] For example, a U.S. shipyard recently built four container vessels for Matson Navigation Company for operation in U.S. domestic trades at a reported cost of $140 to $150 million per vessel. Vessels of similar size and capabilities would currently cost around $40 million from foreign shipyards.

[13] Among the U.S. Jones Act-qualified fleet, only a single roro vessel, American Shipping Group's *Westward Venture*, and possibly two very old containerships (over thirty years of age) of Horizon Lines are currently available for any SSS deployment.

[14] U.S. Army Corps of Engineers, *U.S. Waterborne Commerce* statistics

Without successful political resolution of the key high-cost vessel constraint, however, the likely rate of SSS penetration is likely to be much lower than the levels projected above – probably in the order of 300,000 to 400,000 truckloads per year at the high end.

CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 4B-09

One reviewer commented as follows:

This paper quite usefully points to the current inability of American shipyards to produce the modern and affordable vessels required to develop an oceangoing or Great Lakes based short sea system, and it lays the blame squarely on Jones Act policy limitations. While the seriousness of this obstacle should not be underestimated, the paper tends to understate the costs of service development – especially the need for subsidies to get shippers to use the system and then to sustain operations until long-term commitments are made. Initial trucker resistance to launching a new competitive service should be anticipated. Also the assumption of market acceptance of two day a week service schedules is enough to start and grow short sea business may be overly optimistic.

Given the future congestion scenarios set for in other papers – it is fair to believe that Short-Sea is inevitable on long distance routes – particularly on south to north East Coast and Gulf States corridors. This may present an excellent opportunity for public-private sector partnerships to assist a timely start up of a new congestion relieving freight service option. Although unmentioned in the paper, federal operating assistance, via a CMAQ-like program will likely be needed.