FEDERAL MARITIME COMMISSION

# U.S. Container Port Congestion & Related International Supply Chain Issues:

## Causes, Consequences & Challenges

(An overview of discussions at the FMC port forums)

BUREAU OF TRADE ANALYSIS

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July 2015

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# Introduction

## Global Trade and the U.S. Economy

Global trade is of increasing relevance to the U.S. economy. With the Trans-Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TTIP) free trade agreements in advanced negotiation, it seems certain that the U.S. role in global trade will expand in the years to come and international trade will become even more engrained in the U.S. economy. According to the World Trade Organization (WTO), the dollar value of world merchandise trade was almost $19 trillion in 2014, $4 trillion of which (over 21%) was accounted for by the U.S.[1] Moreover, the OECD projects that trade-related international freight will expand by a factor of 4.3 by 2050. While international trade through U.S. ports now accounts for around 32 percent of the nation's economic output (GDP), this figure is expected to reach 60 percent by 2030.[2]

International trade helps to support U.S. jobs. In 2010, the latest year for which full data is available, nearly one quarter of all U.S. manufacturing and agricultural jobs were supported by exports.[3] In today's modern economy, over half of U.S. traded goods are comprised of intermediate inputs. Importantly, imports of intermediate goods are more sensitive to trade costs (including congestion costs) than are finished products. Because international trade and GDP are thoroughly linked, modern efficient ports are essential in facilitating international trade and in maintaining a healthy and vibrant economy.

Given that future expansion of international trade is inevitable, future demands on the U.S. intermodal system will be considerable. However, compared with the nation's dry bulk and liquid tanker trades, the nation's merchandise trade is concentrated at a relatively small number of container ports (see the table below).

| Port | Loaded TEUs (2014)[4] | Cumulative percentage of U.S. total |
|---|---|---|
| 1 Los Angeles | 5,881,556 | 18.6% |
| 2 Long Beach | 4,927,219 | 34.2% |
| 3 New York/New Jersey | 4,276,081 | 47.7% |
| 4 Savannah | 2,592,825 | 55.9% |
| 5 Norfolk | 1,931,479 | 62.0% |
| 6 Houston | 1,629,083 | 67.1% |
| 7 Oakland | 1,612,261 | 72.2% |
| 8 Charleston | 1,428,416 | 76.8% |
| 9 Tacoma | 1,371,178 | 81.1% |
| 10 Port Everglades | 755,843 | 83.5% |
| 11 Seattle | 751,779 | 85.9% |
| **All U.S. ports Combined** | 31,632,000 | 100% |

*Source:* PIERS Interactive, Federal Maritime Commission

[1] World Trade Organization, *Trade Statistics and Outlook*, April 14, 2015.

[2] American Association of Port Authorities, U.S. Public Port Facts. Accessed April 8, 2015, (http://www.aapa.ports.org/industry/content.cfm?Item Number=1032)

[3] U.S. Department of Commerce, International Trade Administration, Office of Competition and Economic Analysis, *Jobs Supported by Exports, 1993-2011*. October 2012, p. 8.

[4] The figures cited relate to international inbound and outbound full containers and, therefore, exclude the handling of empty, domestic, and transshipment containers.

The top three U.S. container ports in 2014 accounted for almost 50 percent of the nation's containerized international trade and the top eleven container ports accounted for over 85 percent. About one-quarter by value of the trade in goods through U.S. seaports via vessels flows through the two main West Coast container ports. On the one hand, this concentration could help America focus resources on expanding the capacity of its most important container ports, but on the other it also makes the freight system more vulnerable to the sort of disruption and delays the industry experienced in the past year or so.[5]

Improved ocean shipping contributes to more efficient international supply chains. As the shipping system becomes more efficient, shipping costs relative to the value of finished products should fall. More efficient supply chains increase not only the volume of trade by lowering the cost of imported and exported goods but it also increases the distances over which those goods can be sourced or sold. In many ways, the elimination of congestion is today's most critical and relevant trade-related issue. Improving the efficiency of the U.S. international supply chain goes hand in hand with the global effort to facilitate trade. Just last year, the member nations of the WTO recognized the crucial linkages between economic competitiveness, trade facilitation, and global supply chains when they agreed to a new multilateral trade facilitation agreement.[6] Transportation costs are now a larger factor in international trade than are developed-country tariffs on non-agricultural goods. The lack of efficiency in supply chains, logistics and trade facilitation is equivalent to an additional tariff on the imported or exported goods.[7] The U.S. has ample opportunity to improve its supply chain efficiency. The Logistics Performance Index (LPI) published episodically by The World Bank uses scores on six key dimensions to show each country's comparative performance in logistics.[8] Overall, the U.S. ranks 9th behind countries like Germany, Netherlands, Belgium, U.K., Singapore, Sweden, Norway and Luxembourg.

Maintaining the efficiency and effectiveness of America's global supply chains is exceptionally important to the nation's continued economic vitality. Unfortunately, congestion at ports and other points in the nation's intermodal system has become a serious risk factor to the relatively robust growth of the American economy and to its competitive position in the world economy. Participating at the Federal Maritime Commission (FMC) port forum held in Baltimore former FMC Chairman Helen Bentley pointed out that the primary responsibility of the FMC, ever since the liner shipping statutes were first enacted in 1916, is to oversee the ocean commerce of the United States. The key to that commerce, in her view, is the nation's ports. She urged her fellow participants, as they began examining conditions in our ports and the challenges they face, to keep in mind that the search for solutions presents a golden opportunity for those connected with ports and the intermodal system that support the U.S. international supply chain to work together to develop a shared vision of the transformation of U.S. ports. Addressing congestion,

[5] U.S. Department of Transportation. *Beyond Traffic 2045: Trends and Choices* (Draft framework, 2015), p. 257.
[6] WTO's Trade Facilitation Agreement will enter into force when two-thirds of the 160 members ratify it (which is expected to occur by December 2015).
[7] Krist, W. *Globalization and America's Trade Agreements*, pp. 250-251. Woodrow Wilson Center Press, Washington, D.C. 2013.
[8] The World Bank. *Connecting to Compete 2014: Trade Logistics in the Global Economy*. Washington, D.C. 2014

therefore, is not only vital for many individual port gateways but is of paramount national importance. The FMC has accepted the responsibility of moving this debate and conversation forward.

**Industry Condition and Trends**

As recently as 2006, the industry's biggest concern was how it and the nation were going to deal with infrastructure issues when cargo volumes were steaming ahead at double-digit growth rates. Throughout the period 1980 to 2006, an annual rate of growth in global liner cargo of 10 percent was the norm.[9] Then came the Great Recession and the issues being faced in 2006 went into hiding, but they did not disappear. However, by 2009, it became clear that the industry was not going to see the return of double-digit growth any time soon.[10] As a result, according to ocean carrier executives who participated in the FMC port forums, the capital needed to prepare for growth diminished and participants in most sectors of the industry began searching instead for lowest cost business models. With these financial problems still extant, building sustainable solutions for the industry's future could be especially challenging.

The growth experiences of U.S. ports by coastal range are displayed in the exhibit on the next page. Loaded container volumes handled annually between 1998 and 2014 are shown together with annual projections through 2030 of the volume that should be anticipated under three different growth scenarios.[11] A sustained seven percent annual rate of growth would be lower than rates of expansion seen prior to 2009 but higher than what it has been since then. At a seven percent rate of growth, the container volumes ports are handling currently would double by early 2025. A sustained five percent rate of growth would reflect what the average rate of growth has been since 2009.[12] At this rate of growth, container volumes would double by early 2029. At a three percent rate of growth, it would take 24 years for U.S. container trade volume to double. It is interesting to note that the three percent growth projection seems consistent with the growth trend at West Coast ports since 2009. The five percent growth projection seems consistent with the growth trend at East Coast ports since 2009, and the seven percent growth projection seems consistent with the expansion since 2009 that has occurred at Gulf Coast ports. In light of the recent congestion problems at several key U.S. port gateways, it is a daunting prospect that at five to seven percent annual rates of growth twice as much port capacity may be needed in just 10 to 15 years to accommodate anticipated growth.

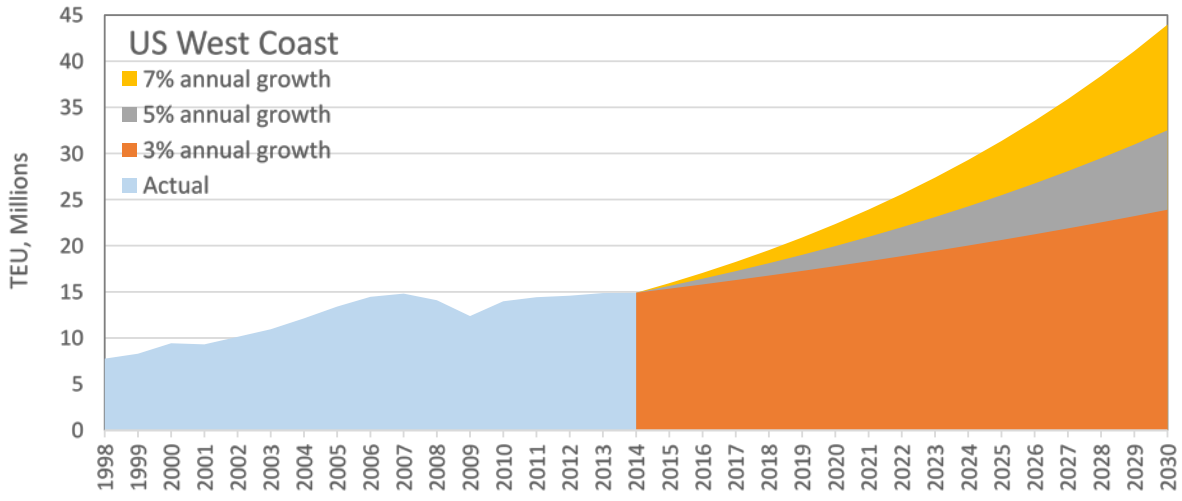
Although the U.S. ports industry has entered a period of lower growth, Drewry Maritime Advisors identified North America as a region where demand growth still is likely to outpace

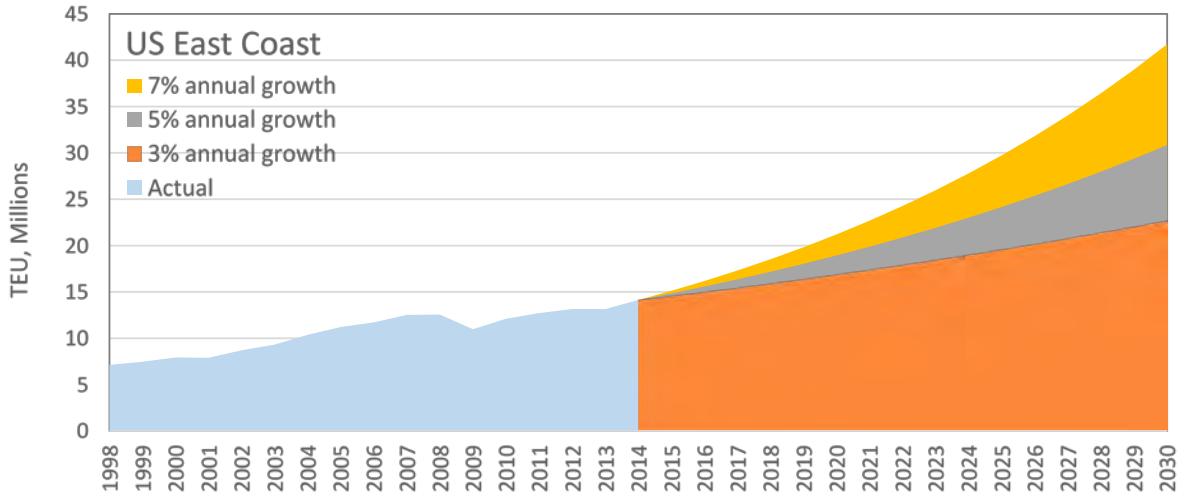
[9] The worst expansion during this whole period occurred in 1982 when the growth rate was just under 5 percent.
[10] Aggregate container trade in the U.S. liner trades began decreasing on a year-to-year basis in spring 2008. At the lowest point, in the first quarter of 2009, U.S. container volumes had fallen 20 percent compared to the same point in the previous year.
[11] The loaded container volumes shown in the charts reflect the movement of international inbound and outbound full containers. The movement of empty, domestic, and transshipment volumes are excluded.
[12] The greatest impact of the Great Recession on the U.S. container trades was felt in 2009. Ignoring this atypical year, U.S. container trade overall has expanded by about three percent since the end of the Great Recession.

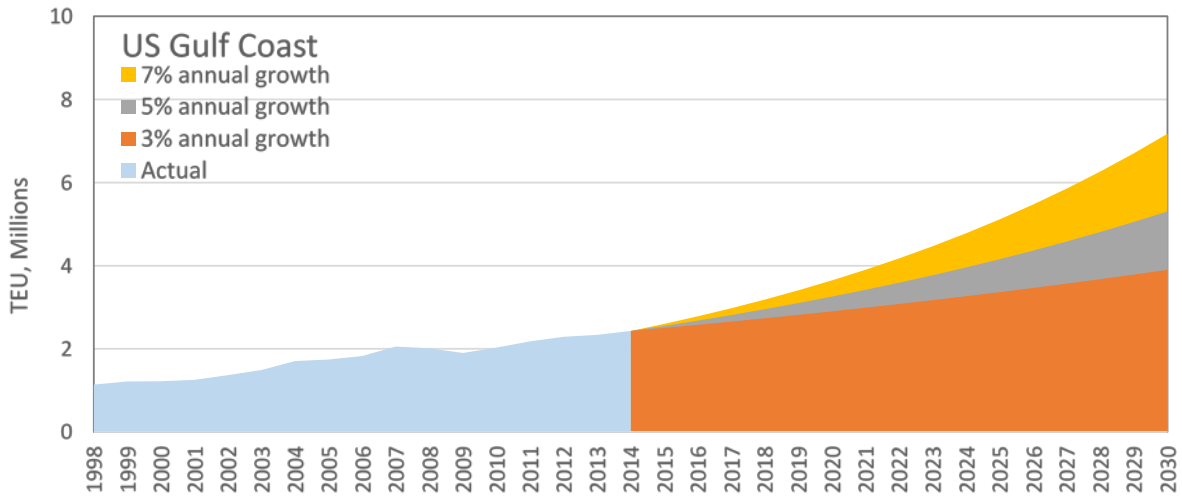
terminal capacity.[13] The region's inability or unwillingness to provide additional capacity could be attributed to some industry trends now unfolding - rapid explosion of ship size in the Asia-Europe trade that causes the cascading of large vessels out of that trade into other trades, including the U.S. trades;[14] formation of new and larger alliances; continuation of poor financial performances by ocean carriers; lack of public funding; rising terminal valuations; and terminal productivity that has been slow to improve. Until 2011, the top-3 global carriers had sufficient volume to operate outside of formal alliance structures. That no longer is the case. The formation of new or larger alliances since 2011 has complicated the operational factors that ports and ocean carriers must deal with, and has intensified competitive pressure. For example, mega-size vessels require mega-size gantry cranes and more of them in order to turnaround these very large ships in a reasonable amount of time. Another operational tension is that at load ports in Asia, it may be more efficient operationally to load containers for a particular destination port in a few adjacent bays of the ship, but at the discharge port a more dispersed loading pattern may allow more gantry cranes to work the ship at any one time. Questions remain about (a) whether container yard and landside facilities are able to cope with the greater volume of containers being discharged by the big ships, (b) whether the ocean carriers are prepared to pay for the additional resources required to handle these ships, and (c) whether terminal operators have the labor availability and flexibility to clear the cargo volume before free time expires. A final complicating factor is the changing ownership profile of terminal operators. Family and private equity interests have been divesting themselves of their terminal assets to financial investor portfolios and, going forward, the latter are expected to demand commercial rates of return on those assets and for any new investments.

[13] Liu, T. *The World Economy versus Global Port Trade*, Port Development Forum, Shanghai, March 2014.
[14] Over 100 ships between 7,000 and 10,000 TEU will cascade out of the Asia-North Europe trade by 2016. (Ibid.)

**Annual Container Trade at U.S. Ports (Actual TEUs), 1998-2014**
**& Projected Trade under Different Growth Scenarios, 2015-2030**



**Federal Government Interest in Port Performance and Port-Related Infrastructure**

Investing in port-related infrastructure, such as marine terminal facilities and the roads, rails, and navigation channels leading to and from these ports, has become critical to several Administration initiatives to grow and strengthen the U.S. economy, including the Build America Investment Initiative, the National Freight Infrastructure program, and the National Export Initiative. President Obama cited the value and need for "modern ports to move our goods" in his State of the Union Address in 2013. His statement recognized that ports and the trade that flows through them are vital to creating and sustaining jobs, economic growth, and enhancing U.S. global competitiveness. Today, international trade accounts for almost one-third of the nation's GDP, a share that is expected to continue to grow, and goods moving through U.S. ports generate about 13 million American jobs. As recently as November 12, 2014, at the annual convention of the American Association of Port Authorities (AAPA), Vice-President Biden called for improvements to the nation's ports, and declared: "This is a passion of mine." He went on to say that ports are the life blood of the U.S. economy and confessed to the conference attendees: "You are the best-kept secret in the world." At the November AAPA conference, the Vice-President expressed the view that the U.S., as the greatest economic power in the world, needs the most dynamic ports' system in the world, but cautioned that government is not the answer, *although it could be the catalyst*.

**The FMC Port Forums**

With a view to carrying forth the Administration's aspirations for the nation's port system, and set against the backdrop described above, the Federal Maritime Commission took the port congestion discourse into the field with an open mind to hear firsthand the problems that ports, their customers, and other partners in the U.S. intermodal system were facing as a result of problems brought on by contemporary developments in liner shipping. Four separate one-day listening sessions were held in different regions of the country, each led by at least one Commissioner.[15] The sessions were extremely well-attended and, at most venues, there was standing-room only by the time each listening session got underway. The energetic discussions that took place at each forum were transcribed, and by the time the fourth forum concluded in early November 2014 over one thousand pages of transcripts had been compiled. Immediately after the forums were concluded, brief summaries of each session were issued and the Commission began designing a series of follow-up actions intended to keep the dialog begun at the FMC port forums continually refreshed to ensure a continuing contribution is made to the

[15] The first port forum, covering the U.S. West Coast, was held at the Port of Los Angeles in September 2014. A second forum, covering mid- and north Atlantic ports was convened at the Port of Baltimore. The Port of Charleston hosted a forum covering the south Atlantic ports, and the final forum took place at the Port of New Orleans covering Gulf Coast ports. A list of participants who presented at each port forum is provided in Appendix A. In addition, the Commission welcomed the submission of written materials. These latter materials and the verbatim transcripts of each forum are accessible on the Commission's website at www.fmc.gov.

Administration's current port-related infrastructure initiatives and the high ambitions it harbors for our nation's ports.[16]

The FMC port forums provided a unique opportunity for industry stakeholders to gather in various locations around the country to share their views on the causes, consequences and challenges surrounding congestion at ports and other parts of the intermodal system, be listened to, and to respond to the concerns of other affected parties. Participants not only gave detailed accounts of what they saw as the root causes of congestion in several of the nation's largest ports, but they also came with reports of new solutions being applied, and shared some fresh yet-to-be tested ideas too. With appropriate leadership and support, constant encouragement, and a willingness to cooperate, industry stakeholders' thoughtful insights and expressions of concern seemed to demonstrate that the intermodal industry itself is well-capable of accurately diagnosing the problems and crafting enduring solutions.

Over the course of the last few years, the Administration has brought attention to, and has been focused on, the physical capacity of the nation's port and intermodal system.[17] This system doubtless requires attention, but the unfortunate reality is current investment resources are limited because of fiscal constraints in the public sector and the relatively poor financial health of shipping and shipping-related sectors. By and large, participants at the port forums recognized that long-term fixes to the system's infrastructure issues are needed, but they saw also an urgent need for short-term solutions. Consequently, although finding ways to fund much needed infrastructure is a priority for the nation if the economy is to stay globally competitive, the most immediate set of post-forum follow-up activities developed by the Commission focus on identifying more efficient ways to manage *existing* capacity and on identifying and elaborating upon the *most effective* or innovative operational strategies, technologies, and practices currently being deployed in order to *maximize* the use of existing resources.

Generally speaking, the discussions at each forum were organized in panel format, with each panel typically composed of a few individuals representing a particular stakeholder group. Immediately following each port forum, Commissioners and their staff compiled short summaries of the discourse that took place at their respective venues. Additionally, various resources have been posted to the FMC website, such as written materials submitted and verbatim transcripts of the proceedings. By encapsulating the issues of most concern to each group of stakeholders, these meeting summaries reflected the way the panels were organized. The exhibit on the next page charts the composition of those attending the forums in terms of

[16] Brief summaries of the individual port forums are available on the FMC website.

[17] Congress previously also gave attention to this issue. Following the military force build-up for Operation Iraqi Freedom Congress directed the Maritime Administration (MARAD) in fiscal year 2004 to report on the performance of the U.S. intermodal system with respect to the efficiency of the most congested ports, including a summary of future actions "MARAD plans to take measures to address and improve the throughput of cargo in America's ports." (See, *Report to Congress on the Performance of Ports and the Intermodal System*. U.S. Department of Transportation, MARAD. June 2005.)

which parts of the international supply chain they represented, as well the extent to which different topics or issues were discussed.

This document highlights the main themes discussed across the four venues based on reviewing all the delivered comments and written submissions. Six major themes emerged from the discussions – (1) investment and planning; (2) chassis availability and related issues; (3) vessel and terminal operations; (4) port drayage and truck turn-time; (5) extended gate hours, PierPASS and congestion pricing;[18] and (6) collaboration and communication. With respect to each of these themes, this document frames the main issues, provides a cross-section of stakeholder viewpoints expressed at the forums, and lays out stakeholder suggestions, proposed solutions, or fixes.[19] Other important issues also discussed at the forums, but less extensively, include; free-time, demurrage and detention; the Class I railroads; the role of Federal partners in the supply chain; and congestion costs. Although congestion cost was not discussed at length like some of the other topics, it did generate a great deal of discontent from cargo interests and motor carriers who appeared to be incurring demurrage and detention fees when containers had been delayed or equipment prevented from being returned for reasons well beyond their ability to control. Because of the urgency of the situation, this topic was dealt with separately on a faster track and staff's report on detention, demurrage and free-time was released on April 13, 2015.[20]

**Other FMC Follow-Up Efforts**

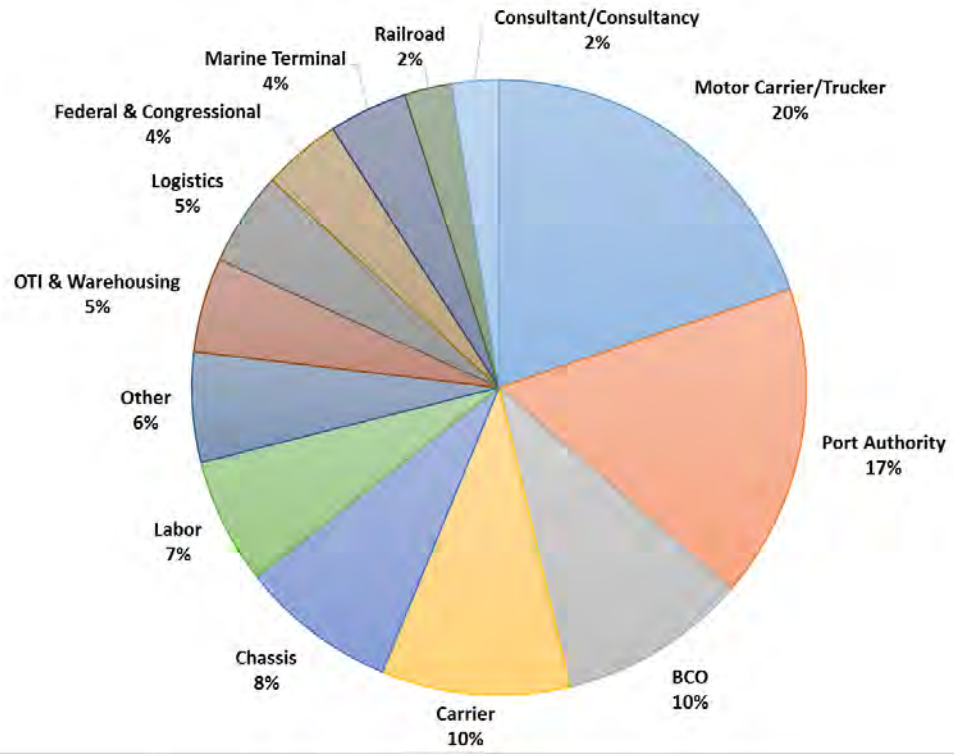
Identifying what the Commission and its stakeholder groups have still to learn is probably at least as important as articulating what they have learned. In fact, finding answers to "known unknowns" could spur further innovation and fuel additional efforts to find solutions. Some unknowns include, for example: What is the true cost of port congestion? How does this cost impact U.S. international trade, the U.S. economy, and U.S. jobs? Which stakeholder groups are most harmed by port congestion and by how much? Does any group benefit from the disruptions caused by congestion and, if so, how? How effective are the solutions being implemented or proposed? What's the cost of these solutions, and do more cost-effective alternatives exist? Why were congestion problems not addressed before they formed into a crisis? If congestion problems are long-standing, why have they not been dealt with sooner? What could or should be done to avoid further meltdowns? These themes, among other things, are being explored by the Commission in an effort to synthesize recent port and supply chain congestion mitigation initiatives in the U.S., and abroad where necessary, in order to identify relevant strategies, technologies, and practices that are being used for managing congestion within the U.S. container ports and intermodal system. This synthesis should aim to provide a neutral assessment of the most promising techniques available currently to manage congestion

[18] The off-peak gates program known as PierPASS is only applicable currently to the ports of Los Angeles and Long Beach.

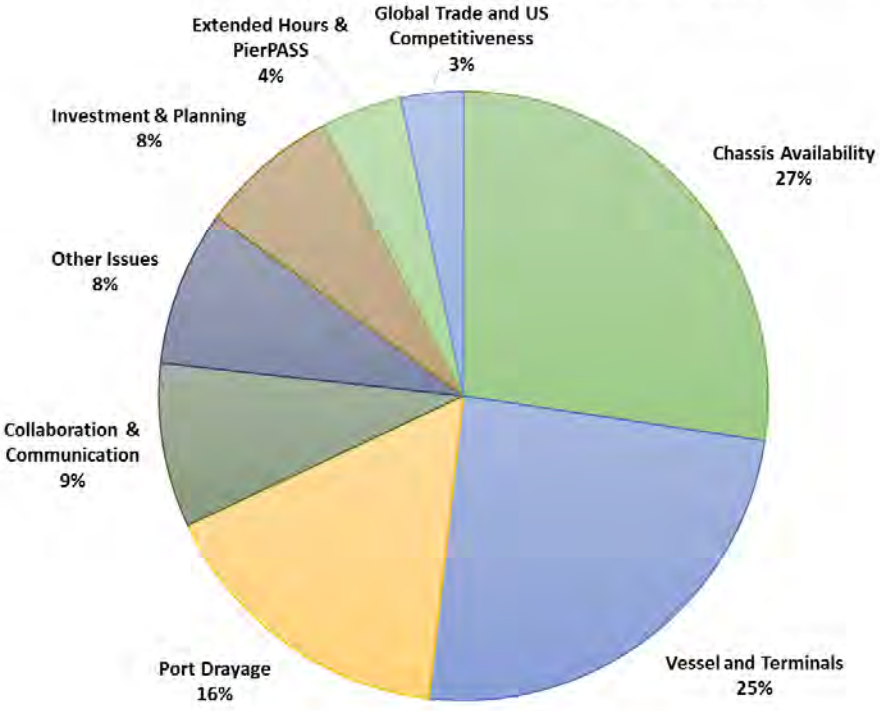
[19] To help clarify issues the information collected at the forums is supplemented, where necessary, with information from secondary sources.

[20] *"Rules, Rates, and Practices Relating to Detention, Demurrage, and Free Time for Containerized Imports and Exports Moving Through Selected United States Ports."* Federal Maritime Commission staff report, April 2015.

## Forum Participants by Industry Segment




## Approximate Discussion Time Distribution by Topic (across all the FMC Port Forums)



issues,[21] and could allow for recommendations on possible data collections, studies, and policy initiatives that might contribute further solutions to the port congestion issue.

One view of the U.S. container ports congestion crisis is that it has resulted from events that have developed or emerged over a considerable period of time and from within the system itself, rather than being the result of external shocks, such as unanticipated surges in container volumes or management-labor issues. According to this view, methods and practices developed and applied perhaps decades ago in quite different circumstances have morphed into today's problems. Regardless of the merits of this viewpoint, many seem to think it is inevitable that embracing "business as usual" will lead to significant further declines in the performance of the U.S. intermodal transportation system and degrade supply chain efficiency, if only because international trade will continue its relentless expansion. It is widely recognized that resolving the causes and consequences of congestion is of paramount national importance. So, the congestion crisis could give those most impacted the will and determination to engage the problem and to try to develop new ways of thinking about the intermodal system. A process that helps cultivate creative ways to eliminate the current system's vulnerability to old operational methods and commercial practices that no longer suit today's vastly different circumstances seems critically needed.

One view the FMC is considering that could help the industry to look for and craft suitable solutions to major issues affecting the U.S. intermodal supply chain is by establishing a national-level Federal advisory committee - such as a *National Council on Intermodal Supply Chain Efficiency* (or Council)[22] - to help facilitate discussion and resolution of issues of national importance that are affecting or promise to affect the U.S. intermodal system.[23] The Commission is exploring whether it should establish such an Advisory Committee in conformity with the Federal Advisory Committee Act (FACA). As an initial matter, as outlined in the staff's earlier report on demurrage and detention, the Commission could direct it to offer suggestions for the Commission's regulation of MTO and VOCC demurrage and detention rates, rules and practices. Alternatively or in addition, the Council's goal could be more forward-leaning by conducting, for example, a critical reassessment of ocean carrier, port, terminal, rail, drayage, and equipment provisioning systems and procedures and suggest how 21st century methods and technologies could be adopted to enhance container velocity through these systems,

[21] The idea here is not to recommend or suggest "best practices." It would be invidious for the Commission to declare "best practices." Moreover, a practice considered "best" in one set of circumstances may not be appropriate in other situations. The research synthesis contemplates simply reporting on the evidence that exists in the public record and in the literature about the effectiveness of the solutions/practices identified - both positive and negative aspects. It would be left to the port professional to decide on the appropriateness of each practice.

[22] A National Council focused on supply chain efficiency issues offers perhaps the broadest perspective and issues of concern, and provides the widest umbrella under which to accommodate many different intermodal stakeholder groups. However, it should be noted that the Department of Commerce's *Advisory Committee on Supply Chain Competitiveness* similarly addresses supply chain efficiency issues and has recently engaged the issue of port congestion and the Department of Transportation's *National Freight Advisory Committee* may address intermodal transportation congestion generally.

[23] Similar efforts are taking root at the local level with the formation of individual port productivity task forces, but no such effort appears to be taking shape at the national level.

thereby reducing supply chain costs. Unlike the port forums which were led by FMC Commissioners, the Council, if formed, would be led by industry executives who would work with the Commission and its staff to develop the Council's activities and initiatives.

**Organization of the Report**

The functioning of three interconnected commercial markets were unequivocally at the epicenter of the FMC forum discussions on port congestion and related international supply chain issues. These markets were chassis provisioning, port drayage, and the servicing of vessels in terminals. A summary of the forum discussions tied to these markets is presented in turn following a summary of discussions that took place regarding the need for investment and adequate planning. It was widely acknowledged at the forums that if investment falls behind the needs of the U.S. intermodal industry, the episodic congestion of the last two decades is certain to be repeated, perhaps with more profound consequences than those now being experienced. Other distinct issues are covered too in the chapters that follow, the most prominent and topical of which was extended operating hours and the prospect of 24/7 gate operations at the nation's busier port complexes. At the forums, a substantial amount of time was devoted to the discussion of several collaborative congestion mitigation initiatives already underway and the need for more collaboration as well as greater communication, transparency, and sharing of information. This is the subject of the penultimate chapter. The report concludes with a summary of issues that were discussed less extensively and a tabulation of port congestion causes, possible solutions, and challenges as expressed by forum participants. A glossary contained in Appendix D spells out the many acronyms used in this report.

## Capital Investment & Planning

### Framing the issues

Congestion is a serious challenge to America's continuing economic growth and competitive position in the world economy. Each segment of the international supply chain has a responsible role to play in preventing congestion. One way this can be accomplished is by ensuring that new developments and other unfolding events in any one link in the chain are adequately anticipated, planned for, and accommodated. Current trends indicate U.S. container volumes should continue to expand and container ships calling at U.S. ports should continue to grow in size.[24] However, if investment falls behind and fails to meet industry supply chain demands, more intense congestion at intermodal transfer points, greater pollution, and other negative consequences are inevitable. Continued growth will further stress the operating limits of our ports and marine terminals at the berths, in the container yards, at the gates, at the railheads, and on the connector roads surrounding port facilities. Port authorities and their private business partners, therefore, will need to invest in capital infrastructure to ensure competitive capabilities and to develop well-paying jobs. A great deal was said about the big ships at the forums, but it does not make much economic sense for them to call at ports without the critical support infrastructure being in place that enables them to maximize efficiencies throughout the entire supply chain.[25] Perhaps more than ever before, therefore, participants felt it was critical to create a business environment that promotes the necessary capital investment needed to provide for modern intermodal infrastructure, technology and equipment.

Presently, many U.S. terminals are struggling to turn the large ships around and move containers through their facilities in a timely manner. To improve matters, port authorities and terminal operators should be prepared to spend substantial sums of money to acquire super-post Panamax gantry cranes, redevelop berths, or expand gates and inland transportation connectors, etc. Several major investment projects are in progress, such as the Middle Harbor development underway in Long Beach and raising the Bayonne Bridge in New York, but participants felt that more investment is needed to prepare to meet future demands. Ports strive to stay ahead on infrastructure and to have it available to handle all the change and volume that comes their way, but funding these needs is an investment challenge when the intermodal freight system consists of commercial entities engaged in intense competition which leaves them with narrow profit margins most of the time.

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[24] Charts in Appendices B and C illustrate changes in container volume, ship size, and the average number of containers exchanged by coast and by individual ports between 2005 and 2014. At West Coast ports, generally, average ship size increased more than 40 percent and the average container exchange by over 20 percent. Over the same period, at the Port of Virginia average ship size increased by 55 percent and the average container exchange increased by 42 percent. The growth experiences of several other ports are shown in these appendices.

[25] The Bayonne Bridge, for example, is being raised to provide greater air draft so as to allow bigger ships to pass under at a cost of $1.3 billion. Once raised, there likely could be a dramatic increase in the size of ships serving East Coast ports. Some participants at the forum questioned how well PONYNJ terminals would be able to handle these bigger ships if they seem unable to efficiently handle consistently the ones arriving today.

Although ports, marine terminals, and other intermodal facilities, cannot afford to be behind industry demand, neither can they risk building too far ahead of needs, otherwise assets end up being poorly utilized.[26] As a result, ports and terminals need to be engaged in a constant two-way conversation with ocean carriers and other service providers that facilitate and support cargo movement. They need to know what each is going to do, what is likely to come through the terminals, and when. Working hard at planning to avoid congestion also entails working closely with labor and maritime employer associations to ensure a sufficiently skilled and productive workforce is available when needed. In all these efforts, participants stressed that sharing information is key to successful planning – not just receiving the information needed to plan, but rather also sharing that information with the whole port community.

Port authorities and their private sector business partners are still spending large sums of money on port-related capital improvements – a total of $46 billion over five years (2012 to 2016) or about $9 billion annually, according to a recent American Association of Port Authorities' (AAPA) survey.[27] As can be seen in the table below, one-third of the total is expected to be spent by the ports themselves and two-thirds by their private sector partners. Capital investment currently being undertaken by port authorities seems to be concentrated in the South Atlantic, Gulf Coast and Pacific Southwest (i.e. California) regions.[28] Private sector investment is concentrated at Gulf Coast ports and, to a lesser degree, on the West Coast. While these data show that port authorities and their private sector business partners are making major investments in port facilities, they do not necessarily indicate whether the sums involved are sufficient to meet future needs.[29]

**Projected Capital Expenditures Over Five Years (2012 through 2016) in Billions of U.S. Dollars**

| Port Region | Port Authority | | Private Sector | | Total Port & Private | |
|---|---|---|---|---|---|---|
| North Atlantic | $2.12 | (11.5%) | $1.21 | (4.3%) | $3.33 | (7.2%) |
| South Atlantic | $4.08 | (22.4%) | $0.26 | (0.9%) | $4.34 | (9.4%) |
| Gulf Coast | $4.34 | (23.7%) | $17.78 | (64.3%) | $22.12 | (48.1%) |
| Great Lakes | $0.22 | (1.2%) | $0.14 | (0.5%) | $0.36 | (0.8%) |
| Pacific Northwest | $1.76 | (9.6%) | $5.91 | (21.4%) | $7.68 | (16.7%) |
| Pacific Southwest | $5.80 | (31.6%) | $2.34 | (8.5%) | $8.14 | (17.7%) |
| **Total** | **$18.33** | **(100%)** | **$27.64** | **(100%)** | **$45.97** | **(100%)** |

*Source:* AAPA Port Infrastructure Investment Survey, May 2012

A new resource to help U.S. ports obtain funding for freight transportation, facilities, and other port-related improvements was recently released by the AAPA under a cooperative agreement

[26] A recent report by Drewry claimed that North American terminals underperform as compared to the rest of the world in the utilization of three key container terminal assets – berth space, gantry cranes, and terminal space.
[27] Port Infrastructure Investment Survey, AAPA, May 2012. (Sixty-three ports out of 82 responded to the survey, which was conducted in early 2012).
[28] Capital spending at ports in the Pacific Southwest is expected to total $5.8 billion in this period. Los Angeles accounts for about $3 billion of this total, Long Beach accounts for about $2 billion, and Oakland accounts for the remainder.
[29] A comparison of capital spending by other transportation sectors shows: (a) The Class I Railroads spent over $90 billion between 2003 and 2012, averaging, $9 billion annually (AAR); (b) In 2010, highway capital investment totaled $88 billion from all sources other than the American Recovery and Investment Act (AASHTO); and (c) U.S. airlines and their airport partners spent more than $70 billion at the country's 30 largest airports since 2008, about $10 billion annually (Airlines for America).

with MARAD. Called the *Port Planning and Investment Toolkit*, the first module issued deals with funding strategies and processes that ports could use to assess a range of financing opportunities, including public-private partnerships (PPPs or P3s).[30]

Intermodal links to and from port facilities, such as roads, bridges, tunnels and federal navigation channels, typically receive less attention and not enough funding from state and federal agencies responsible for their upkeep and this often results in traffic congestion beyond port perimeters.[31] A study conducted by the Federal Highway Administration (FHWA) of the level of investment for intermodal connectors to ports showed per mile expenditures to be less than 40 percent of the average for the national highway system (about $100,000 per mile) even though port connectors showed more deficiencies. The challenge for international supply chain partners is to find ways to increase funding for these vital supply chain links either by increasing their priority for transportation funding or by creating new financing mechanisms, such as public-private partnerships.

Addressing the performance of U.S. port and related infrastructure as an integral component of our nation's freight transportation system is one goal of Moving Ahead for Progress in the 21st Century or MAP-21 which establishes a National Freight Program. New bipartisan legislation introduced recently in the U.S. Senate, "Developing a Reliable and Innovative Vision for the Economy Act" (DRIVE Act), would provide $13.4 billion over six years (starting at $2 billion in FY 2016 and increasing to $2.5 billion in FY 2021) in formula funding to states that could be used, among other things, to address "last mile" and other connectivity issues. [32] The Administration's GROW AMERICA legislation would authorize $18 billion over six years for two dedicated freight programs (one formula and one discretionary) which could be used on multimodal freight projects. With respect to navigation channels maintained by the U.S. Army Corps of Engineers, most of the nation's busiest ports are dredged to their authorized channel depth 35 percent of the time and far fewer channels are dredged to their authorized widths, even though the big ships being built achieve their larger size by expanding length and width, and depth not so much.[33]

As seen earlier, most funding for port-related improvement projects comes from the private sector. A possible solution to the lack of public sector funding may be found in private sector

[30] Public-private partnerships (PPP or P3s) are contractual agreements formed between a public agency and private sector entities that allow for greater private sector participation in the implementation and operation of transportation projects.

[31] A recent Congressional Budget Office report on public spending on transportation and water infrastructure showed public spending on transportation infrastructure in 2014 was $279 billion, with just $10 billion of that total spent on waterways, ports, and the equipment needed to support seaborne traffic (mainly the Coast Guard expenditures). Of the $10 billion spent on waterways and ports, 60% was expended on operations and maintenance rather than on new capital projects.

[32] S.1647, *Developing a Reliable and Innovative Vision for the Economy Act* (introduced in the Senate on June 23, 2015).

[33] The USACE spends $1.5 to $2 billion on navigation projects each year. As the costs for deep-draft improvements typically are shared with local port authorities, the latter also spend more than $1 billion annually on dredging and related infrastructure improvements. Harbor Maintenance Trust Fund (HMTF) revenues amount to about $2 billion annually but, because receipts consistently outpace spending, the fund has a surplus of $8.5 billion.

partnerships. Undoubtedly, in our country there is capital abundance in the private sector so long as commercial returns are assured. New types of investors have entered the industry in the last decade or so as traditional family investors relinquished assets. The former are well attuned to fiduciary-duty responsibilities and how their investment dollars are being returned.

The industry should be able to meet the challenges of inexorable container volumes through a strategy of innovative technologies, modernized cargo handling, and terminal operating procedures made possible by effective capital investment and new financing mechanisms, as well as flexible and sustainable labor agreements. At the present time there are a variety of public and private ownership structures within our ports, not all of which are thought to be conducive to attracting highly demanding capital market participants, private equity investment, or the most effective forms of debt capital financing. All stakeholders, therefore, must be prepared to explore innovative arrangements. If P3s are viewed as a kind of government contract, according to some participants, they are not likely to work.[34]

**Cross-section of stakeholder viewpoints**

Citing specific development projects in different stages of completion, the senior executives of major port authorities, marine terminals and ocean carriers attending the port forums all pointed to the fact that collectively the industry is investing billions of dollars to modernize facilities to accommodate expected future growth and increasingly larger ships. Various projects were described, such as raising bridges, dredging harbors, widening channels, and installing bigger ship-to-shore gantry cranes, as preparations and foundations for expected increases in demand and ensuring efficient intermodal freight movements. Some port authorities also described how they and their private sector partners are participating in several road and rail projects to help eliminate freight bottlenecks and to facilitate the efficient movement of freight from ports to inland intermodal and distribution centers.

Although U.S. ports do not directly receive federal funding for port infrastructure projects, a few federal initiatives are helping the industry deal with congestion issues. For example, the U.S. Department of Transportation's TIGER discretionary grants program has provided about $500 million to help ports cope with increasing growth. In addition, through a cooperative arrangement with the AAPA, MARAD's *StrongPorts* program provides planning and technical assistance resources to help ports upgrade and maintain their infrastructure. MARAD's marine highway program also helps to address congestion in marine terminals by eliminating some truck moves.

Beyond needing resources to help upgrade and maintain current infrastructure, several participants also expressed the hope that the Administration and Congress would commit sufficient budgetary resources to federal agencies that are critical links in the international

[34] The Administration is supportive of leveraging federal dollars through the use of P3s. The recent trend in highway P3s has been toward "availability payments," where the private sector builds and operates the infrastructure for the public sector, but the public sector pays the private sector availability payments and bears most or all of the risk if traffic does not materialize.

supply chain, such as Customs and Border Protection (CBP) and USACE. According to some participants, CBP seems to need more resources to provide expanded hours for Customs officials and to help prevent inspection delays. The major concern expressed about USACE was the need to speed up the approval process for channel navigation projects. The need for a national freight transportation plan was brought into the discussions several times and participants stressed the need to ensure transportation policies at the national level address the role of ports and that infrastructure challenges to the international supply chain are identified before they become serious problems. With limited federal spending on port infrastructure, several participants wanted to know how ports could gain greater access to the nation's transportation infrastructure funds.

The representative of a marine terminal operator that has a presence in 36 different ports globally mentioned the major capital equipment projects being undertaken by his company at the ports of Long Beach and Tacoma that promise new operating efficiencies. He asserted that his company, and others like it, have sought or are seeking the necessary investments in infrastructure to handle larger vessels with bigger container exchanges and said that dredging, berths, and gantry cranes are in some stage of development in every major port. He emphasized the need for ports to plan for and prepare to handle more terminal and gate throughput.

A senior official of the Port of Virginia, an East Coast port experiencing quite severe terminal congestion, stated that his port authority did not invest heavily enough or soon enough. He felt that the port had taken many actions to improve matters this year (2014), but recognized that the port still had a long way to go. He suggested that federal resources at CBP had not kept pace with the growth of the business, claiming that the port has the same number of CBP officers as it had six years ago when container volumes were less by 35 percent. He talked about the port needing more rail capacity, specifically needing two double stack Class I railroads instead of one. The port's current Class I railroad is working on upgrades but, meanwhile, the work is creating congestion. Over five years, he reported that the port authority lost $120 million and remarked that it was tough to invest when a business is losing money. The port handles 2 ½ million TEU now and has plenty of potential future capacity, subject to finding suitable financing. The Virginia International Gateway (former APMT terminal) could accommodate double the port's current throughput and could bring this added capacity online within three years and, with appropriate financing, the port reportedly could get to 5 to 7½ million TEUs within 10 to 15 years.

The representative of a large ocean carrier claimed that vessel sizes and cargo volumes are beginning to outpace capacity at many locations here in the U.S. He advised that the ocean carrier business became more conservative about investing in capacity after container volumes sank in 2009. He said capital investments are still being made but the return on investment needs to be assured and there is an expectation that resources must be fully utilized. The representative of another large ocean carrier suggested port authorities need to invest in capital infrastructure to ensure competitive capabilities and to further grow well-paying jobs. He said large capital investments have been slow to develop and are behind industry demands.

In 2004, for example, when the APM terminal was built at the Port of Virginia, it was known the large Triple E class ships were coming, yet, ten years later most U.S. ports would not be able handle this size vessel. This representative expressed views on investment in several other sectors involved in the international supply chain. For example, he suggested that terminals need to work closer with chassis providers to ensure resources are available and that chassis are timely repaired. He also felt that terminals must find innovative ways to promote gate flexibility and not simply rely on solutions like PierPASS, which he thinks succeeds only in pushing gate congestion to the evenings. Motor carriers, according to this participant, need to invest in their drivers to ensure there is a secure future for drayage and invest in and take responsibility for chassis in line with the model followed everywhere else in the world. Shippers must invest in the service levels they demand. Cargo is compressed into seasonal windows, straining peak capacity. Warehousing hours and drop-and-pick operations interfere with meeting the needs of cargo surges as shippers hold equipment and ask for more free time, contributing to further equipment shortages. The representative suggested that railroads and railcar operating companies need to invest in equipment and infrastructure and need to reappraise operational practices that add to equipment shortages and congestion. According to this participant, there is insufficient railcar supply in the network causing shortages and delays throughout the network.[35] Chassis lessors need to invest in chassis to upgrade and replace an aging fleet, timely repair, and equipment repositioning from surplus locations. USMX, ILA, PMA and ILWU must address availability of the workforce to meet the cyclical demands of the industry and, in this context, he applauded the ILA's recent efforts to limit vacation time to meet peak freight demand. Ocean carriers need to invest in large ships to obtain scale economies and should educate stakeholders on the management options available under the new chassis paradigm. Claiming that none of the issues in this extensive list is completely new, and that all are being worked on to some degree, he nevertheless believed that problems are being exacerbated by the slow pace of investment seen to date. Simply put, he stated that volume growth is outpacing investment capability.

One of the Gulf port executive directors advised that decision-making has to remain fluid because the cargo dynamics in the Gulf region are changing constantly. He felt that the federal government in particular needs to speed up its approval processes for projects that ports deliver. He explained that his port was engaged in three different P3 projects, investing with private partners who are looking for true commercial rates of return. He suggested that this was the way industry, working together with government, can move forward to expand capacity in various modes. Underlining these points, the Port of New Orleans representative commented that container business at that port has doubled in the last three years and that projections indicate it will continue to grow at a very fast rate. The port is now looking for P3 partners to invest in $565 million of infrastructure investment at the container terminals that they believe will be needed over the next 10 to 12 years to fill out the port's footprint to 1.8 million TEUs. To avoid future congestion, the port wants to make room for future expansion and growth but to accomplish this, it needs two main things: (1) Dredging of the Mississippi

[35] This concern was reiterated by other participants including one from the Port of Mobile where the port is building an intermodal container transfer facility (ICTF) but is concerned about Class I railroads' ability to service the facility. This representative reported seeing more and more service problems with the rail carriers.

River to 50 ft.,[36] and (2) Landside infrastructure development, particularly the "last mile," to allow truckers to have easy access in and out of the port's terminals as expansion takes place. Recognizing that anything that is done to deepen the navigation channels to allow for the arrival of bigger ships will be for naught if nothing is done to correct the last mile, the port is looking at an investment of $600 to $650 million to get landside infrastructure improvements accomplished.

As waterfront properties are among the most expensive, one port director stressed that all ports have to work hard to use those properties wisely and ensure they are used for the movement of cargo, not for their storage. As a result, ports should be constantly rethinking ways to keep cargo velocity moving faster. Ports in the Gulf region are seeing truckers leave drayage to go to the oil fields. In addition, this participant said that ports have to make the terminals efficient for truckers to have short trips. Observing that CBP plays a key role in flowing commerce through the port's terminals, historically, they are budgeted for not being able to work a lot of hours which has to change, according to this participant, because there is tremendous investment in assets that should be used 24/7 for maximum cost efficiency. He pointed out that the port already has billions of dollars invested in the Bayport container terminal and plans to invest another billion dollars over the next five years. However, those assets are used for just 25 percent of the clock hours each week. With respect to dredging, the Port of Houston invested $80 million of its own money in deepening and widening access to the Barbours Cut and Bayport container terminals and got the work done in four years, versus potentially 15 to 20 years through the normal federal process. Although these terminals have a capacity of 2 million TEUs, and an ability to expand to 5 million TEUs or more over the next 10 to 20 years, the roads coming in and out of the terminals have to be planned to retain the mobility to move the greater projected cargo volume in and out of the region. So, the port is working closely with local and state departments and federal agencies to make sure the infrastructure required to move the cargo is in place at the right time.

**Stakeholder suggestions and proposed fixes**

No obvious or quick-fix solutions were offered by participants as sure-fire ways to address the nation's port and port-related infrastructure investment needs. It was generally felt that capital investment shortfalls are more readily apparent in the public sector because of budgetary pressures caused by fiscal restraints. It appeared to most participants expressing views on this topic that capital to fund private projects is not lacking so long as the projected returns satisfy highly demanding capital markets. Partly because of this, some participants suggested greater use of public-private partnerships to support the nation's port and port-related infrastructure needs. Others suggested various strategies that could facilitate ports gaining greater access to those public sector funds that are available and/or promoting one or more funding sources dedicated to ensuring goods move smoothly and quickly to or from ports. A final suggestion consisted of encouraging neighboring ports to collaborate to jointly exploit their resources and capabilities to ensure continued provision of high-quality infrastructure so as to better compete

[36] According to the port representative, a recently completed study indicated that the cost benefit ratio of dredging the river from 45' to 50' is 89 to 1.

against more distant ports, including foreign ones. Each of these suggestions is elaborated upon below.

- **Explore the potential of using public-private partnerships (P3s) as a financing and procurement tool**. It was suggested that government and private sector parties have to be flexible to see across the lines of their traditional roles and that some legislative and regulatory restructuring at the state level may be necessary to secure private sector capital using this tool.[37] It was claimed the FMC has an important role to play by taking steps in advance to ensure P3s move through the Shipping Act process smoothly. The work of a panel on public-private partnerships formed by the U.S. House of Representative's Committee on Transportation and Infrastructure was touched upon at the port forums.[38] This panel cautioned that P3s should not be thought of as the solution to transportation infrastructure funding challenges for several reasons. The panel pointed out, for example, that the U.S. has a robust municipal bond market that helps to provide infrastructure financing which explains why, according to the panel, the potential for P3s in the U.S. may be limited. While recognizing that in certain circumstances P3s can accelerate the delivery of high-cost, technically complex projects, and leverage private sector resources and expertise, these agreements, which may last 30 years or more, also constrain the ability of legislators to manage public assets in the future. The House panel cautioned that it is important that these typically long-lived agreements protect the public interest as they often will have the capacity to affect both current and future generations.

- **Ports and their supply chain partners should take advantage of the fact that the nation is in the process of developing a national freight strategic plan**. Among other things, provisions of MAP-21 call for establishing a national freight network and the development of a national freight strategic plan. Several participants felt that ports and their business partners should actively participate in developing their statewide freight plans and become active on state freight advisory committees to ensure that freight plans and policies address the roles played by ports, marine terminals, and other international supply chain participants.[39] An estimated $78 billion of the Administration's six-year $478 billion surface transportation reauthorization bill is slated for infrastructure related to ports and the freight network through the creation of a national freight program. Congress currently is weighing its options for providing funding to states to strengthen key freight corridors. The Administration's plan calls for $18 billion to be placed in a fund for regional transportation projects, especially on major corridors subject to bottlenecks.

[37] A recent *Build America* request for public-private partnership projects resulted in more than 20 port-related P3 projects being submitted.

[38] *Public-Private Partnerships: Balancing the Needs of the Public and Private Sectors to Finance the Nation's Infrastructure*. Special panel of the House Committee on Transportation and Infrastructure. Washington, D.C. September 2014.

[39] According to the AAPA's Port Surface Transportation Infrastructure Survey (April 2015), 70 percent of its member ports have participated in statewide freight plans and state freight advisory boards.

- **Reinforce (arguably) the weakest link in the freight network – the "first and last mile" connector links between ports and the national highway system**. Ports and their private sector business partners are investing hundreds of millions of dollars to expand their facilities to meet the future needs and growth of the country, yet considerable concern was expressed at the port forums about the precarious nature of the intermodal industry's connectivity to the nation's highway infrastructure.[40] Initiatives are underway in Congress to try to provide a dedicated source of funds for infrastructure developments related to goods movement. The "National Freight Network Trust Fund Act of 2015" was outlined by U.S. Congresswoman Hahn at the West Coast ports forum. Financed through a small portion of existing Customs duties, the proposed trust fund would provide $2 billion annually dedicated for improvements to rail lines and roads used to move goods to and from ports.[41] U.S. Congressman Lowenthal, who also attended the West Coast ports forum, is co-sponsoring similar legislation. The "Economy in Motion: The National Multimodal and Sustainable Freight Infrastructure Act" would establish a Freight Transportation Infrastructure Trust Fund to be funded through a one percent fee on the waybill (transportation invoice) for goods moved more than 50 miles by ground transportation.[42]

- **To help optimize the impact of limited investment dollars, ports could take advantage of the limited antitrust immunity afforded by the Shipping Act to engage collaboratively in joint planning, investment, and marketing activities**. At one of the forums, it was reported that the ports of Mobile, Tampa and Houston have a joint marketing arrangement dubbed, *The Gulf Coast Advantage,* in which the ports work together to market the attractions of the U.S. Gulf region around the world. The ports of Seattle and Tacoma have filed a rate discussion agreement with the FMC that involves a broad set of integrated collaborative activities (FMC Agreement No. 201222). Through this agreement, the two ports are engaging in formal collaborations designed to improve the competitiveness of the Puget Sound gateway. The ports intend to combine some of their resources, capabilities and joint capacities to ensure high-quality service and infrastructure continue to be provided. During the current due diligence phase, the parties are examining business objectives, strategic marine terminal investments, financial returns, organizational structures, etc., with a view to forming a joint marine cargo operating entity, called the *Seaport Alliance* that would enable the ports to pursue unified actions, such as joint presentations to potential customers and joint negotiation

[40] AAPA reports, for example, that port connectors account for about 1,200 miles of the national highway system and that one-third of the connectors will need $100 million or more in capital improvements by 2025.
[41] The GROW AMERICA legislation referenced earlier would also create multimodal freight programs.
[42] H.R. 5624, *Economy in Motion: The National Multimodal and Sustainable Freight Infrastructure Act* (introduced in the House on September 18, 2014) would create two freight-specific grant programs. A formula based infrastructure fund would distribute funds to states based on the amount of existing infrastructure within the state. A second funding mechanism would consist of a competitive grants program open to all levels of government. Eligible projects would include intermodal, port, inland waterway and airport facilities, first- and last-mile connectors, and land ports of entry.

of customer port agreements. At the end of this phase, a separate agreement is expected to be filed with the FMC that would seek to unify the management and operation of the ports' cargo marine terminals and related business functions, while separately retaining the current governance and asset ownership structures of the two ports.

## Chassis Availability and Related Issues

### Framing the issues

At each FMC ports forum a considerable amount of discussion and debate centered on chassis shortages and a host of other chassis-related issues, and how all of these inter-connected factors are contributing to congestion at our nation's ports.[43] The lack of chassis availability emerged, alongside dissatisfaction with inequitable application of demurrage and detention charges, as being by far the most pressing problem needing to be solved and, arguably, the biggest single cause of chronic congestion in many container terminals. It emerged from the forum discussions that chassis shortages were much more acute in some geographic locations (e.g., at the larger port complexes found in Southern California and New York/New Jersey) than in others.

As demonstrated by recent events in the terminals, chassis are a critical link in the international supply chain; yet, they are a relatively small link in that chain. Last year, for example, the total value of U.S. containerized imports and exports amounted to almost one trillion dollars and, based on average ocean freight rates and U.S. container volume, international containership lines probably generated $30 to $40 billion in revenue carrying that cargo. In contrast, the marine chassis business probably generated an estimated $2 billion in annual revenue. It was recognized that all parties in the intermodal business need to work collaboratively to solve the serious problems being caused by this small but crucial link in the international supply chain.

Chassis shortages, or perhaps more accurately chassis supply imbalances, inevitably lead to delays inside the terminal, but issues connected to terminal operations and processes also can lead to chassis shortages. Chassis supply imbalances emanate from two general causes; the first is intrinsic to the way the marine chassis industry provides chassis, and the second is related to there being several chassis provisioning or supply models that have been changing rapidly and are still in a state of flux. However, several significant developments and events *external* to the marine chassis business also have contributed to chassis shortages (e.g., larger ships with bigger container exchanges per call, vessel bunching, and broader alliances with more partners), and the industry is still learning how best to deal with the impact of these developments. In the port complexes where congestion has appeared most acute – Southern California and New York/New Jersey – both general causes have merged to form a large confluence of problems that have manifested themselves in severe chassis shortages, geographical dislocation of chassis, and prolonged delays in accessing cargo and equipment.

[43] Nationally, there are approximately 565,000 marine chassis in the U.S., of which an estimated 75,000 are out of service (i.e., inactive because of maintenance issues). *American Shipper*, February 2015. If properly maintained, most people in the chassis business believe that the number of chassis is adequate to meet the needs of ocean commerce. In most cases, chassis shortages develop for a variety of operational reasons, even locally, such as high out-of-service levels or chassis being in the wrong locations (which requires re-positioning), and not because there are insufficient numbers of chassis available.

The Transportation Board (TRB) as part of its National Cooperative Freight Research Program (NCFRP) initiated a research effort a few years ago that resulted in publication of a detailed *Guidebook for Assessing Evolving International Container Chassis Supply Models* that helps shed light on the way marine chassis supply, ownership, and management in the U.S. are in transition.[44] The report also examines the anticipated future form of chassis supply and its implication for international supply chain participants, but notes that this future supply model is unclear and will depend on three factors: the structural chassis supply context; the heterogeneous nature of the chassis supply landscape; and the multiple and unaligned interests of chassis supply stakeholders. Since the beginning of container shipping in the U.S., ocean carriers have provided chassis for shippers and their motor carriers who pick up and deliver containers at ports and inland intermodal terminals. In this historic provisioning model, shippers or their motor carrier were not charged daily rental fees. Instead, the usage rate for the equipment was built into the delivered freight rate negotiated between the ocean carrier and its customers as a bundled service. The practice of shipping lines owning the chassis is unique to the U.S.[45] In most other countries, the motor carrier provides the chassis with which to move the container.[46] Longshore labor had jurisdiction over the repair and maintenance of steamship lines' containers for reasons of safety, and with it the ocean carrier-owned chassis. In this traditional model of chassis provisioning, the ocean carrier absorbed the cost of supplying and maintaining chassis at the various locations serviced by the line. Ocean carriers have a strong commercial incentive to maintain an adequate chassis supply. Containers are unable to move without a chassis, and ocean freight revenue is compromised if containers fail to move because of a lack of chassis. Even though most ocean carriers no longer own chassis, they have devised ways to ensure the continued availability of competitively-priced chassis. Some ocean carriers recognize that an ample supply of well-maintained chassis can provide a distinct commercial advantage by enhancing the service available to shippers. For this reason, a few ocean carriers in some places still own and operate their own chassis.

Maintaining chassis at each of the locations served by an ocean carrier in sufficient numbers to meet peak periods of shipping demand is challenging for an individual ocean carrier. Chassis pools were formed by carriers to more cost effectively manage this equipment. A chassis pool is simply a fleet of chassis in a specific location or region into which two or more carriers have contributed and agree to share chassis when moving their containers to and from intermodal facilities in that region. Such pools can meet the collective needs of the pool members with fewer chassis than if each carrier had to operate chassis independently of the other members. This reduces operating expenses and the amount of space needed to store chassis. Individual ocean carriers earn a pool credit on days when that ocean carrier's need for chassis is low and is

[44] Transportation Research Board, National Cooperative Freight Research Program (NCFRP) Report 20. *Guidebook for Assessing Evolving International Container Chassis Supply Models*. Washington, D.C. (2012).
[45] Transportation Research Board, National Cooperative Freight Research Report (NCFRP) Report 11. *Truck Drayage Productivity Guide*, p 64. Washington, D.C. (2011).
[46] This practice likely developed in the early days of containerization because the availability of ample, low cost land in most locations in the U.S. gave ports the low cost option of storing containers on chassis in the terminals (called a wheeled operation). This option becomes cost prohibitive in more densely populated regions, like Europe and Asia, where land values are much higher. In these places, containers are grounded and stacked to minimize the amount of land needed to store containers awaiting shipment or pickup.

then able to use this credit to pay the pool manager for times when the ocean carrier needs to use more chassis than the ocean carrier has contributed. However, the competitive advantage for the individual ocean carrier of running a well-maintained and supplied chassis fleet is surrendered for savings in operational cost in the pool model. In the early 2000s, added impetus for the formation of chassis pools was provided when the Class I railroads began encountering severe space issues at rail ramps. Instead of permitting multiple competing ocean carriers with separate chassis occupying lots of limited space, the railroads encouraged the formation of neutral pools. Under this arrangement, a neutral third-party – typically a chassis leasing company – provides all the chassis in the pool.

Chassis pools are set up and operated in several different ways. In addition to neutral pools, there are cooperative pools, and pools operated by terminals, ocean carriers and motor carriers. Neutral pools are owned and managed by chassis leasing companies and are viewed as being neutral because they are not associated with any particular ocean carrier. The cooperative chassis pool concept was pioneered by Maher Terminals. The several lines calling at this terminal at the Port of New York/New Jersey (PONYNJ) contributed chassis in proportion to their container volumes. The pool not only reduced the number of chassis required by 25 percent, but also reportedly improved the condition of chassis in the fleet. The six regional pools operated by Consolidated Chassis Management (CCM) include over 100,000 chassis contributed and used by the 20 or so members of Ocean Carrier Equipment Management Association (OCEMA). A *Unitary Pool Concept* (UPC) implemented by CCM allows leasing companies to become contributors and provide chassis to users who are not CCM members. Initially, operational management of the CCM pools was undertaken by either Flexi-Van or TRAC Leasing, but eventually this function was taken over by CCM itself. An example of a port-wide pool is the one maintained by the Port of Virginia. In 2004, this port became the first one in the U.S. to require all chassis on-site to be part of the pool. This allowed the number of chassis to be reduced from 15,000 to less than 10,000, which then allowed many acres of space to be reclaimed for use by the port's terminals. Commonly expressed concerns about pools include high maintenance cost and the difficulty of upgrading to improved safety and lower maintenance features on chassis in a shared pool environment.

Initially, cooperative pools were established to enable ocean carriers to share chassis equipment in order to reduce operating cost by eliminating duplicative costs, minimizing the use of space at port or inland terminals (which eliminates the need for individual providers to each have their own storage facilities) and to ensure adequate chassis availability when individual contributors encounter busy days. However, coinciding with the Great Recession in 2009, ocean carriers began announcing that they no longer intended to provide chassis for their container movements.[47] More stringent federal safety requirements had been imposed on equipment providers shortly before this very difficult financial period for ocean carriers, further increasing the cost of operating chassis and making managing the fleets more difficult. In

[47] The year 2009 was the worst ever for container shipping. Maersk reported losses of over $2 billion and, globally, the container carrier industry lost an estimated $15 to $20 billion. In the relatively infrequent years in which container carriers are profitable, reported profit margins are relatively small (e.g., about 5 percent of revenue on average).

addition, as the intermodal equipment provider of record, the ocean carrier's liability exposure was raised considerably. Maersk Line was the first ocean carrier to split off its chassis operation and announced that it would begin charging motor carriers a daily rental fee for chassis use. Most other carriers quickly followed suit divesting themselves of these assets, the majority of which were acquired by the three established chassis leasing companies (TRAC, Flexi-Van and DCLI).[48] Through OCEMA, the ocean carriers made a collective effort to gather and disseminate information to shippers and motor carriers about the transition. Nevertheless, the rapid pace with which this change occurred, and the seemingly scattershot way ocean carriers got out of the chassis business, as well as the inclusion of many operating and rate exceptions by geographic location, trade lane, terms of carriage (e.g., tariff or service contract) and by type of service (e.g., store door, intermodal, port-to-port), meant that shippers and motor carriers ended up being confronted with a bewildering array of commercial arrangements that were difficult and time consuming for them to manage.

Although the ocean carriers decided to sell their chassis and no longer make them part of the ocean transportation contract, they still needed to ensure chassis were available to support their container activities at marine terminals and intermodal railheads. When they sold chassis to the leasing companies, the ocean carriers negotiated contractual arrangements with the leasing companies acquiring those assets to ensure a continued supply of chassis. As a result of these commercial deals, ocean carriers began announcing to motor carriers that transportation of their marine containers must be on a chassis rented with the leasing company designated by the ocean carrier at rates already set in the purchase contract with the chassis leasing company. In most cases, motor carriers currently must deal with these directives and, thus, have few opportunities to select their chassis provider or to shop for more competitive charges and terms from alternative providers.

The second way ocean carriers have tried to ensure an adequate chassis supply, even as they began disengaging from the chassis market, was by encouraging parties other than leasing companies to become contributors to the pools. This approach was adopted by CCM in 2011. CCM began encouraging non-ocean carriers to contribute chassis to any of its six regional pools, hoping that motor carriers and beneficial cargo owners would supply chassis to the pools in addition to the chassis leasing companies who were existing contributors. The ocean carriers believe that an open form of chassis pool which welcomes a wide variety of different contributors (not just chassis leasing companies) allows for maximum competition, thus providing the best guarantee possible of ensuring an adequate supply of properly maintained chassis at an affordable competitive price.[49] However, with one notable exception, the vast majority of chassis sold by the ocean carriers have gone to one of the three major chassis

[48] The transfer of assets occurred more quickly than most people thought possible. In 2009, ocean carriers still owned or long-term leased more than 50 percent of the marine chassis fleet. By 2014, this figure had dropped to 13 percent. Ocean carriers today are thought to have less than 100,000 chassis left to trade. The most recent transfer occurred between MSC and DCLI.

[49] As of June 30, 2013 the three chassis leasing company - TRAC, Flexi-Van and DCLI - owned over 71 percent of the nation's chassis (marine and domestic) with shares of 38, 19 and 14 percent respectively.

leasing companies.[50] Sanctioned by the Surface Transportation Board (STB), twelve members of the Intermodal Carrier Committee (IMCC) of the ATA joined together to contribute chassis to one of the six CCM pools in 2013. As the North American Chassis Pool Cooperative (NACPC), these motor carriers contributed 1,200 chassis that had formerly been owned by COSCO to the CCM South Atlantic Chassis Pool (SACP).[51]

Restrictions in today's chassis business models seem to be limiting motor carriers' ability to choose the chassis provider even when they are footing the bill, a restriction which leaves the daily rental charges subject to less competitive pressure. This is one reason why NACPC was formed. NACPC wants to see transparent at-cost daily use rates, with those paying for using the chassis being allowed to select their chassis provider. NACPC claims that the contractual arrangements agreed between ocean carriers and the chassis leasing companies to whom they sold chassis hinder NACPC from entering every market.[52] Like the ocean carriers, NACPC wants to ensure an adequate supply of chassis secured by open market competition at both the pool management level and chassis use level. They also would like to see chassis quality upgraded with enhanced safety and lower maintenance features, such as radial tires, LED lights, automatic inflation devices, and automatic braking systems (ABS). Finally, through their trade associations, motor carriers are pressing to be permitted to interchange chassis according to UIIA interchange rules. UIIA is a multimodal negotiated interchange agreement that serves as the standard interchange agreement for most intermodal equipment interchanges *except* chassis. Reportedly, chassis leasing companies continue to insist motor carriers sign their proprietary interchange agreements.

Chassis availability and dislocation problems have been tough issues to resolve at the nation's two largest port complexes – Los Angeles/Long Beach and New York/New Jersey. The medley of pools in these locations do not serve all the terminals in their respective port complexes which leads to many unproductive truck trips, excessive wait times, and congested terminals. The port authorities in both locations have stepped up efforts to develop complex-wide gray pools, although it seems the gray pools in these two large port complexes will be structured somewhat differently. The chassis leasing companies that cover the ports of Los Angeles and Long Beach have opted for a "pool of pools," while the Port of New York/ New Jersey seems to be leaning towards establishing a "market pool."

Just six months after the port forum in Southern California, the three leasing companies that own more than 80 percent of the chassis serving the two San Pedro Bay (SPB) ports began operating a pool of pools which permits their respectively owned chassis in the three pools they manage (LABP, DCLP and GACP) at eleven terminals to be used interchangeably through a

[50] Chassis leasing companies increased their share of the marine chassis market from 49 percent in 2009 to 80 percent in 2013. (Rubin, Global Supply Chain Summit, 2013). Their share currently is 87 percent (American Shipper, February 2015).

[51] SACP has 50,000 chassis spread across four ports and several inland locations.

[52] In the SACP pool run by CCM, for example, a motor carrier participant reported at one of the forums that only six of twenty carriers that serve the region allow motor carrier (open) choice, and those that do allow open choice tend to be the smaller lines that represent only eight percent of all chassis moves. The other 92 percent of moves reportedly are determined by the ocean carriers.

Chassis Use Agreement. This should considerably improve the ease of obtaining a chassis and the efficiency with which they can be deployed in drayage truck operations throughout the ports complex. The pools operated by each of these companies will remain commercially independent, leaving each chassis provider free to compete for business, and unconstrained in setting its own leasing terms and rates. The Chassis Use Agreement is open to other pools operating at the SPB ports. The other pools are the WCCP managed by TRAC and two ocean carrier-specific pools (Evergreen and MSC). A separate third-party service provider is managing the pool-of-pools inter-pool chassis usage, billing, and other proprietary information such as the master customer list. An inter-pool operations committee meets daily to review chassis balances and repositioning issues between pools and terminals. With three of the four chassis pools in the Southern California ports having entered the pool of pools, 81,500 chassis in the region have become gray and interoperable and this will rise to over 95,000 if the WCCP joins in, as seems likely. Terminals will no longer need to segregate chassis for the different pools, thereby freeing up space in the congested terminals.

A market pool is formed when various chassis providers come together to contribute their chassis into one port-wide or region-wide fleet. In this arrangement, all chassis would have the same mark and would be managed at arm's length by a third-party under contract to a Pool Board composed of contributor representatives. Chassis users gain access by establishing a commercial contract with one of the chassis contributors – a market based competitive activity – and, because the different contributors may offer unique product offerings and services, competition on a variety of service dimensions is preserved. Meanwhile, the market pool itself offers contributors operational efficiencies that come with being part of a larger fleet and users obtain full interoperability of chassis at all terminals within the port complex. While PONYNJ is expected to deploy this type of pool model later in 2015, this model was recently deployed to serve the ports of Seattle, Tacoma and Portland when TRAC with 6,000 chassis and DCLI with almost 2,500 chassis joined forces to form a market pool.

Even after the various changes discussed above are implemented, it was recognized that significant industry challenges would remain. For example, governance rather than management of the pools could become an issue. Chassis providers and contributors likely will demand a greater say in setting the business rules and not allow the ocean carriers to continue imposing the rules when no longer owning the assets. Ocean carriers have not cleanly disengaged from the business.[53] If some carriers still operate their own pools, interoperability issues may persist. Rail ramps likely will remain mostly wheeled operations, possibly hindering motor carrier ownership of chassis.[54] In this situation, a motor carrier arriving at the ramp with a loaded container on its own chassis would require a flip, as would a trucker arriving at the

[53] To facilitate interoperability, most stakeholders seem to want ocean carriers to get out of the chassis business entirely. Some ocean carriers have remained in the business for commercial advantage. Those that have left would prefer to see all ocean carriers out of the chassis business because they believe it would put less pressure on ocean rates. While some ocean carriers still offer chassis, market forces compel those that no longer provide chassis to reduce ocean rates.

[54] Some observers suggest that motor carrier ownership of chassis is operationally unrealistic. In addition to the added cost of flip lifts cited in this example, most motor carriers competing for shipments are small to medium in size and lack the resources required to own and store this equipment.

ramp where the container he wants to pick up is already mounted on a chassis. Instead of taking it on another provider's chassis, the container would have to be flipped at added expense onto the trucker's chassis. Perhaps most important of all, as the chassis supply model evolves, increasingly, concerns are being expressed about the potential risk to competition. Observers note, for example, that chassis purchases have been pursued aggressively by only a few well-financed leasing companies and that the resulting leasing terms are said to be restrictive with daily rental charges most often being dictated rather than negotiated.[55] Motor carriers fear that the contributory gray pool ultimately may be eliminated via the transfer of assets from ocean carriers and others to unregulated chassis providers whose growing control of equipment supply and interchange terms could stifle viable supply alternatives. For this reason, some meeting participants advocated for a greater role for the FMC both during and after the chassis business transition process. Echoing key oversight standards in the Shipping Act applied to ocean carrier and MTO agreements, these advocates argued that the FMC should ensure that the transfiguration of the industry is accomplished within a transparent and predictable framework that preserves and promotes competition and does not cause a substantial increase in transportation cost or decrease in service or safety.

A final factor critical to chassis availability relates to chassis safety inspection, maintenance and repair, and roadability rules. Reflecting the history behind the provision of chassis in the U.S. by ocean carriers, most chassis are usually stored and maintained on marine terminals (in a comparatively harsh operating environment). Being more complex to maintain in good order than a simple marine container for example, they are subject to being damaged and to quite stringent highway safety requirements. Several different points in chassis operations at the terminals can impact chassis availability. For example, once a driver locates a chassis, he or she is required to conduct a pre-trip inspection to check the condition of various safety-related components, such as coupling devices, locking pins and twist locks, tires, mud flaps, lighting devices, and brake components. Ascertaining chassis condition is important from at least three perspectives – safety and liability, damage disputes and claims (the chassis hirer is liable for any damage beyond regular wear and tear), and highway violations (traffic laws are directed at operation not ownership, so drivers are cited).

If the chassis passes the driver's checks, the driver will take it to have an empty or loaded container mounted. If the chassis has a minor problem (e.g. low tire pressure or a missing mud flap), the driver would have to decide whether to search for another chassis or take it to roadability for repair. Truckers routinely find themselves draying equipment to on-dock repair shops to have another party's equipment made safe. To them, this is a major loss of productivity as the trucker is not compensated for draying bad order equipment to on-dock repair facilities. If the chassis has a more serious problem (e.g., a jammed landing gear), the driver is more likely to search for another chassis rather than risk being sent into a flip line to

[55] In the traditional chassis business model when ocean carriers controlled the equipment, the chassis leasing companies obtained 90 percent or so of their revenue from around 30 customers – the major steamship lines through long-term leasing of chassis. Today, chassis leasing companies obtain most of their revenue from thousands of motor carriers primarily through short-term daily rentals. This change puts the chassis providers in a stronger negotiating position.

have the mounted container off-loaded at additional cost and then still have to search for another chassis.

An obvious inefficiency in current practice is that whenever a driver identifies and rejects a defective chassis, it is not flagged in a way that would allow other drivers to avoid repeating this process on a piece of equipment known to be defective. Also, ocean carriers and other chassis providers probably are reluctant to have chassis repaired if their records indicate there are others chassis still on hand. As a result, chassis tend to get repaired only when the trucker decides a defective chassis is the best one available and takes it to roadability for repair. Clearly, it would enhance chassis availability if terminals were to devise a process that allows for substandard chassis to be tagged when they are returned and for maintenance staff to make repairs so that all chassis are in a roadable condition when the trucker arrives to select one. Federal regulations actually require intermodal equipment providers (IEPs) or their agents to ensure any equipment intended for interchange with a motor carrier is in safe and proper operating condition before it is offered for interchange.[56] Current practices, however, unduly affect terminal efficiency and add to congestion. Drivers' hours of service are limited by federal regulation, yet some of those hours are wasted by drivers having to locate roadable chassis (when that equipment is expected to be roadable to begin with), or to waste time waiting for minor defects to get fixed prior to exiting the terminal.

One challenge to maintaining chassis in proper operating condition is that the labor force available to repair chassis reportedly is stretched thin. It also takes time to hire and properly train these mechanics. Consequently, it is difficult to expand this labor force to handle unanticipated spikes in volume. Another issue is that this labor seems to get pulled away from chassis repair to work on other activities, such as repair work on refrigerated containers. There also appears to be a lack of proper inbound inspection and inadequate reporting by motor carriers of FMCSA driver vehicle inspection reports (DVIR) at the inbound gates.[57] This leads to chassis being deposited in terminals in an unidentified condition. It was asserted by one participant, for example, that about 70 percent of chassis returned bare to terminals are in a damaged condition but are not being reported as damaged. If drivers would report damage, the chassis pools could better attend to chassis damage issues which would improve the chances truckers could locate a roadable chassis.[58]

Marine terminals currently contract for and direct maintenance labor so, if mechanics are needed elsewhere, they will be directed to where they are most useful to the terminal operator, not necessarily where they are most useful to the chassis provider or motor carrier. Therefore, if the chassis supply model is kept on terminal, it may not be possible to address some of the problems that currently limit chassis availability. If the chassis provider controlled

[56] 73 FR 76822, Dec. 17, 2008 as amended at 74 FR 68708, Dec. 29, 2009; 78 FR 58483, Sep. 24, 2013.
[57] At the time equipment is returned, a driver or motor carrier is required by FMCSA to report to the IEP or its agent any known damage or deficiencies in the equipment. The requirement to file a DVIR if no defects are being reported was eliminated in June 2012.
[58] It is a FMCSA requirement that intermodal equipment intended for interchange with motor carriers is in a safe and proper operating condition *before* it is offered for interchange.

the source of labor, rather than the terminal operator, chassis quality could be better controlled. If chassis came off the terminal, the chassis provider also could put in more stringent gate control, the lack of which is problematic for chassis providers. On the terminal, the chassis provider is dependent on someone else. Off terminal, the environment would be more controlled and more predictable and chassis providers would be better able to properly size their chassis fleet.

Current law requires IEPs to provide a safe roadable chassis for pick-up. However, this is not being fully complied with or enforced which causes drivers to wait while the chassis is being repaired before leaving the terminal. When chassis are deployed that are not roadable, drivers continue to be charged with equipment violations. The IMCC advocates that these violations instead should be assigned to the IEP. Another roadability-related issue involves organized labor's assertion of a contractual right over chassis M&R activities. Under the historic, traditional chassis model, chassis owned by ocean carriers were stored, repaired and maintained on marine terminal property by organized labor under contract. Under the evolving paradigm, however, the equipment is more usually owned by private third-party leasing companies and sometimes motor carriers. Forum participants indicated that labor, however, still wants to preserve its right to the M&R function. Although the large chassis leasing companies and pool operators have not sought to move their operations to non-union (or other union) M&R, how this will play out in the long term is unknown. Until this situation is clarified, container traffic flow through the gates likely will be slowed by longshore unions at times when they want to underscore their M&R claimed rights.[59]

**Cross-section of stakeholder viewpoints**

Without doubt, the discussion of chassis availability and the still unfolding chassis provisioning business models ranked alongside concerns about the continued viability of the port drayage industry as the most discussed topics at the FMC port forums. Representatives from each of the major equipment leasing companies – TRAC Intermodal, Flexi-Van, and DCLI – presented their viewpoints, often at more than one venue, as did ocean carrier and motor carrier representatives. Absent from the discussion of this topic were contributions from marine terminals. The general consensus appeared to be that it is not so much the change in chassis

[59] The National Cooperative Freight Research Council (NCFRC) Report 11 (2011), *Truck Drayage Productivity Guide*, produced by the Tioga Group and others, devoted a chapter to container chassis supply and delays. Noting that chassis condition and availability has remained a long standing point of contention between drayage companies, terminal operators, ocean carriers and chassis providers, the authors suggest that a long-term strategy would be for ocean carriers to stop providing chassis entirely and change instead to a motor carrier, customer, or third-party chassis supply as used in other countries. If this situation were ever reached, it would eliminate having to inspect chassis at terminal gates or to document the interchanges, drivers would not have to locate a chassis and assess roadable condition, flip lifts would not be needed for mismatched chassis and container combinations, roadability stations and chassis repair services and facilities would not be necessary and there would be no need to store chassis at terminals, thereby freeing up considerable space on terminal. The report did not discuss how certain impediments that prevent this long-term vision being realized, such as jurisdictional issues over maintenance and repair or rail intermodal terminals still being overwhelmingly reliant on wheeled operations, could be surmounted.

ownership that adds to congestion (i.e., who owns the assets). It has more to do with the operating models which are still evolving. Ultimately, the view seemed to be that most likely there will not be a dominant one-size-fits all model, but rather multiple models that evolve organically in response to the operational exigencies and past histories of chassis provisioning in different port complexes and regions.

Despite port congestion problems at some locations, meeting participants were reminded by CCM representatives that ocean carriers, through cooperation under the Ocean Carrier Equipment Management Association (OCEMA), had improved efficiencies at port terminals and inland rail terminals by creating, about a decade ago, regional gray cooperative chassis pools. CCM reported that it operates six pools covering ports in the southeast and Gulf Coast and in a majority of the heartland. It was pointed out that within the regions CCM operates, port congestion has not been a prominent issue, the implication being that gray pools are a solution. The gray pool allows one party to manage logistics and stock controls, one party to meet with major BCOs and ocean carriers to discuss peak shipping needs, one party to communicate with the motor carrier community, and one to negotiate with labor on maintenance requirements. Gray pools also help free up much needed space in terminals, reduce truck turn-times, and expand competition and customer options by allowing multiple provider participation.

CCM used the South Atlantic port forum to showcase the claimed success of their South Atlantic Chassis Pool (SACP) and pointed to what seems to be working well there. Several attributes were suggested that, according to CCM, make Southeast ports less congestion prone than ports in other regions of the country. First, the Georgia Ports Authority and the South Carolina Port Authority are viewed as being service and customer focused. Service standards were said to be held as a priority at the highest level in these organizations. Second, they are operating ports rather than landlord ports which eliminates another layer of stakeholder interests that complicates efficiency of operation. Third, the ports had the foresight to regionalize a chassis pool almost ten years ago in 2006 and together took the decision to support one gray pool in the region. Finally, according to CCM, a single regional pool is more efficient than having different pools in multiple ports or terminals because chassis dislocations are minimized. Prior to CCM establishing the SACP, for example, the GPA operated with over 10,000 chassis on terminal; today the pool handles 9,500 gate moves with an on-terminal stock averaging 2,500 chassis.

An additional perspective on chassis challenges was provided by Flexi-Van, a chassis provider and pool manager, as well as a contributor of chassis to the CCM pools. As a result of running service centers in nine major ports, dealing with four different unions, and operating non-union workshops as well, Flexi-Van is well-versed in major issues confronting the chassis business. Its representative stressed that the transition of chassis ownership and operation primarily from the ocean carriers to the leasing companies occurred much more quickly than anyone had thought possible and this has intensified the problems now facing the industry. He pointed to the fact that just five years ago, 85 percent of revenue in the Flexi-Van chassis business came from 22 shipping lines leasing its chassis (mainly under long-term leases). The company now deals with 5,000 relatively small customers (mostly motor carriers), resulting in higher

administration costs and potentially a less stable revenue stream (mostly daily or short-term chassis rentals). Flexi-Van pointed out that many acquisitions of the assets by the leasing companies had ancillary conditions negotiated by the ocean carriers linked to continued chassis usage and cautioned that, as these contracts expire, the market may change again. Flexi-Van sees the market of leasing chassis to the larger motor carriers as growing and also the market of leasing chassis to beneficial cargo owners. Examples of the later include arrangements with Lowes and Georgia-Pacific to supply them with dedicated (or closed) chassis fleets. Closed fleets give shippers a lot more control and ready availability of chassis. Efforts to expand the market into this area would help restore the long-term revenue stability lost when ocean carriers terminated their leases.

According to Flexi-Van, the biggest issue facing the chassis pool operators "by far" is lack of control of maintenance and repair cost, which is the business's largest category of expenditure. As so much M&R work gets done on the marine terminal, there is a significant disconnect between having to pay the M&R bills and having no control over post-repair inspections. The Flexi-Van representative believed that too many repairs are done at roadability. He cited not only a shortage of trained mechanics but variability in their availability, with perhaps 15 mechanics working on chassis at a terminal one day, followed by only two the next day. Repositioning of chassis is the second biggest expenditure after M&R. Attempting to minimize this cost is what drove the formation of regional gray pools. These pools help reduce the number of bare chassis moves from one location to another. Flexi-Van suggested that one problem that affects chassis availability on terminals is their not being able to always get accurate data from the terminals. He pointed out, for example, that only 40 percent of these data comes through electronic data exchange. Data cleansing has become the company's largest department – dealing with bad data to ensure correct billing. Flexi-Van also pointed to the difficulty of introducing quality and safety enhancements to chassis (e.g. radial tires, LED lights, ABS) in a chassis pool environment. On a more optimistic note, Flexi-Van reported having budgeted several hundred million dollars over the next five years to build chassis and was confident that if stakeholders work together in forums like the ones conducted by the FMC that progress could be made.

DCLI manages 130,000 chassis nationwide through partnerships formed with Maersk Line, NACPC, and now Flexi-Van. The largest pool it manages is the Grand Alliance Chassis Pool that has 36,000 chassis spread over nine terminals in the San Pedro Bay (SPB) ports complex. DCLI outlined what it is doing to improve chassis operations. It has instituted improved methods of communication between ocean carriers, marine terminals, railroads and motor carriers. It is working with stakeholders to forecast short- and long-term volumes, establishing on-terminal usage requirements for wheeled and bare chassis, reducing on-terminal and street dwell times by establishing improved standards, and creating better metrics to track performance across pools. Specific initiatives undertaken by the company to improve chassis availability include: (1) adding more mechanics to reduce out-of-service chassis volume, (2) moving chassis to off-site container yards supported by union labor to increase the rate of repairs and to clear on-terminal space, (3) attempting to gain better access to marine terminal operating systems in order to identify and track imports on wheels with high dwell times still awaiting pickups, (4)

encouraging carriers to reduce on-terminal free time and establishing maximum street times with penalties for excess usage on the street, (5) developing joint ocean carrier and motor carrier strategies that involve incentives to terminate or pickup chassis at deficit or surplus locations (supported by email blasts), and (6) implementing a motor carrier hotline implemented to help truckers find available chassis within a regional pool location. Notwithstanding having taken all these steps to improve chassis availability, DCLI emphasized that the most significant chassis productivity step it has taken to date was deciding to participate in the pool-of-pools chassis provision model.

Claiming that no new chassis had been added to the market in the last seven to eight years, a representative of the North America Chassis Pool Cooperative formed by twelve motor carriers emphasized the need for open market competition regarding chassis contributors, chassis providers and pool managers. In his view, new chassis are needed not only to meet future volume needs but also to replace deteriorating chassis quality. In his view, any future chassis model needs to possess four absolute features – (1) it should be a gray pool to ensure interoperability, (2) there should be 100 percent motor carrier choice, (3) open market competition in terms of pool management and chassis use, and (4) the UIIA should be used to govern interchange rules (i.e. no proprietary interchange agreements). NACPC supports the pool-of-pools concept that allows all chassis in a port complex to be gray but with multiple pool managers. In its view, this chassis model creates competition in pool management which should foster innovation and further cost containment. A practical example of the type of benefit made possible by the pool-of-pools concept was given by a meeting participant who claimed that DCLI, a few weeks prior to the meeting, moved 300 chassis into the TraPac terminal at the Port of Los Angeles on the same day that Flexi-Van moved 275 chassis out. If a pool-of-pools had been in place, the net number of bare chassis moves would have been just 25. Dozens of drivers, if not hundreds, were tied up re-positioning this amount of equipment when the work could have been done with a handful of drivers under a pool-of-pools arrangement.

One representative of a major ocean carrier claimed there are not enough good order chassis. He went on to suggest that the area inside a terminal where chassis are picked up needs to be more like a car rental lot to allow drayage drivers to just hook up to a roadable chassis and go. Instead, too many drivers are left to search around terminals for a chassis in good order. He also suggested there should be designated yard locations near terminals for good order chassis. To ensure truckers with minor damage issues are not allowed to get delayed behind a driver with a major problem, he suggested prioritizing what is minor damage and what is heavy damage so the latter chassis can be completely removed from the terminal to be managed by the chassis pool or chassis owner. It was the view of a different ocean carrier representative that chassis are still one of the least utilized assets, citing the fact that 60 to 70 percent of chassis are sitting idle at any given time. This person also suggested that ocean carriers do not help enough to solve chassis availability. Issues like vessel bunching caused by slow steaming, and not sticking to schedule, add to an already bad situation. The chassis challenges discussed at the port forums had reached crisis level, according to another shipping line executive, because most stakeholders are too anxious about their own narrow interest. He cited the railroads as needing to look closely at their operational practices that add to port congestion

and equipment shortages. In this participant's view, the wheeled chassis operation required by railroads to minimize their own operational costs has a disproportionate impact on already over-utilized chassis capacity.

Motor carrier choice, greater need for chassis interoperability, and sufficient good order chassis being made available to deal with anticipated workloads were key issues for most motor carriers. At the port forum in New Orleans, a motor carrier claimed he is forced to use chassis providers dictated by the ocean carriers and that this lack of choice puts him at risk of being overcharged. This same motor carrier highlighted what seems like a counterproductive situation at a container facility in New Orleans. He claimed this facility within its perimeter has two terminal operator tenants and that each MTO has its own chassis pool operated by the same chassis management company. He asserted that trucks that service both terminals in the same day have to exit and re-enter the same gate, drop and swap chassis, and have information entered into two separate systems. Another motor carrier had more gray chassis pools among his top five wish list items. He thought chassis should not be allowed to remain in silos because this creates tremendous complexity for companies and drivers, especially when working with large-shipper accounts who may be shipping with numerous ocean carriers. He felt the drayage industry should not have to reposition equipment around the port complex without being compensated.

A motor carrier attending the port forum in Baltimore felt there needs to be a major change in how chassis are made available and how they are managed. In this person's view, the roadability system in particular needs to be re-engineered. In his view, chassis should be ready "to hit the road" when hooked up. This motor carrier demonstrated his claim that often there are not enough chassis with two examples. Based on daily email reports of the number of chassis available during the week before coming to the meeting, he reported that there were 1,145 chassis available each day, on average, across the two largest chassis providers at the PONYNJ where 13,000 loads a day are moved. At one specific terminal that moves 1,300 containers per day, the average number of chassis available at the beginning of the morning was 46. He went on to explain that, where shortages exist, the truck driver has two options. Either s/he can deal with a red-tagged out-of-order chassis or wait for a pool chassis to arrive, but the trucker has little idea when that may happen.

**Stakeholder suggestions and proposed fixes**

Being able to achieve greater interoperability of chassis was seen as perhaps the most pressing need by a very broad group of stakeholders attending the port forums. Promising interoperability solutions were discussed at length that, if implemented, seemed as if they might provide significant relief to motor carriers and others from the chassis shortages impeding container flows at some of our busiest ports. In addition, motor carrier participants, as well as those from the chassis leasing companies, articulated several issues involving the maintenance and repair of chassis that, if suitably addressed, may further improve chassis availability. With chassis having transferred so rapidly into the ownership of a small number of privately held and well-financed equipment leasing companies, ocean carriers and motor

carriers expressed concern about the attendant risks to competition. Specifically, motor carriers pressed for open choice of chassis provision and argued against having that choice dictated by the ocean carrier when the motor carrier was footing the bill for renting the chassis. Meeting participants offered the following suggestions or potential solutions for how the aforementioned concerns could be addressed:

- **Implement more gray pools to expand chassis interoperability**. It was noted that this need appeared greatest at the larger port complexes, such as the Ports of Los Angeles and Long Beach and the Port of New York/New Jersey, where the existence of multiple pools seems to result in many unproductive truck trips and added driver wait times, both of which reduce drayage driver's available hours of service. It is important to note that following the attention given to this potential solution at the FMC port forums, a "pool-of-pools" gray pool concept has been introduced at West Coast port complexes in the SPB and Seattle-Tacoma-Portland regions.[60] Also, the Port of New York/New Jersey's Council on Port Performance has since agreed to adopt a similar port-wide gray pool concept – "the market pool" – that likely will be implemented later this year. If successfully implemented, these schemes should make more drayage truck capacity available because many unproductive truck trips would be eliminated, along with some pool repositioning of chassis. When trucks are more productive, chassis are being used more efficiently and this should lead to greater chassis availability.

- **Attention was drawn to the Gulf region as not being served by a single gray chassis pool**. It was suggested that a single gray pool for the region could have significant advantages, not only for truck and driver efficiencies but also terminal efficiencies, and particularly at the rail ramps with wheeled operations.

- **Inbound container volume forecasting should be improved to allow daily chassis supply at terminals to be planned and prepared more effectively**. It was suggested this could be accomplished through the simple expedient of better communication among and between ocean carriers, terminals, and chassis providers. Absent reliable forecasts, chassis pool managers are forced into having to use historical baseline data.

- **More could be done from a capital investment standpoint to address chassis shortages**. For example, refurbishing chassis or by buying equipment in surplus markets and redeploying that equipment in markets where needed. Others suggested safety stocks could be re-examined to help deal with demand spikes. Two of the chassis leasing companies reported they had begun refurbishing units to add to safety stock.

- **The physical configuration of container facilities should be kept under regular critical review**. One participant commented that the physical layout of most marine terminals and rail facilities is designed foremost for handling loaded containers, with little consideration

[60] Three months after the forum in Southern California, the ports of Los Angeles and Long Beach amended their environmental and infrastructure cooperative working agreement to allow broad ranging discussions with all of the ports' stakeholder groups on congestion-related issues.

given to yard layout for chassis operations and improving motor carrier efficiencies. Someone else pointed out that gate controls also are container based. The lack of proper validation processes on chassis exiting gates has resulted in unauthorized usage, stolen chassis, and billing discrepancies. As an indication of the size of this problem, a chassis provider reported that at one Gulf port approximately 4,000 unauthorized chassis moves occur per month.

- **Hire more mechanics and dedicate them to chassis M&R work.** A shortage of mechanics was believed responsible in part for lack of chassis availability. Given the difficulty of finding trained mechanics, it was suggested that more should be done at the local level to tie into training programs at community colleges. When mechanics are available on terminal, a commonly heard compliant was that they are often pulled away from chassis to more remunerative work activities. Mechanics dedicated to chassis M&R work was suggested but seems feasible only if chassis are pulled off terminals into their own depots. Although getting chassis yards out of terminals could improve the prospect of having a dedicated source of mechanics and free up space in congested terminals, others caution that this has the potential to increase unproductive drayage truck moves. Related to this issue, one final suggestion aimed at increasing truck turn times and de-clogging terminals was to segregate major chassis damage from minor damage and to take the former off terminal to get repaired.

- **Ocean carriers should get out of the chassis business completely**.[61] Motor carriers seem resentful of having the choice of chassis provider, in some cases, dictated by the ocean carrier. Where this occurs, it reflects the contractual arrangements ocean carriers made with chassis leasing companies when they sold their chassis. Motor carriers complained these tying arrangements result in additional truck moves, poorer utilization of chassis, and diminishes competition among providers. Presumably, this particular problem should gradually diminish as these contracts expire.

- **Rail intermodal terminals should move to grounded operations**. Wheeled operations at these facilities impede potential progress toward motor carrier or shipper owned and operated chassis fleets.

- **Modernized and upgraded chassis**. Motor carriers and leasing companies alike want to see chassis modernized with upgraded safety and reduced-maintenance features, such as radial tires, LED lights, auto inflation, and ABS to address road violation issues and to reduce M&R cost, but recognize that progress in this area is not easy to achieve in a shared chassis pool environment.

[61] A recent report by the Boston Consulting Group, *The Transformation Imperative in Container Shipping* (March 2015), recommends that ocean carriers should identify customers that do not have their own intermodal capabilities and to charge premiums for providing these additional services. Their current practice involves providing mostly all-in rates in which the ocean freight subsidizes intermodal expenses.

- **Interchange chassis according to UIIA interchange rules**. According to motor carriers, chassis leasing companies continue to insist motor carriers must sign proprietary interchange agreements which, they argue, is often a source of delays at the gates.

- **Conduct chassis inspections for outbound movements before the chassis is interchanged with the drayage driver**. Motor carriers assert federal law requires chassis to be roadable before being interchanged. They argue that if the intermodal equipment provider or terminal wants to conduct chassis inspections for outbound movements, then these should be done after the equipment is returned. The current system that relies on inspections before exiting the terminal erodes hours of service as the driver is forced to wait for repairs to be made before exiting the gates.

- **Motor carriers plan to press FMCSA to enforce compliance with roadability rules**. While recognizing that it is not FMCSA's responsibility to ensure that there are enough chassis available, motor carriers argue that FMCSA is, however, responsible for ensuring that the chassis stock is in a roadable, safe condition before being interchanged with the trucker or motor carrier.

- **Regulatory oversight by an appropriate body**. This could help ensure that the still incomplete transition from ocean carrier ownership and operation of chassis to equipment leasing company ownership and operation results in a chassis provisioning business model that promotes competition and does not unreasonably decrease transportation service. This suggestion reflects the viewpoint that ocean carriers are strongly motivated to provide sufficient chassis, yet no longer control the supply. However, according to this viewpoint, the few leasing companies that now control supply may find chassis rates and overall revenue easier to raise when chassis supply is constrained and, therefore, are less motivated to ensure supply is adequate.

## Vessel and Terminal Operations

### Framing the issues

Having explored in the previous section how substantial structural change in the chassis industry has affected chassis availability, particularly who is now supplying chassis (i.e. primarily leasing companies instead of ocean carriers) and how that supply is being provided and managed (i.e., by the various types of pools), it is time to explore a second group of reasons that affect chassis availability caused by vessel and terminal operations.

Ocean carriers' rapid disengagement from the chassis business following the Great Recession of 2009 was one of many measures taken at that time to reduce ocean carrier operating costs. Other cost saving measures included the deployment of much larger, more fuel-efficient ships, slow-steaming of vessels, the formation of new alliances, and the restructuring of existing alliances into larger groups of carriers.[62] In various ways, these cost-cutting measures have compounded the chassis availability problem caused by the structural changes occurring within the chassis supply market itself. The principal factors that are internal to pool operations that drive chassis availability are chassis fleet size, out-of-service levels, chassis not being where needed (dislocation), in-terminal dwell time, and street dwell time. Unlike the other factors critical to chassis availability, out-of-service level is linked to M&R and roadability issues and has no direct link to ocean carrier operations. Chassis providers can adjust fleet size, but not by much in the short-term. Thus, the key factors that limit chassis availability as a result of ocean carrier, terminal and vessel operations are chassis dislocations and dwell times. The culprits most often cited by participants as the chief causes of terminal congestion are big ships, vessel bunching, and larger alliances with broader memberships. As explained below, each of these factors, in different ways, cause chassis dislocation and shortages and congested terminals.

The deployment of bigger ships into services calling at U.S. ports does not directly cause chassis shortages. The more critical metric that may trigger chassis availability issues is the number of containers exchanged (i.e. discharged and loaded) at each vessel call. All else equal, bigger ships should be expected to exchange a larger number of containers. Although big ships generate economies of scale at sea, these gains are dissipated if those ships spend longer in port being discharged and loaded. To avoid this, terminals typically will use more gantries and gangs to work bigger ships. Consequently, there will be more containers coming off and going onto the ship in any given period of time compared to smaller ships.[63] For example, a 13,000 TEU ship at berth could generate 2,750 container moves per day, compared to 1,650 moves for a 7,000 TEU ship. This greater daily volume requires more chassis. Insufficient availability of

[62] The Boston Consulting Group's recent report, *The Transformation Imperative in Container Shipping* (March 2015), asserts that many ocean carriers also have renegotiated terminal contracts owing to the "relentless pressure created by weak fundamentals in the industry." (p. 18)

[63] Drewry Container Insight, *Who will pay for a port productivity revolution?* March 24, 2015. (The figures cited here assume three gantries work the smaller ship and five gantries work the larger ship and that each crane handles 25 containers per hour working 22 hours per day.) A realistic top-end performance of 3,000 to 3,500 moves per day is thought to be achievable in a large terminal handling the largest ships, according to Drewry.

chassis will constrain a terminal's ability to service the ship. Also, the volume coming off the ship and into the container yard has to reasonably match the container yard's ability to clear containers out of the yard by efficiently dispatching outbound containers to motor carriers and other land modes. Any mismatch in these flows, perhaps because a disproportionate amount of resources is being devoted to handling the big ships, could result in containers accumulating in the container yard. If allowed to persist, the terminal will run out of space and/or container stacks will grow in height. As truckers generally arrive in a random manner at marine terminals to pick up specific containers, overcrowded container stacks lead to shuffling containers multiple times to get to the required container and this slows the process, delays and congestion build, and in-terminal dwell-time lengthens. As dwell-time lengthens, it has the effect of reducing the effective size of the chassis fleet which may then impact the ability of the terminal to service the ship. As chassis become less available and more difficult to locate, on-street dwell-time will increase because motor carriers hold on to chassis longer than necessary (hoarding), further exacerbating the chassis supply problem.

In normal circumstances, the scenarios just described are avoided because there is usually an ebb-and-flow to the work of a container terminal. While a ship is being worked, containers tend to accumulate in the yard more quickly than the yard is able to dispatch containers to the out gates, but the terminal manages to catch up with yard work when the ship has left the berth. Arrivals and departures at a terminal's berths are carefully managed to help ensure that available equipment and labor resources are allocated appropriately to flow cargo through the terminal without undue disruption. However, when vessel arrivals get out of sequence, vessel bunching can put enormous pressures on the terminal because resources available to work the vessels are finite. Some vessel bunching occurs by design. In Southern California, for example, inbound vessels tend to arrive later in the week primarily for the benefit of intermodal cargo movements. This pattern leaves the terminals somewhat devoid of vessels after the weekend. Although not ideal from a resource efficiency perspective, this situation is anticipated and planned for.

In contrast, in recent years, vessel arrivals at terminals have been bunching because of slow steaming practices. First introduced as a fuel conservation measure when bunker fuel oil rose above $600 per ton, it became more widely applied as an industry cost saving measure after the Great Recession. Ocean carriers seem reluctant these days to speed up ships when they fall behind schedule (which burns more fuel) and this may cause them to miss berthing windows which disrupts the terminal's work planning processes.[64] There are several reasons a ship may fall behind schedule, including delays at the berth caused by slow handling because of chassis

[64] Relying on data provided by software provider *Freightos*, American Shipper Daily (March 24, 2015) reported that average vessel delay across West Coast ports was 1.4 days in January 2014, rising to 1.7 in September 2014 at the time of the FMC port forums. Average ship delay exploded to 5.2 days by December 2014 when operational issues combined with longshore labor contract issues to further hamper port performance.

shortages. This is one of those factors that feeds upon itself to further compound the congestion problem.[65]

Ocean carrier operational alliances were cited often as a factor contributing to port congestion. In the past year, some alliances re-organized into larger groups of carriers. For example, the New World Alliance and Grand Alliance carriers formed the G6 Alliance and Evergreen joined the CKYH Alliance (which became CKYHE). In addition, new alliances have been formed, specifically, the Ocean Three (consisting of CMA-CGM, CSCL and UASC) and 2M (consisting of Maersk and MSC). When assessing the impact of alliances on congestion, it is important to recall that when the FMC port forums were held in September, October and November 2014, just one of the new alliance formations was operational (i.e., the G6 Alliance) in the U.S. trades. The G6 Alliance has been operating between Asia and U.S. East Coast ports since May 2013, and between Asia and U.S. West Coast ports since May 2014. The other new alliances did not begin deploying services until early 2015.

The G6 Alliance was cited by participants as an example of the way in which alliances have the potential to cause severe dislocation of chassis and more repositioning of equipment. With respect to the G6 Alliance, reportedly, the larger group of carriers in this alliance has resulted in containers being landed across as many as nine different terminals at the SPB ports complex. Even in the same service, a ship operated by the alliance may use Terminal A this week, while the next ship in the rotation may use Terminal B the following week. This practice creates more dispersed chassis operations. Several different participants asserted that moving equipment around the SPB ports complex to meet the needs of the expanded alliances' arriving ships has created additional inter-terminal movements of containers, resulting in chassis shortages, dislocations, and extra demand for drayage.

Average container exchanges at most ports are relatively modest.[66] However, the absolute size of the container exchanges typically associated with the big ships can swamp a terminal's ability to manage high volume without temporarily causing congestion. When this container volume exceeds the volume that the terminal's available equipment and labor resources can move off the dock before free time expires, it may result in congestion in the container yard and creates tension among motor carriers and BCOs. Most terminals and/or ocean carriers collect demurrage fees even when the terminal may have known in advance that it would not be able to clear the cargo from the container yard within free-time limits given the resources at its disposal.

Most stakeholders recognized that terminal operators work for the ocean carriers so, logically, the terminal operator's main focus is on satisfying the business needs of its primary customer,

[65] For example, ships being off schedule results in bunching of arrivals, which leads to lack of chassis availability, delays to ships at the berth, and the ships end up further off schedule.

[66] See appendix C. At most U.S. ports, large ships still account for a relatively small proportion of overall vessel calls. As a result, they do not have much effect on the average figure for the number of containers exchanged per vessel call. Nevertheless, individual calls by big ships that off-load and load large numbers of containers in any one visit can overwhelm the finite equipment, labor, and trucking resources needed to clear out those containers in a timely manner.

which means turning that customer's ships as quickly as possible. The larger ships get, the more pressure there is on terminal operators to turn the ship around without delay. Although the economic incentives make this action imperative, according to some stakeholders, they lead to business practices that are overwhelmingly focused on ship-shore operations to the detriment of container stack-to-truck operations. With the heavy emphasis on ship-to-shore (quayside) operations, trucking operations become something of an afterthought.

A representative of large retail goods importers pointed out that marine terminals are not rewarded by ocean carriers for handling yard and gate operations expeditiously and, in the absence of any established set of metrics by which to measure or assess gate efficiency, beneficial cargo owners (BCOs) are not able to hold their ocean carriers accountable for improvements in terminal turn-time and gate queues. If this information were available, according to this participant, BCOs could use it to convince their ocean carrier supply chain partners to value efficient container yard and gate operations, and ocean carriers could then pressure terminal operators into ensuring adequate resources are provided in this area of the terminal. If such metrics were available, informed BCOs could choose to give their business to ocean carriers who demonstrate that they value efficient yard and gate operations. At present, according to this participant, BCOs have no alternative but to absorb the cost of inefficient container yard and gate operations.

An ocean carrier participant brought out the importance of terminal services agreements, describing them as the terminal operator's life blood. This contract will define the type and level of services to be provided by the terminal operator to the ocean carrier and the costs entailed. The charges for handling the ocean carrier's containers will be expressed in this document and are negotiated usually based on volumes. Most contracts are multi-year, with break clauses. The terms typically commit the ocean carrier to a minimum guaranteed volume and, in exchange, the ocean carrier is usually provided with guaranteed time slots for vessel berthing and guaranteed handling rates at the quay (container moves per hour on/off the ship). Contract terms are usually based on container moves, regardless of size or type, but there are usually different rates for full and empty container movements and allowances for transshipment containers. Part of the terminal services agreement will address demurrage and free time. According to one participant, there may be room to innovate here by developing ways to use electronic payment instead of check or cash payment. Operations within the container yard also may reflect what has been negotiated in terminal services agreement. For example, it may specify that the first 100 containers discharged from the ship for a named BCO will go on the first train out of the terminal. This type of requirement creates operational complexity which tends to increase terminal operating costs, but these added requirements should get reflected in the overall price of the contract.

**Cross-section of stakeholder viewpoints**

A representative of waterfront employers remarked: "If you've seen one port, you've seen one port," implying that ports can learn very little from each other. However, the speaker went on to explain that while the character of our ports is often very different, their basic mechanics are

similar. His essential point was that ports can learn from each other even though they do things increasingly differently. As if to underscore this point, another participant drew attention to some significant differences in the performance of terminals operated by a state or local government entity (i.e., an operating port) versus those that are operated privately under the auspices of a state or local government administration (i.e., at a landlord port). He surmised that operating ports tend to be more efficient because they have more control and are not competing among themselves as privately run terminals often are. The executive director of a large landlord port assured attendees at one of the forums that there are no excuses for viewing themselves as merely landlord ports and emphasized that such ports are well-positioned to facilitate positive outcomes to congestion issues.

An ocean carrier representative, who has a panoramic nationwide view of conditions at U.S. ports, commented that he was not seeing port congestion happening any more acutely at one port than others, except in just a couple of locations.[67] However, he observed that terminals in most ports were working almost at capacity. He believed that while ocean carriers can live with this situation, albeit not that happily, the bigger problem was what the future is bringing - growth! In the past year, this ocean carrier's container volume had grown 15 percent on the East Coast, and seven percent elsewhere. Moreover, this large expansion had occurred on an existing base of high numbers. He explained that his company expects to create problems for terminals wherever the carrier calls on account of their large volume and that his company expects terminals to be prepared for that growth. In general, he felt that terminals are getting prepared and sees a lot of good efforts everywhere. He saw some problems, however, including labor shortages, rail and truck bottlenecks, construction work, etc., and his worst fear was that these problems would converge. He cautioned participants not to look to others to solve congestion problems. This ocean carrier, for example, has made tactical decisions in the short-term to diversify cargo inland by calling at five Northeast ports to create options in case of unforeseen events. The carrier also has been looking at how to better manage equipment imbalances to avoid problems at its terminals and has embarked on a program of free time reductions and plans to do even more of that. Looking at long-term efforts, this participant felt that there are insufficient gate hours at too many terminals, that more appointment systems were needed, that there should be more incentives to use barges to move some cargo more quickly out of terminals. He also wanted to see improved dialog among participants in the supply chain specifically to obtain better cargo forecasts from shippers.

Vessel schedule reliability was described as being "miserable" by one port representative who went on to stress that vessel bunching puts extra strain on already challenged terminals. Using a recent experience, a motor carrier at the Baltimore port forum highlighted vessel bunching's impact on drayage. In the week before the forum, he claimed some vessels were supposed to have arrived Wednesday at the port his company's drayage trucks serve and be unloaded by Thursday. However, the vessel schedules slipped and the ships bunched with other arrivals over

[67] This participant represented one of the largest global container carriers. He reported that his company calls at 18 different U.S. ports (five in the Northeast, four in the South Atlantic, five in the Gulf Coast, and four on the West Coast) and is responsible for 3,000 ship calls at U.S. ports per year while moving 2.7 million full and empty containers.

the weekend. As a consequence, half of his drivers reportedly had no work Thursday and Friday. Without a more even flow of cargo, his company is not able to move all the cargo off the terminals within the constraints of free time. This participant wanted to be given additional free time when vessel schedules slip and believed that this measure would help to relieve congestion because, under the current practice, drivers have to crowd into the terminal in a just a couple of days to clear the cargo out before free time expires.

A return to the truck servicing levels that terminals demonstrated prior to the current bout of congestion should be an immediate performance goal, according to a participant at the Baltimore port forum. While recognizing that working the ships is very important to terminals and their primary customer, the ocean carriers, this participant stressed that it is also important to have the appropriate equipment levels to work the ships, the rail, and the trucks at the same time. Too often in his view, terminals shift equipment away from the different sections of the terminal to facilitate container flows to and from the ships which leaves trucks sitting around. Another motor carrier participant claimed the terminal gates at the Port of New York/New Jersey are open on average only 22 to 28 percent of the time. This participant wanted terminals to examine how they could extend hours while maintaining adequate equipment availability. He also wanted to see more consistency in terminal operating hours. Because drivers operate under stringent hours of service (HOS) rules, in his view, standardized hours across terminals would help motor carriers to better plan and schedule deliveries and pickups.

According to the representative of a large shipper-based organization, a significant problem with the structure of the ports industry is that there is no real commercial relationship between the shipper (and his drayman) and the terminal operator upon whom shippers depend for efficient performance. In this situation, neither the shipper nor the drayman has any means to impact or influence the terminal's provision of service. This participant believed that the focus of the ocean carriers has been on bigger ships to drive down cost but with too little planning and investment having been made to ensure that the cargo brought by those bigger ships flows efficiently through the terminals and into U.S. commerce. In his view, terminals have provided inadequate resources in the form of equipment, labor and time (i.e. gate hours) to their yard and gate operations. Another participant suggested that with no direct commercial relationship between the terminal and the shipper or drayman, terminals have overlooked the notion that ocean carriers and terminals exist to serve the needs of the cargo, and thus of shippers.

**Stakeholder suggestions and proposed fixes**

Solutions proposed by participants for addressing terminal congestion typically involved some combination of six elements, namely, labor, land, equipment, business processes, information technology, and time (in the form of more gate hours). It is important to recognize that solutions are devised to address the root causes of a particular problem. Therefore, what may be an appropriate solution in one terminal, at one port, or in one region of the country, may not be the most appropriate approach in others. In devising solutions, it is also important to trace the root cause of the problem. For example, if big ships with large container exchanges are overwhelming the ability of the local drayage fleet to clear out containers before free time

expires, a possible solution may involve extended gate hours. However, if the effective capacity of the drayage fleet is being reduced by other practices in the port, such as inconsistent operating hours across terminals or the closure of gates on short notice – practices that interfere with the motor carriers' abilities to efficiently dispatch drivers – it may be more appropriate to address those issues. Several of the solutions suggested seemed more like palliatives rather than long-term solutions to port congestion. Nevertheless, palliatives will help provide some immediate relief and give some extra time to search for more enduring solutions. Participants provided the following suggestions for relieving terminal congestion:

- **Move away from random access to container yards to a more planned truck arrival system**. There appears to be general recognition that random arrival of drayage trucks at terminals is wasteful of resources and that these inefficiencies will only get worse as the volume of containers that terminals are expected to handle continues to increase. Terminal operations within port complexes are becoming more integrated because of ocean carrier alliances and this is compounding an already difficult situation. The introduction of more order in drayage truck arrivals could be achieved in several ways, for example, through truck appointment systems which involves the motor carrier scheduling visits in advance (often days in advance) or by deploying real-time information systems that allow motor carriers and terminals to exchange information seamlessly with each other to help the terminal prepare for the truck arrival even when the truck has to deviate from prior intentions communicated to the terminal because of traffic delays, etc. These and other similar suggestions are further outlined below.

- **Traditional truck appointment systems**. Although truck appointment systems are in place at several terminals around the country, there appears to be no strong support, especially among the motor carrier community, for applying these systems more widely. Several participants pinpointed some basic flaws in these systems that restrict their effectiveness as a congestion management tool. As currently configured, most appointment systems are seen as providing some benefit to terminals because they provide advance knowledge of work volumes so terminals can plan resources accordingly, and the appointment windows help spread the expected work volume more evenly throughout the day. However, normally, there is a high proportion of no-shows or missed appointments, partly because appointments often must be scheduled days in advance. Most motor carriers claim to obtain little or no benefit from appointment systems because they are simply appointments to get through the terminal gate into the container yard. Typically, appointment systems are not used by terminal operators to facilitate containers being made readily available for pick-up by truckers soon after they have entered the container yard.[68]

[68] There are some exceptions to this statement. A participant reported, for example, that the APM Terminal in Mobile has an appointment system with 100 percent appointments. The system allows a trucker to enter the terminal even when the appointment is missed, s/he is just required to come in that day. This allows the terminal to obtain information up front for resource planning. It was reported that the terminal's operating system (NAVIS) provides seamless real-time communication between the gate, equipment and container, such that when a truck comes through the gate, equipment operators start to react immediately.

- **Traditional truck appointment systems that provide benefits to motor carriers as well as terminals**. Port Metro Vancouver (PMV) has a port-wide truck appointments system that penalizes no-shows, but also compensates drivers for excessive wait times.[69] The appointment window is one hour. If an appointment is missed, the trucker is required to pay a $50 fee. Terminal operators also are required to pay a fee if the turn time exceeds a certain amount of time. Trucks serving the port are equipped with GPS and the clock commences as soon as the truck drives by a PMV GPS data point set at the gate queue. If a trucker does not exit the terminal within 90 minutes, the terminal operator will owe the trucker $50, and $25 per half-hour up to the 2½ hour point, and then $20 for each additional 30 minutes beyond that. Cancellations are allowed without penalty through noon for the next day or by 9 am for that night. Although the system reportedly keeps turn times manageable, motor carriers assert that terminals reduce the available appointments to ensure turn times stay under 90 minutes. As a result, truckers cite having to wait up to three days for an appointment. This scheme is linked to a related truck licensing system, which reduced the number of trucks serving the port complex from 2,000 to 1,450 that are operated by less than 70 licensed trucking companies under a comprehensive port drayage regulatory system.

- **Dynamic truck appointment systems using automatic "data handshakes" of container availability and truck dispatch information between motor carriers and marine terminals**. A demonstration project is currently underway in the Los Angeles/Gateway Cities region in Southern California, funded by the U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology, involving two private sector participants (a 50-truck harbor motor carrier and Yusen Terminals, Inc., a Port of Los Angeles marine terminal operator).[70] Called *Freight Advanced Traveler Information Systems* (FRATIS), through a bundle of software applications, the project aims to improve terminal visit pre-trip planning as well as routing around congestion so as to allow truckers to arrive at the terminal gates at less congested times. The potential benefits include less truck trips, reduced travel times, and improved terminal gate and container yard processing efficiency.

- **Use dedicated container stacks to expedite container flows out of the gates.** The suggestions discussed previously are concerned with more efficiently managing container volumes in container yards by moving away from random access to terminals. When access to terminals is random, the more crowded the terminal becomes, the more likely it is that work processes will breakdown. Even in normal conditions, random truck arrivals inevitably result in some sorting and shifting of boxes to access the container required for pick-up. As container stacks get larger, the amount of digging out increases. When container stacks can no longer accommodate any more containers, containers coming off the ship would have to be assembled in areas outside the stacks and re-positioned later into the stacks, creating additional work for the terminal labor force. The industry has developed certain processes to help decongest crowded terminals, such as "free-flow" and "peel-off" (also known as

[69] PONYNJ terminals also operate a scheme that compensates drivers for excessive wait times.
[70] Los Angeles-Gateway Freight Advanced Traveler Information Systems, Demonstration Plan, U.S. Department of Transportation, June 2013.

dray-off). These methods, outlined below, rely on identifying the containers of specific shippers or consignees as those containers are lifted off the ship.

- **Free-flow for large-volume shippers**. The basic idea of free-flow is to get containers out of the terminal as quickly as possible. Several large retail importers have been using free-flow operations at terminals for some time. When there are a sufficiently large number of containers for the same cargo owner arriving on the same ship, the terminal can arrange for longshore labor to stack them together and load them on to the retail drayman's trucks as they arrive. When a retailer's drayman arrives at the stack, the operator puts the first container off the top of the stack onto the truck which eliminates having to move other containers around to get to a specific container as occurs with random arrivals.

- **Free–flow for small-volume shippers**. Testing is currently underway at the West Basin Container Terminal (WBCT) in Los Angeles to make the "free flow" concept possible for smaller volume shippers using a new mobile phone application developed by *Cargomatic*, an information technology firm based in Southern California. Acting as the middle-man, *Cargomatic* bills the shipper for drayage services rendered and reimburses the trucker. *Cargomatic* customers are individual small-to-medium size shippers who may not have enough containers per vessel to support free flow operation. Shippers who sign up, notify *Cargomatic* when their containers are on a vessel that *Cargomatic* will be servicing, and *Cargomatic* relays this information WBCT. Upon the ship's arrival, these containers are stacked separately within the terminal. The stack is subdivided based on distance to the shipper's distribution center or warehouse – hauls under 25 miles from the terminal, hauls 25 to 50 miles from the terminal, and hauls 50 to 150 miles from the terminal. Truckers are alerted via the *Cargomatic* app to containers that are ready for pick-up. Truckers decide the distance range they are willing to haul and pull up to the appropriate subsection of the stack and the first available container is loaded. Containers must leave the terminal within 48 hours. Currently, the program is responsible for moving about 60 containers per week while servicing about three weekly vessel calls. This program hopes to move one thousand containers per week by year's end.

- **Container dray-offs to near-dock yards, sometimes referred to as "peel-off."** Partnerships are forming involving ports, terminal operators, cargo interests, harbor truckers, and railroads, to develop business processes that would transform marine terminals into (rapid) transit facilities for containers rather than storage sites. Under this concept, the goal would be to dray most containers out of terminals within 24 hours of being loaded off the ship and cleared by customs rather than have them linger in the terminal for three, four or five days. SSA Marine, which operates three container terminals in Long Beach, has been engaged in dray-offs for more than a decade. When container volumes in Southern California surged in the mid-2000s and began to strain the physical capacity of its terminals, SSA secured off-dock sites in the region. As containers are discharged and cleared, they are placed on chassis and trucked to off-dock yards. Importers pick up the container usually in less than 24 hours for shipment to their distribution facilities. Earlier this year, working with the West Basin Container Terminal and several other partners, Total Transportation Services, Inc.

(TTSI), a harbor trucking company, introduced a similar two-stage process to speed up the delivery of containers from ship to shipper. In the conventional drayage model, a truck would pick up a specific container from the port and drive it perhaps 60 or so miles across the Los Angeles basin directly to the shipper's or consignee's facility. According to TTSI, this method returns an average of about one turn a day due to inefficiencies in collecting containers at the port. In contrast, TTSI's dray-off model uses an intermediate drop yard about a mile from the WBCT terminal. Using this model, a TTSI truck picks up the first available container from a set-aside stack of containers and brings it to the drop yard where it is kept on the chassis. The TTSI truck returns to WBCT with an empty container. Another truck arranged by the shipper or consignee will pick up the specific container at the drop yard for delivery and typically bring with it an empty container for returning to the port.

- **TTSI reports that trucks moving between the terminal and the drop yard achieve 4-6 turns per day (and have a goal of 6-8 turns per day).** Trucks delivering between the drop yard and the shipper's facility reportedly achieve about three turns per day. This program allows the terminal to clear out 300 to 1000 containers at night, depending on what shifts are used. Truckers make more turns and shippers benefit from faster deliveries and/or more reliable delivery times with potentially little to no additional cost to them. Anecdotal reports suggest that free-flow and peel-off have cut average truck turn time by half.

- **Port authorities should consider increasing the scalability of dray-off programs by piecing together suitable parcels of land in their real estate portfolio.** The evidence to date suggests that the dray-off and free-flow concepts are practical and feasible, but they have not been widely used.

- **Automatic extension of free time when terminal congestion prevents timely removal or delivery of containe**rs. This step may not ameliorate congestion, but would go a long way to assuage the hard feelings felt by those shippers or motor carriers who incur additional congestion-related charges when the cause of that congestion lies outside their control. For instance, participants cited examples of terminals, refusing to accept empty equipment, restricting the time for storing export containers, or closing sections of their terminals to truck traffic, without prior notice, resulting in late charges for the return or pick-up of containers and chassis. In these situations, shippers and motor carriers see themselves as being penalized for the terminal's own lack of efficiency. Some suggest that terminals should extend free time for equipment in these circumstances, while others argue congestion would be made worse if the incentive to remove equipment from the terminals is eliminated. When congestion occurs, terminals and ocean carriers feel pressured to shorten free time to prevent further backups in the terminal. But, if the free time period is too short, it may exacerbate the congestion that it is designed to prevent by causing more dray trucks to descend on the terminal to remove the cargo in the shortened timeframe.

- **Standardize terminal operating hours within a port complex and provide longer advance notice of changes in hours or gate closures**. These measures allow motor carriers to dispatch drivers more efficiently, thereby making more drayage capacity available.

- **More capital investment and perhaps new financing mechanisms to help make those investments possible**. The innovative technologies, improved terminal operating procedures and more cargo handling equipment, embedded in the suggestions discussed above often require capital to implement them. Several participants noted, however, that investments have been slow to develop and are behind what is needed to support efficient U.S. supply chains. Some participants felt that more innovative pricing strategies could help terminals to better manage congestion and provide a funding source for projects that aim to speed cargo through the ports.

## Port Drayage & Truck Turn-Time

### Framing the issues

At each FMC port forum, the subject of port drayage received considerable attention, perhaps almost as much as that given to chassis-related issues. Central to these discussions were concerns about lengthy wait times, the lack of agreed upon metrics, and the absence of service standards at most U.S. marine terminals. Together with container stacks reaching skyward, long lines of idling trucks waiting to enter terminal complexes are the most visible manifestation of port congestion. Participants from all quarters of the international supply chain seemed to recognize the ill-effects congestion was having on the drayage motor carriers and appeared empathetic toward drayage drivers in particular. The plight of the drayage industry, especially around the nation's busiest ports complex in Southern California, has received a good deal of attention in recent years.[71] Much of this attention was prompted by concerns of how new regulatory demands placed upon the industry would affect the international supply chain. In the last 10 to 15 years, for example, the drayage industry has had to adapt to a series of challenging regulatory issues, including post 9/11 security issues (e.g. TWIC), operator and vehicle safety issues (e.g. FMCSA hours of service), and clean air initiatives (e.g. CARB regulations and clean truck programs at various ports). These new demands, placed on an already economically fragile drayage industry, have led most noticeably to less availability of trucking capacity and driver shortages.

As noted in the report produced by the Tioga Group, port authorities, marine terminals, and other supply chain participants often do not observe the full effects of the problems encountered by draymen because drayage operations, like trucking in general, are highly adaptable.[72] However, as port congestion frequently results in long lines of idling trucks waiting to enter terminals, its effects are plain for all to see. Although the underlying causes of this congestion usually have little or nothing to do with draymen, congestion costs are felt most immediately and acutely by them. This is because the predominant model for drayage trucking in the U.S. is the independent owner operator (IOO) who contracts his services to a licensed motor carrier (LMC) and gets paid by the trip. Port congestion severely impacts the number of trips per day the driver is able to achieve. Consequently, the most immediate cost of container terminal congestion is not borne by the terminal operators, longshore labor, steamship lines, shippers or the port authority, but by drayage drivers.

Most of the influences affecting truck drayage performance that emanate from sources of congestion external to trucking are discussed in other sections of this report, including the problems the industry is grappling with as a result of changes in chassis ownership and

[71] Several groups have produced recent data-driven analyses of the industry and its economic condition, including: The Tioga Group, et. al. (*Truck Drayage Practices*, National Cooperative Freight Research Program (NCFRP) Project No. 14, 2009 & *Truck Drayage Productivity Guide*, NCFRP Report 11, 2011); METRIS by Digital Geographical Research Corporation (*Turn-Time – Meltdown or Summer Heat Wave?* November 2013); and the Harbor Trucking Association (*Turn-Time Report*, April 2013).

[72] NCFRP Project No. 14, Task 3, Literature Review (2009), p. 30.

operations, as well as the effects of recent developments in vessel operations (e.g. larger container exchanges) and terminal practices (e.g. inconsistent gate hours). The principal effect of these external influences is a reduction in the effective capacity of the drayage fleet. The main thrust of the discussion that follows centers on what could or should be done to help make the drayage industry more resilient to further bouts of port congestion. One such approach focuses on improving the economic and general working conditions of drayage drivers, for example, by taking steps to ensure drivers' available hours are better utilized and that drayage truck productivity is raised. The measures required to bring about these changes could include, truck turn-time metrics, terminal service commitments or standards, dynamic appointment systems, more flexibility built into the hours of service rules to help deal with temporary disruptions caused by congestion, weather events, etc., and engaging more extensively with the wider port and supply chain community to ensure drayage interests are fully represented and taken into account. In short, a significant part of the U.S. supply chain is built around an independent driver model, but this model is economically fragile.

The drayage industry is economically fragile because of its basic economic structure. Yet, arguably, it incurs a disproportionate share of congestion costs. The port drayage market fits the perfect competition model.[73] Drayage services are homogeneous, licensed motor carriers are numerous and individually lack the power to raise prices, barriers to entry and exit are extremely low, customers readily switch to other trucking companies for small rate differences, and many customers (e.g., retailers, steamship lines and major exporters) are in very strong negotiating positions because of their size. As a result of this market structure, profit margins are persistently small for the thousands of IOO drivers and the hundreds of LMCs that serve our ports. At the South Atlantic port forum, a significant risk to U.S. supply chains was highlighted. According to one participant, the U.S. import supply chain is an estimated $7 trillion sector that depends heavily on the highly-fragmented and financially weak $10 billion intermodal drayage industry. In this situation, the smallest link in the supply chain – port drayage – can suddenly become the weakest if it is taken advantage of economically. This participant argued that the stronger segments of the supply chain should no longer allow the drayage community to carry a disproportionate economic burden by pushing the cost of congestion downstream onto those least able to bear it.

Through an extensive review of the literature, the Tioga Group outlined the chief characteristics of the U.S. drayage industry and the principal factors affecting efficient operations.[74] According to this review, draymen are typically 35 to 44 years old, mostly Latino immigrants, with six years or more experience in drayage.[75] Surveys of working conditions show that drivers most often work 10-hour days and 50 to 55 hours per week. Despite being in a physically demanding occupation (i.e. having to secure loads, frequent climbing in/out of the truck, etc.), one-third or less have no health insurance. Even though they are independent owner operators, drivers usually contract their services to a LMC rather than attempt to find their own hauls. The surveys

[73] One meeting participant reported 90,000 drivers work in port drayage for over 5,000 licensed motor carriers companies, with no one LMC having over $250 million in annual revenue.
[74] Op. cit., NCFRP Project 14.
[75] Motor carrier participants at the port forums reported their drivers typically had 10 to 12 years of experience.

by the Tioga literature review cited the typical truck as being 10 to 12 years old, with 600,000 to 750,000 miles on the clock.[76] The typical drayage truck was driven 60,000 miles annually, with the average trip length being about 60 miles. The average number of trips per day was reported as being 3.2, which generated an average annual income of $28,000 for IOO drivers and $35,000 for employee drivers, equivalent to hourly rates of between $10 and $12.[77, 78]

The Tioga report goes on to identify some of the factors that impair drayage operations, gate queuing being one. Queue time was reported as being a function of gate transaction time and the number of trucks at the gate. Once inside the terminal, according to this review, delays occur at the container stacks waiting for service from container handling equipment (e.g. top-loader, rubber tired gantry, etc.), but rather than being serviced on a first-in, first-out basis, whichever truck was closest to the handling equipment seemed to get serviced sooner. Higher stacking meant more re-handling of containers and longer waits. According to the report, the terminal operator's practice of trying to increase throughput by reducing container dwell time through shortening the amount of free-time and increasing demurrage fees, may negatively impact drayage operations. This is because a shorter window of time for cargo pickup often leaves the motor carrier with insufficient time to find a workable return load, which increases unproductive truck trips. Other sources of terminal-related delays were identified as being trouble tickets, chassis flips, equipment issues, and searching for roadable chassis.

According to the report, even in normal times many ports are space constrained and face the challenge of needing to increase throughput capability while not compromising truck turn times. At the time of the report, this challenge was being met in a variety of ways, including extended gate hours, appointment systems, automated gates, virtual container yards, and so on.[79, 80] Analysis of the reasons why certain transactions incur much longer wait times than others have led to operational improvements at terminals, such as staggered labor breaks and two-stage gates, that have reduced turn times. In some cases, according to the survey, 50 percent reductions in average turn time were achieved after focusing analysis on outlier

[76] Since the time of the survey, several ports have implemented clean truck programs which has probably resulted in younger, more modern dray fleets, in those locations.

[77] An asset-based trucking company serving the South Carolina Ports Authority (at Charleston) in one of the port forums reported that its trucks make about 500 drayage moves daily with 80 trucks (i.e. about 6 turns per day). This company's drivers have 18 years of drayage experience on average and are paid hourly using a productivity and safety-based matrix scale. This scale renders hourly rates ranging from $20 to $27 an hour, with the $7 per hour differential reflecting the driver's individual productivity and safety-based scores from the prior month.

[78] A motor carrier serving ports in Southern California reported that in normal circumstances independent drivers could usually get 2-3 loads per day, with each trip paying around $170 to $250 depending on distance from the port, but were now down to 1 or 2 loads per day (with the average being 1.65).

[79] One study of appointment systems that included the Port of Long Beach, Sydney, Vancouver, and Southampton found that they had no influence on turn times, even though this outcome is the one most needed to incentivize drivers to use appointment systems. (Davies, P. *Container Terminal Reservation Systems*. 3rd National Urban Freight Conference, Long Beach, CA. 2009)

[80] HTA data indicates that (Southern California) terminals with an appointment system produced reduced wait times outside the gates but longer wait times inside the terminal.

transactions (e.g. those exceeding, say, two hours).[81] Finally, the Tioga report suggests that most marine terminal operating practices are aimed at minimizing terminal operating cost, maximizing throughput, and/or turning vessels on schedule without much regard being paid to drayage operations and concludes that marine terminal initiatives that solely benefit drayage operations are unlikely to be implemented.

According to a report by METRIS, GPS studies show that truck visit times at the ports of Los Angeles and Long Beach average about an hour.[82] It also noted that many visits were short, the most frequent visit duration (i.e. the modal value) was 30 minutes, with the mean value being 55 minutes.[83] The METRIS report identifies turn-time as having at least five components: (1) transaction and wait time; (2) baseline delay due to port-wide policies such as the collection of fees, labor agreements, chassis policy, and port-wide conditions that are difficult for anyone to change, such as roadability inspections, security checks, etc.; (3) terminal-specific delay based on physical infrastructure capacity and management; (4) short-term problems (such as crane failures or construction work) that impacts the whole port or a specific terminal; and (5) transaction-specific delay, such as transposition of container numbers in commercial documents.

The report argues that the motor carrier community is keen to highlight differences among terminals but points out that changing a terminal's performance is costly.[84] The authors argue that motor carriers should shift their focus to the common factors among terminals, i.e. port-wide policies. In their view, this area is where the most significant improvements to turn time could be achieved at little or no cost. The report cited labor breaks as an example where improvements could be made. While acknowledging that some terminals admit and service certain trucks during some labor breaks, this practice, in general, continues to be a major productivity problem for truckers.

The report gives the PierPASS traffic mitigation fee (TMF) as a second example where turn-time reductions seem possible. It suggests that, although the TMF was designed to ease traffic on freeways, it unintentionally causes considerable congestion in the ports complex because trucks begin lining up as early as 3:30 pm to access the free night gates that open at 6 pm. The report claims this queuing constitutes a significant portion of the 25 percent of truck visits that take two hours or more, but it is not being addressed because the marine terminals that operate the PierPASS program do not consider the long lines outside the gates as their

[81] At the San Pedro Bay ports, in normal times, the Harbor Trucking Association reports that about 17 to 20 percent of visits exceed two hours. This figure peaked at almost 35 percent in November 2014. (Journal of Commerce, *Los Angeles, Long Beach truck turn times improving but still long*. March 31, 2015.)

[82] METRIS. *Turn-Time – Meltdown or Summer Heat Wave*. Since this report was issued, turn time averages in the port complex have gotten longer because of increased port congestion. In the second half of 2014, for example, average turn-time had reached about 90 minutes. (Op. cit. Journal of Commerce, March 31, 2015.)

[83] According to the *Truck Mobility Data Project* (2013) led by the Harbor Trucking Association, the mean gate queue time at SPB terminals was 12 minutes, and the mean in-terminal time was 32 minutes.

[84] At the Southern California port forum, one motor carrier with warehouses located seven to ten miles outside the SPB ports reported, for example, that his drivers averaged 1.4 to 2.8 containers per shift but his drivers pulled four to five containers at the most productive terminals.

problem. The METRIS report suggests that the TMF should be ramped down over a few hours prior to opening the off-peak gates at 6 pm rather than falling immediately from $133 per FEU to nothing. This action, coupled with staggered longshore labor breaks, could reduce turn-time at the SPB ports by "perhaps" 20 percent, according to the report.

In addition to turn-times, truck driver hours governed by FMCSA rules were much discussed at the port forums. Operational inefficiencies at the ports eat into drivers' limited available daily hours as well as their weekly work schedule which is constrained by the FMCSA 34-hour rule. These rules provide that drivers are allowed to drive 60 hours over seven days, or 70 hours over eight days if the company the driver works for operates seven days per week.[85] These schedules consist of a rolling window of hours; that's to say, as each new day comes along, the driving hours from seven (or eight) days ago drop from the count to be replaced by the driving hours accumulated in the current workday. From the time a driver comes on duty for the day, s/he has a 14-hour window to be on duty and to complete their travel.[86] Within those 14 hours, a driver can drive for 11 hours maximum, after which they must take a 10-hour break. Also, they are allowed to drive a maximum of eight hours consecutively, after which they must take a 30-minute break. The driver's 60 hours over seven days (or 70 hours over eight days) window can be restarted after taking a 34-hour break.

In 2013, the FMCSA updated the rules so that restarts could be used once a week (i.e. every 168 hours) and to ensure the restart period encompasses two periods from 1 am to 5 am. However, that change was suspended in December 2014, until September 2015, while the agency completes a study of these rules and their impact. There are, in the meantime, no time restrictions and no limit on the number of times truckers can use the restart.

**Cross-section of stakeholder viewpoints**

There were persistent calls among motor carrier participants for the development of agreed upon metrics for truck turn-time, to include the time trucks spend idling waiting to enter the terminal gates as well as calls to make this information public and transparent. The same group of participants suggested one hour as the standard metric for total turn-time and expressed a willingness to work collaboratively with other segments of the port community to achieve this goal. Extended gate hours and added flexibility to the hours-of-service (HOS) rule were seen as a necessary two-prong approach to dealing with congestion. Some questioned the effectiveness of the former proposed solution in the absence of the latter. Others wanted to see productivity in the container yards raised as an alternative to extended gates. Achieving this latter aim possibly would require marine terminals to deploy additional equipment and labor resources. Requiring terminals to set service commitments or service standards was seen by some as one way to incentivize terminal operators to expand the resources deployed to service trucks. The severe driver shortage was viewed as reflecting deteriorating operational conditions in the

[85] Hour of Service of Drivers: Final Rule. 76 FR 81133, Dec. 27, 2011.
[86] On duty can mean filling out paperwork, waiting at the loading dock, completing a pre-trip inspection, etc.

terminals but that solving these issues would make the driver shortage problem much less acute. A cross-section of participants' perspectives on the aforementioned issues follows.

The presiding officer at one of the port forums described a recent presentation made to him by port officials, part of which consisted of performance metrics, including truck turn-time. When he inquired, "What would this metric show if it was looked at over the last ten years?" The port official replied that truck turn-time had remained about the same. According to the presiding officer, it would be difficult to find an industry in the United States that had not improved an important performance metric in ten years. He questioned why such an important production metric had not improved in a decade. In a somewhat similar vein, a participant pointed out that drayage drivers are allowed to drive 11 hours and be on duty for 14 hours in any 24-hour period and added: "If that is not enough time to make a decent living, then the industry is doing something badly wrong!"

A motor carrier participant at the Southern California forum enumerated the following five key elements that were needed, in his view, to create stability and sustainability in port drayage: (1) extended gate hours to allow drivers to work at less congested times; (2) gray chassis pools to relieve the burden of repositioning chassis around the terminals;[87] (3) rate relief;[88] (4) equipment free time;[89] and (5) treating draymen more like customers. He claimed that the lack of respect given to drivers at terminals is a major source of driver turnover.

According to several participants, the basic problem with providing more gate hours was hours of service limitations. As a result, well-intended solutions like extended gate hours and providing Saturday gates may end up not being fully utilized if drivers have already run out of hours waiting to get in and out of the port. Instead of extended gate hours, one participant felt that the ports industry needs to make the hours that are available more efficient. He suggested that ports should set minimum standards for moving trucks in and out of the terminals. He pointed out that if terminal management and labor can turn ships around within forecasted timeframes, the same should be possible for truck turn-times. He claimed that terminals have not acted on this proposal because there is no financial incentive or penalty that motivates terminal operators to focus on truck visit times. He cited the Clean Truck Program in Southern California as a suitable approach to follow. According to this participant, the port authority should set a turn-time standard (e.g., no more than one hour for a standard transaction), declare that the standard must be met four or five years into the future, and then allow

[87] He emphasized that having chassis in separate operational silos creates tremendous complexity for drayage companies, especially when they work with large shipper accounts that use several different steamship lines.
[88] Here, he pointed out that not only trucking costs have gone up, but also customer service requirements.
[89] He argued that drayage companies and shippers should not be burdened with penalties if they are unable to get in and out of terminals smoothly, especially as more large ships come into port. He stressed it is virtually impossible to change the number of available drivers in any one day and that, as a finite number of drivers can only move so many loads, trucking companies need extended free time help.

industry participants to work towards meeting the standard through the normal interplay of open market forces.[90]

Several stakeholders warned of a tremendous shortage of drivers. It was reported at one of the forums, for example, that the American Trucking Associations (ATA) predicts a shortage of 239,000 drivers in trucking generally by 2022, and the need for an additional 100,000 drivers per year for the next ten years to make up for turnover and retirements. It was pointed out that before the events of 9/11, prospective drayage drivers could go into terminals with an experienced driver to learn the ropes. As this practice is no longer allowed, it means a person has to be fairly well educated to learn ahead of time how to navigate and conduct business effectively in marine terminals. Underlining the difficulty motor carriers have retaining drivers, a participant representing motor carriers in New Jersey reported that motor carriers serving the PONYNJ complex had lost 20 percent of their drivers in the last year. It was inappropriate to blame any part of port congestion on the lack of drivers, according to a major shipper, because driver shortages are an *effect* of port congestion, not its cause. In this participant's view, drivers are leaving the industry due to their inability to get in and out of terminals in a timely manner.[91] In order to retain drayage drivers, it was a widely expressed view that total turn time needed to be reduced to one hour or less, including gate queue time. An ocean carrier cited retirements among an aging driver workforce as an additional cause of the shrinking driver base. To help address the driver shortage issue, a participant at the New Orleans port forum offered a less obvious suggestion – identifying and eliminating all unnecessary barriers to qualified military personnel driving after discharge. He pointed out that while some military driving is recognized by the insurance industry, others are not.

**Stakeholder suggestions and proposed fixes**

The suggestions below were put forth by meeting participants. They are listed here without regard to their feasibility or practicality.

- **Establish an agreed upon metric for truck turn-time, to include also the time trucks spend idle waiting to enter the terminal gates and make this information public and transparent.** A one hour standard for total turn-time was suggested for terminals at

[90] In this type of program, terminal operators are penalized for failing to meet the standard by having to compensate drivers for excessive wait time. Such programs, however, are usually associated with appointment systems that allow the terminal operator to gauge day-to-day resource needs more accurately and fine truckers who miss appointments.

[91] Illustrating truckers' inability to get in and out of terminals in a reasonable amount of time, a motor carrier at the Baltimore port forum gave the following (edited) description of a driver's typical daily schedule: *Most of the local fleets start work at 4 am. Inspecting the truck will take 30 minutes and then drivers are on the road in order to get in line at the port by 5 am. Most likely, depending on where they live, there will be a vast amount of trucks ahead of them, usually about 100. The driver typically will make it into the loading zone in maybe two hours. He'll be in the zone over an hour and it'll take another 30 minutes to get out of the port. Already five hours into the workday, he has accomplished very little. It will take him another hour or an hour and a half to get to the customer. As most customers are drop and hook, the driver will be at the customer's facility less than an hour. If he gets back to the marine terminal during the lunch break, he'll have to wait to pick up the next container and may leave by 2:30 pm to 3 pm, to head into the evening rush hours.*

large port complexes, but the metric could vary from port to port depending on local conditions.

- **Compensate draymen for "excessive" wait times.** Terminals at some ports attempt to address the impact of excessive wait times through their schedules (tariffs) but most of these efforts are said to be ineffective. According to participants, this is because the provisions in the schedule/tariff do not start until the driver has reached the gate pedestal or "first point of processing." In today's port environment, drivers often enter long lines and have already incurred substantial wait time before they reach the gate. One solution would involve placing radio-frequency identification (RFID) readers at strategic locations outside the gates as this would allow more equitable compensation for all the wait time incurred. Data streams generated by RFID also could be made available to motor carriers in real time to help truckers avoid more congested terminals.[92]

- **Apply an automatic trigger mechanism that would extend free time when service or productivity levels fall below some percentage of a defined work standard**. Shippers, ocean transport intermediaries, and motor carriers believe this sort of mechanism in terminal schedules/tariffs would help ameliorate the consequences of poor container yard productivity.

- **Leverage current and emerging technologies to create real-time channels of communication**. According to this suggestion, greater integration of information technology could facilitate more efficient flows of containers moving in and out of terminals on trucks and trains, and eliminate some of the current bottlenecks being experienced. Examples of such initiatives already underway include FRATIS, *Cargomatic* (a kind of Uber scheme for trucking), and virtual container yards.

- **Expanded gate hours to help reduce the number of drivers leaving drayage**. At the port forum in New Orleans, for example, it was reported that the renaissance of the energy sector in the Gulf region has caused truckers to leave drayage to find jobs at the *Eagle Ford Shale* oil and gas development region where they can make more money. To combat this erosion of draymen, the Houston Port Authority recently agreed to expand operating hours to allow truckers to make more turns to boost their earnings.

- **Provide consistent and standard hours of terminal operation**. With consistency of operation, motor carriers have more ability to schedule drivers within the constraints of the HOS. Standardized hours also help with planning and scheduling deliveries and pickups. Motor carriers report that changing hours of operation on short notice results in a higher proportion of unproductive trips.

[92] Wait time frustration and dissatisfaction reportedly is exacerbated because drivers oftentimes are captive in long queues if they have few or no opportunities to pull out and abandon the line.

- **Build some flexibility into the HOS rules**. Following the closure of terminals at PONYNJ and the Port of Virginia as a result of severe winter weather, the ports added extra gate hours to help deal with the accumulated container backlog. However, reportedly, trucks did not show up in the numbers expected because drivers were out of legal hours and unable to adjust their HOS clock. One participant reported that ATA's Intermodal Carrier Conference (IMCC) is attempting to get the FMCSA to introduce some flexibility into the HOS provisions. Specifically, the IMCC is looking at filing waivers that would allow truckers in specific congested ports to get relief for perhaps 90-days to drive more hours and to adjust the 34-hour clock.

- **Port authorities should communicate and stay connected with local port service providers, including motor carriers**. Likewise, local motor carrier trade associations should constantly engage with all segments of the port community. The Maryland Port Authority, for example, chairs two different groups of stakeholder meetings specifically to discuss current port issues. One of these groups is the Maryland Motor Truck Intermodal Council, representing the interests of harbor truckers. This group focuses on terminal processes and examines what aspects are not working and need attention. Its principal focus is to shorten trucker transaction times with the goal of ensuring local draymen make five to six turns a day.[93] In pursuit of this goal, the group has successfully addressed terminal traffic flows, yard equipment allocations, flex hours, e-notifications for container availability, and chassis pool inventory adjustments.

[93] The Maryland Port Authority representative reported that the port's Seagirt container terminal operates at an average of 28 minutes for a single truck move or 55 minutes for a double move on a pedestal-to-pedestal basis.

## Extended Hours, PierPASS, and Congestion Pricing

### Framing the issues

Extending the hours that terminal gates are open to truck traffic is one method by which truckers could conceivably increase the number of turns they are able to make in a shift. However, except in unusual circumstances, there are few examples of permanently extended gate operations at terminals in U.S. ports.[94] Marine terminals do not typically accommodate cargo pick-up and delivery outside of daytime weekday hours primarily because of longshore labor costs. Longshore labor contracts provide for differential shift pay, overtime pay, minimum hour guarantees, and minimum size of labor work units. Terminal operators strive to keep cargo pick-up and delivery activities to a single day shift because to do otherwise would raise their operating costs significantly.

In most places outside of the SPB ports, evening and weekend operating hours are typically limited to special arrangements with an ocean carrier or preferred customers moving large numbers of containers. Another reason for the widespread absence of extended gates is said to be resistance from drayage drivers and some customers.[95] Off-peak work, for example, means an extended work day for the truck driver or a shift in the driver's schedule to a less family-friendly night shift. Warehouses, distribution centers, manufacturers, and steamship line help desks, also must be available to help process cargo during off-peak hours and, in some locations, zoning ordinances prohibit night or weekend deliveries.

The first large scale, permanent extended-hours program was implemented ten years ago at the ports of Los Angeles and Long Beach. However, several precursor schemes preceded the eventual launch of permanent extended gates at the SPB ports. Between 2000 and 2004, the two SPB ports experienced rapid growth with container volumes expanding by 32 percent. Numerous groups in the local community benefited by this surge in growth, but other groups were negatively affected. Motor carriers encountered longer queue times to pick up or drop off containers. Likewise, large retail importers incurred significant problems moving their import containers from the terminals to their warehouses and distribution centers. Furthermore, local residents complained of severe traffic congestion and poor air quality as local highways became congested with more and more drayage trucks. The idea of extending the ports' operating hours as a solution to these growing problems gained local impetus and influence.

Frustrated by the slow progress to extend terminal operating hours, the California Truckers' Association (CTA) lobbied state officials to legislate efficiencies at the SPB ports. Then State Senator Alan Lowenthal (now a member of the U.S. House of Representatives) drafted legislation (AB 2650) that passed by an overwhelming majority in the California Assembly and

[94] Transportation Research Board, National Cooperative Freight Research Program (NCFRP) Report 23. *Synthesis of Freight Research in Urban Transportation Planning*, p. 52. Washington, D.C. (2013).
[95] Ibid.

was signed into law in August 2002.[96] To encourage off-peak operations, this bill imposed a penalty of $250 on terminal operators for each truck that idled more than 30 minutes waiting to enter the gates at the SPB ports and the Port of Oakland. Exemptions were provided for those terminals that *either* operated gates for at least 70 hours per week *or* provided an appointment system.[97]

The legislation had limited impact according to a study by Giuliano and O'Brien which pointed out that no terminal at the SPB ports extended its hours of operation because of AB 2650.[98] At terminals that implemented appointment systems, the authors found no record of improved operating efficiency. Likely this was because such systems provide appointments only to enter the terminal gates, rather than appointments for the actual loading or unloading of the container. In other words, terminals did not use appointments to pre-stage containers in advance for the advantage of truckers. Instead, they were used for the advantage of the terminal to obtain an advance indication of workload. Moreover, the 30-minute limit on truck idling time outside the gate probably also produced the unintended effect of transferring congestion from outside the gate to inside the terminal, with terminals admitting trucks in order to avoid fines. However, once inside the terminals, drivers found themselves having to wait for containers to be removed from the stacks before loading onto chassis, and vice versa.

PierPASS, an extended hours of operation program, was implemented in July 2005. In close consultation with the Waterfront Coalition, this program was developed collectively by 13 container terminal operators at the SPB ports in response to proposed action by State Senator Lowenthal that would have *legislatively* mandated off-peak hours.[99] However, he agreed to withdraw his proposed legislation when the private sector terminals themselves developed an extended gate program to achieve the same goal of mitigating peak period road congestion and reducing air pollution caused by port drayage operations. The PierPASS off-peak program was developed and implemented under the authorities of the West Coast Marine Terminal Operators' Agreement (FMC Agreement No. 201143).

The West Coast Marine Terminal Operator Agreement's (WCMTOA) members decided to impose a traffic mitigation fee (TMF) for at least two reasons. First, terminals incur considerable costs when providing off-peak gates. Compared to labor rates for the regular daytime shifts, labor rates are one-third to one-half higher during the night and weekend shifts. Second, the terminals wanted to make sure the off-peak shifts were well used by encouraging a portion of the daytime traffic to move to the off-peak gates as a result of imposing a fee on daytime moves. Consequently, PierPASS charges a TMF on certain loaded containers that move in or out

[96] The historical and legislative events leading to implementation of a permanent extended hours program at the ports of Los Angeles and Long Beach (called PierPASS) were spelled out by (now) U.S. Congressman Lowenthal at the FMC port forum conducted at the Port of Los Angeles. A city council member at the time, U.S. Congresswoman Janice Hahn provided additional background at the forum on historical events leading to the creation of PierPASS.
[97] Op. cit., NCFRP Report 23, p. 51.
[98] Giuliano, G and O'Brien, T. *Evaluation of the Gate Appointment System at Los Angeles and Long Beach Ports*. METRANS Transportation Center, 2008.
[99] The Waterfront Coalition is a group of shippers, transportation providers, and other businesses in the international supply chain that is concerned with promoting efficient and technologically advanced ports.

of the SPB gates between 8 am and 5 pm. The fees collected on gate moves during the daytime help defray the cost of providing extended off-peak gate operations. Usually, each terminal provides four off-peak gates Monday through Friday between 6 pm and 3 am and a weekend gate, usually on Saturday, from 8 am to 5 pm. Use of the off-peak gates has far exceeded the program's initial expectations.

Under the program, terminals initially agreed to provide complete off-peak services; that is to say the aim was to duplicate the daytime truck handling capacity of the terminals at night and during the weekend off-peak shift. Anecdotal reports indicate this aim has not been achieved. For example, trouble tickets are more challenging to resolve at the off-peak gates because steamship line customer service centers are less available. Other services, such as container flips, are sometimes not available during off-peak hours. Additionally, the reduction in volumes following the Great Recession caused some terminal operators to reduce the number of off-peak gates provided, some of which have not been fully restored.

The PierPASS program has shifted about 50 percent of all truck traffic to nights and weekends. In this respect, it has been successful in reducing the number of truck trips made in the morning rush hours, and to a lesser extent in the evening, but has not reduced the aggregate number of trips. As a result, the program has not eliminated the environmental and social impacts associated with drayage truck trips. Nevertheless, in the last decade PierPASS has diverted more than 30 million containers from peak to off-peak gate shifts. Additionally, the PierPASS program has more or less doubled access to the gates. For example, the SPB ports handled almost 800,000 TEU in June 2004, just prior to PierPASS being implemented, compared to just over 900,000 TEU in June 2014. Without extended gate hours, congestion at SPB terminals would be worse than it is now.

Currently, the TMF is set at $66.50 per TEU (twenty-foot equivalent unit) or $133 per FEU (forty-foot equivalent unit). The fee is imposed on loaded container movements through the gates during peak hours from 8 am to 5 pm. Certain container transactions are exempt, including containers arriving or leaving the ports through the Alameda rail corridor, containers leaving for or arriving from the near-dock and downtown rail facilities, and trucks carrying empties, bobtailing or bringing in or taking out a bare chassis. As a result of the exemptions, less than 20 percent of all containers handled by the SPB terminals in 2012 incurred the TMF. Between 2005 and 2006 the TMF remained at $40 per TEU or $80 per FEU. It was then adjusted to $50 per TEU or $100 per FEU. Since 2011, subsequent increases have been linked to ILWU labor cost increases. A potentially unsustainable tension exists in the program between the level of fees and the proportion of non-exempt container movements that still use the peak hour gates. The more the fee increases, the more likely users will divert to using the off-peak gates. Any such shifts, however, mean that the cost of sustaining the off-peak gates will be borne by proportionally fewer non-exempt movements during peak hours and the terminals in the off-peak hours will become more congested, not less. Ostensibly, the fee is for the account of the beneficial cargo owner (BCO). However, some BCOs may negotiate different arrangements with their motor carrier or cargo intermediary.

**Cross-section of stakeholder viewpoints**

Comments on the operation of the PierPASS program and its initial and current contribution to congestion mitigation efforts in and around the SPB ports were provided by several participants at the port forum in Southern California. As stated earlier, PierPASS was created in 2005 as a response to Assembly Member Alan Lowenthal's traffic and congestion mitigation bill AB 2650 which aimed to expedite truck traffic throughput in the ports' complex. MTOs responded to the traffic mitigation challenge by opening up nighttime and some weekend operations at the ports that historically had operated during the daytime Monday through Friday. One participant at the Southern California forum suggested that previous attempts to open night gates had been unsuccessful due to poor and unreliable staffing of the gates and container yards. According to another participant, the original draft design of the program, developed with input provided by the Waterfront Coalition, called for sun-setting the fee after three years or when night gate moves had reached 30 to 35 percent of total gate moves. However, somewhere in the development process the sunset provision disappeared by the time the program was finally adopted by the WCMTOA. Although the traffic mitigation fee is charged to the BCO, the shipper may dictate to the trucker to only pull containers after 6 pm when the fee is not applicable.

One of the biggest problems with the night gates is that they reportedly are unpredictable and not uniform. For example, there are times at some terminals when off-peak gates may be unavailable for up to five consecutive days.[100] This interferes with a shipper's or motor carrier's ability to ship containers exclusively through the off-peak gates. Staffing hours are said to be somewhat irregular. Gates are supposed to operate from 6 pm to 3 am, but truckers report there are times when a terminal will cease operations at midnight or 1 am. Among a segment of the port community in Southern California, there is a belief that if PierPASS went away truckers would shift back to using only the day shifts. However, one participant argued that, in the current climate of congestion, as long as gates are open, accessible, and productive truckers will utilize them no matter the time of day.

A prominent, high-volume shipper of refrigerated protein products submitted a written statement that focused in part on the operational difficulties PierPASS has caused that company. While acknowledging that the program's initial goals had been accomplished, this shipper asserted BCOs had to pay extra fees to cross-dock operators to hire truckers willing to work nights (as much as $30 per load) and were dealt several other inequities, such as, night gates having been reduced. With respect to the Port of Oakland and the consolidation of terminals that had taken place at that port, according to this shipper, with carriers no longer providing chassis what was previously a one-stop move has grown to 2-3 stops within the same terminal or multiple terminals. These added steps, lengthen truck turn times. Special tri-axle chassis are often required for heavy reefer containers which require a "flip" in order to obtain an empty container for the return leg, yet in some cases the night or weekend shifts do not provide flip service which forces the company's motor carrier to work the high-volume day

[100] Each month a Thursday night shift is cancelled because of union meetings. If no weekend shift has been arranged at the terminal, then no access to off-peak gates is possible from Wednesday night through the following Monday night, despite the fact that ship arrivals at the SPB ports tend to bunch late in the week.

gates that are subject to the TMF. This shipper provided a set of specific PierPASS fixes, including:

- Moving the International Longshore and Warehouse Union's (ILWU) monthly Thursday "stop work" meeting to Wednesday to help manage weekend volumes or, instead, to always have a Saturday gate to recover off-peak capacity lost to the monthly Thursday stop work meeting.
- Saturday gates to provide full service
- Longer advance notice given to warehouse operators and draymen of any shift closings to allow them to re-work their schedules
- Establish designated lines for (high-value) reefer cargo deliveries that are often delayed behind less time sensitive, low-value, high-volume cargo, such as waste paper and scrap metal export containers
- Have reefer containers and "gensets" in the same area of a terminal to minimize unproductive truck trips

A senior PierPASS official pointed out that a less tangible contributor to congestion is the delivery container process – a process of complete and total random access to a specific container number at any time of the day or night that results in a predictably slow rate of eight to ten container mountings per transtainer per hour. He argued that if the industry wants to change the truck turn-time outcome, it needs to seriously consider changing this process: "Doing the same things incrementally faster will not solve the periodic periods of congestion."

Participants from different segments of the industry expressed a variety of viewpoints on 24/7 gate operations as a way to deal with congestion. According to an ocean carrier, there are too many terminals at which gate hours are not sufficient to cope with current container volumes and expected growth. This ocean carrier emphasized that ports and terminals need to look at extending gate hours whenever possible and examine what is needed to accomplish that. This sentiment was echoed by several motor carriers who said that terminals should at least be kept open longer if a second shift is not economically feasible. A West Coast terminal operator said it currently operates two shifts most days, but probably gets the equivalent of only 1¼ shifts worth of throughput. Recently, this terminal had begun offering more gates on Friday night and Sunday, as well as flex-gates, but reportedly they were not being used very heavily.

The representative of a large terminal operating company that manages seven terminals on the West Coast that account for 25 percent of all longshore man hours used along that coast said he was sympathetic about lengthy turn-times but was not sure about what could be done. He did not believe, for example, that 24/7 gate operations was the answer even at a complex as large and as busy as the SPB ports.[101] He stressed that gate shifts are expensive to provide –

[101] It was reported by a participant at the port forum in Southern California that 1,000 registered motor carriers and 11,000 registered drayage trucks use the San Pedro Bay ports complex and transact 35,000 gate moves per day.

around $100,000 to $130,000 per day in labor alone.[102] He acknowledged that truckers were not getting in and out of terminals in the time they need, but placed the blame foremost on chassis shortages. Much of the congestion problem would go away, in his view, if there were sufficient chassis. The second problem he described concerned the typical work pattern of many drayage drivers which splits the day across two shifts at the terminals, coming on duty in late morning and ending their duties well before midnight.[103] As a consequence, the terminals are comparatively empty early in the day (e.g. from 8am to 10 am) and after the night shift lunch break which ends at 11 pm. In the meantime, however, the terminals are paying for two full shifts. He wanted to see a more even flow of trucks coming in the gates across the two shifts.

In response to comments about the desirability of 24/7 operations, a PierPASS representative drew attention to the fact that the SPB terminals already provide 35 extra off-peak gate hours per week in addition to 40 hours of regular daytime access – more hours of gate access than any modern terminal complex in the U.S. or in most other countries. And, within these hours there are some hours that register little or no truck activity. He argued that extending hours to provide for 24/7 operations would not necessarily increase the number of containers processed (as available truck capacity is relatively fixed), but would significantly increase the cost of operating a marine terminal. According to the PierPASS official, the off-peak gates program costs $188 million annually and extending gate access to encompass 24/7 operations would add another $167 million and, without a commensurate increase in the number of containers processed, the added expense of providing 24/7 operations would inflate supply chain costs. Another participant cautioned that the demand for 24/7 gates is emanating from next-generation mega ships which cause terminal capacity issues and argued that it does not make sense to have vessels being worked around the clock while restricting container delivery and receiving operations to 8 hours on some days and 16 hours on other days.

There were several calls among participants for a "PierPASS Version 2.0" that they hoped would take the program to the next level to better address the SPB ports' current problems. In this context, U.S. Representative Lowenthal suggested, "It is time to raise the bar again" and wondered, "How do we move the ball forward?" One of the port directors believes information technology needs to be a substantial component of any PierPASS Version 2.0. In his view, integrating information flows into operations could go a long way toward facilitating the efficient flow of trucks, trains, and cargo movements in and around the ports. A Joint Powers Authority (JPA) similar to the governance structure for the Alameda Corridor was a topic of discussion. Under this proposed idea (presently dubbed GATES for Gate Appointment and Terminal Efficiency System) the JPA could also run an appointment system to enable marine terminals to more accurately predict yard labor demand and develop real-time intelligence software to better share information among port users. Opponents of 24/7 operations – primarily the terminal operators and steamship lines – point to the added cost of running

[102] This MTO representative indicated that a well-running terminal would hire 100 to 130 longshore personnel per shift each costing $900 to $1300 per shift, who may handle sometimes as many as 400-500 trucks an hour.
[103] Late starts in Southern California allow drayage drivers access to the free PierPASS off-peak night gates for some portion of their shift.

operations around the clock. Proponents, on the other hand, counter with the question: "What is the cost of doing nothing?"

**Stakeholder suggestions and proposed fixes**

WCMTOA which owns and operates the PierPASS program has made relatively few changes to the program since its inception ten years ago. Other members of the port community, on the other hand, including BCOs, truckers, and the Port Authorities, have not been reticent in pointing out areas of the program that need attention. The suggestions listed below were made at the FMC port forums or in other communications with the Commission:

- **Ongoing dialog is needed**. There seems to be increasing recognition that an ongoing dialogue among all port stakeholders is needed regarding how best to improve the number of turns per day truckers are able to make in the SPB complex. Queue and dwell times at the terminals have been increasing, making it more difficult for truckers to cover the cost of operating the more expensive clean trucks now required to enter the terminals. Such dialogues could take place through the recently amended Los Angeles and Long Beach Port Infrastructure and Environmental Programs Cooperative Working Agreement (FMC Agreement No. 201219).

- **Measures could be taken to ensure that the off-peak gate shifts provided by the 13 terminals occur on the same weeknights and weekend days**. Currently, most terminals offer four week-night shifts and one weekend shift, but the specific days offered by each MTO tends to vary. Additionally, off-peak shifts are sometimes cancelled or changed on short notice. These practices unduly disrupt a motor carrier's ability to dispatch trucks efficiently.

- **Off-peak gates should have all the same services made available during daytime shifts.** For example, a service that allows heavy reefer containers to be flipped from tri-axle chassis so as to allow the return of an empty reefer container reportedly is unavailable during off-peak shifts at some terminals. Similarly, the resolution of trouble tickets during off-peak shifts reportedly is difficult because steamship line customer service staff are less available at these times.[104]

- **WCMTOA could be more transparent about what it costs to operate the PierPASS program**. A segment of the port user community is unconvinced that the program is not covering its costs.

- **The costs of the program perhaps could be shared more equitably.** Almost everyone benefits from reduced congestion, yet only a small fraction of containers passing

[104] Trouble tickets are caused by the truck driver lacking information or having misinformation contained in documents. At the Southern California port forum, PierPASS reported that five to seven percent of all truck transactions experience trouble tickets which takes the driver out of the container delivery process until the issue is resolved.

through the ports are assessed the TMF to help defray the cost of providing the congestion-reducing off-peak shifts.

- **Consider 24/7 gate access**. With so much cargo being diverted to the off-peak shifts, PierPASS should consider cost effective ways to expand those shifts, perhaps ultimately leading to 24/7 gate access.

- **Share performance metrics**. As a result of the mechanism PierPASS has established to collect the TMF, the program possesses an extensive set of data. WCMTOA could share metrics about truck queue and dwell times to further encourage dialogue and explore ways to improve cargo flow through the terminals.

- **Find ways to deal with known congested periods**. Ways should be found to ease queue times during known periods of congestion. For example, individual terminals probably could provide more flex gates during lunch breaks and the periods between shift changeovers. Similarly, the TMF could be differentiated by time, for example, by having a lower fee in the run-up to the opening of the off-peak shifts at 6 pm in order to avoid the early formation of long lines waiting to gain access to the off-peak gates.

- **Find ways to incentivize terminals to provide optimum levels of service**. The current program returns TMF revenue to the terminals (after deduction of administrative expenses) based on each terminal's total container throughput regardless of the amount of service provided or volumes handled in the peak or off-peak hours. WCMTOA could explore ways to distribute the TMF revenue back to the terminals in ways that incentivize providing higher levels of service. For example, they could use the TMF revenue distribution process to reward terminals that have shorter truck queue and dwell times or return those revenues in proportion to the resources each terminal devotes to off-peak gates (i.e., in proportion to off-peak expenditures).

## Collaboration and Communication

### Framing the issues

The opening chapter of this report discussed the industry's capital investment needs based on expectations of continued future growth in container volumes and of ship size, and other expected pressure points on the national freight network. While timely infrastructure investment may help avoid future bouts of congestion, it will not solve the problems causing port congestion *today*. Immediate actions to improve port performance are needed to remedy some of these problems. There are multiple causes of congestion that seem to converge in the severest cases. For example, in the winter of 2012-13, PONYNJ faced record low temperatures and heavy snowfalls, and the resulting backlog of containers was compounded in early summer 2013 by labor shortages, too few chassis, and an operating system failure at the port's largest terminal. The confluence of all these events created the kind of congestion that was occurring a year later at most other ports. When dealing with their 2013 crisis, PONYNJ came to recognize that while there were several obvious contributors to their congestion problems, there were other deeper underlying systemic issues that had to be addressed in order to arrive at long-lasting solutions. In its role as a landlord port, PONYNJ quickly realized that no one entity at the port could fix the problems, rather the entire port community, including organized labor, had to come together in an atmosphere of trust to openly discuss and formulate a comprehensive set of solutions.

In late 2013, PONYNJ convened a port performance task force composed of executive level representatives of the port's main constituents. Each constituency had to learn and understand the underlying impacts that systemic changes would have on all other constituents. To achieve real progress, task force participants had to take concerns seriously and respond with constructive action rather than just more talk. The task force formed five separate working groups that produced 23 recommendations aimed at improving port efficiency, service reliability, and communication of data and other information in a timely, transparent manner.[105] Similar collaboration efforts with more or less the same goals subsequently got underway at other ports (described later), including the Port of Virginia and the SPB ports. Unique to the PONYNJ effort, a governance structure consisting of a Port Productivity Council has been created to monitor implementation of the task force recommendations and to assess the port's vital performance indicators in order to adjust to and mitigate future performance issues.

Local task forces and work groups at several ports have made encouraging progress in identifying port congestion challenges and in providing forums for members of their port community to be heard, discuss their common interests, and search for workable solutions. However, some current and longer-term issues affecting port congestion and supply chain efficiency need to be addressed at the national level, not locally, if they are to be fully effective. Although the challenges facing our ports and the international supply chain are not new or

[105] The Port of New York New Jersey Port Performance Task Force, *"A Collaborative Effort for a Collective Change."* June 2014.

necessarily limited to the U.S., there are no easy solutions to some of them. Divergent commercial interests, pressures and responsibilities in global supply chains could make some solutions difficult to achieve. Because supply chain effectiveness, reliability and resilience depends on continual adaptation to the dynamics of global trade, there was not much support for governmental prescriptions or requirements particularly as most participants saw government agencies as being organized in silos and generally regulate one mode of transportation or one set of stakeholders. However, participants at the forums did express support for a dedicated port and supply chain disruption group composed of high-level executives of international supply chain organizations to address efficiency challenges and threats on a sustained and continual basis. Several participants felt that potential threats to port and supply chain disruption deserve permanent, continual collaboration and consistent attention by all organizations interested in the success of intermodal transportation.

**Cross-section of stakeholder viewpoints**

During the course of the port forums, it was encouraging to learn of numerous local initiatives organized by both landlord and operating ports to combat rising port congestion. One of the first, most extensive and fast moving initiatives is the one undertaken by PONYNJ in early 2013 as a result of congestion initially caused by bad winter weather but subsequently exacerbated by a variety of other internal and external events. All the local initiatives described at the port forums included organized labor in their quest for solutions.

One of the most elaborate port-wide collaboration efforts currently underway was described by a PONYNJ official. The PONYNJ effort began with the creation of a Port Performance Task Force in December 2013. The task force, and five smaller working groups, provided a framework for port constituents to come together to discuss areas of common interest, identify challenges to port efficiency and service quality, and recommend potential solutions as well as key performance indicators. It was designed as a six-month effort. The theme of the task force and the title of its final report was: *Collaborative effort for collective change*. A set of 23 recommendations had been created by June 2014, and were organized into three tiers. Tier one recommendations are expected to have the biggest impact, the two most critical ones being a gray chassis pool and a truck management system (though not an appointment system). Another recommendation deals with aligning terminal gate hours and coordinating extended hours among the terminals to the fullest extent possible. The task force was not given the responsibility for implementing its recommendations. Instead, four implementation teams were formed from among those who own the processes involved that deal with equipment, rail, gate operations, and customer care.

The Council on Port Performance oversees the work of the implementation teams and the progress being made toward improving efficiency and reliability at PONYNJ. Several recommendations target promoting information sharing so people can manage their businesses better and to ensure that everybody is heading in the same direction on common issues. Some of the elements are quick and easy to implement, for example, producing a guidebook to the

terminals for truck drivers.[106] Others need additional research, such as chassis management. The terminals are working on IT systems to help process work more smoothly, but the port reported that implementing these systems is a long and difficult process. To avoid adding to disruption, the port stressed that implementation efforts must be done in a logical order. According to the port authority, the collaborative work accomplished in the last year has been unprecedented and the port community reportedly is eager to further the highly collaborative and inclusive process begun by the task force.

Similar collaborative efforts to deal with growing container volumes and congestion are underway at several other ports, including the Port of Virginia where a new course is being charted for continuous performance improvement.[107] In most of these efforts, task forces and working groups bring together senior-level supply chain stakeholders to evaluate the root causes of supply chain congestion and to establish forward-leaning approaches to correcting those problems. The Port of Virginia reported having started numerous actions last year as container volumes and congestion mounted, and most of these actions have carried forward into this year. For example, the port convened a motor carrier task force; enhanced its customer services group; engaged in more proactive communication with port partners; embarked on extensive technology and equipment procurements;[108] enhanced the maintenance schedules and delivery of straddle carriers; put in a new terminal operating system; re-opened the Portsmouth Marine Terminal; put in automated gates at the Norfolk International Terminal (NIT); began phasing in appointment systems; increased gate hours; and soon will start construction on a new 22-gate facility at the north end of NIT.[109] An unusual feature of the port's approach to providing transparency in communication with port partners is the weekly publication on its website of detailed up-to-date operational performance metrics by terminal, including number of gate transactions, turn-times, and dwell time for imports and exports and rail containers.[110]

As landlord ports, the ports of Los Angeles and Long Beach, like PONYNJ, are in a unique position to serve as facilitators for discussions among all of the ports' partners to help implement solutions to the issues facing the ocean transportation industry operating through the two ports. These ports announced that they are working individually and jointly on providing additional opportunities to speed cargo out of their terminals and have accorded these efforts high importance. Under an FMC discussion agreement, the ports have engaged with truck turn-time stakeholders since 2010 to address deteriorating terminal productivity.[111] More recently, they have held discussions at different times with several segments of the port

[106] The port also launched an integrated information portal (i.e. a Port Community System) designed to facilitate port-wide information sharing to help optimize the logistics planning required to expedite cargo through the port.
[107] Reinhart, John. *Charting a course for continuous improvement*. Port of Virginia, January 23, 2015.
[108] For example, 50 hustlers, hundreds of additional chassis, OCR cameras and position detection system, have been or are in the process of being procured.
[109] By the end of state fiscal year 2016, the Port of Virginia's total planned investment will be $85 million, $46 million of which will be for new cargo handling equipment. (Op. cit., Reinhart.)
[110] See http://www.portofvirginia.com/pdfs/Weekly%20Metrics.pdf (accessed April 3, 2015).
[111] Prior to this, the ports extensively engaged with the local community, stakeholders, and business partners to develop and implement the ports' Clean Air Action Plan.

community to study what steps are needed to improve chassis availability and usage. Since the port forums concluded, the ports have amended their discussion agreement to allow for a broader set of discussions with multiple stakeholders that will focus on projects and programs that improve cargo velocity and the operational efficiency of their ports complex. These efforts are being led by a Supply Chain Optimization Steering Committee and the first event in April 2015 consisted of a Supply Chain Optimization Stakeholder Forum.

A representative of the Maryland Port Authority (MPA) described what the port does to communicate effectively and stay connected to local port service providers. The MPA chairs two series of stakeholder meetings that are held specifically to discuss current port issues. The first group is called the Maryland Motor Truck Intermodal Council (IC) whose activities were discussed earlier. The second group is called the Quality Cargo Handling Action Team (QCHAT). This group was initially formed to address issues in the port's auto and ro-ro business but has been extended since to include the port's container business. The port reports that bimonthly meetings bring together a diverse group of port stakeholders, including ocean carriers, BCOs, equipment providers, terminal operators, the IC, and heads of the ILA locals. These meetings provide an opportunity to hear from all parties on performance updates that could affect productivity and impact congestion. Topics routinely addressed include pool chassis inventories, chassis operating models, facility construction progress, container availability, BCO forecasts, and variances to productivity at the terminals. According to the MPA official, dissemination of information in this manner clarifies each group's role in making the supply chain work more efficiently and provides added transparency that helps issues get addressed before they develop into bigger problems. Port of Baltimore staff and stakeholders also engage regularly with federal agencies to ensure awareness of new regulations, staffing issues, or policy changes that could affect cargo operations. The port's communication strategy also involves recognizing and promoting the value of the port's skilled and productive ILA workforce as an important aspect of managing terminal congestion and controlling costs.

Representatives of the International Longshoremen's Association (ILA) attending the Baltimore port forum averred that the ILA wants to be part of the solution to resolving congestion, not part of the problem. They recognized that the rest of ocean shipping community know that organized labor want to protect jobs, but candidly acknowledged that to protect longshore jobs their union has to protect the business of shipping. A Port of New York/New Jersey representative confessed that labor supply was not part of the port performance task force's deliberations because that was seen as the New York Shipping Association's responsibility. Nevertheless, he gave assurances that the port is working hard with the ILA to address labor shortage issues and reported that mutually agreed measures recently taken included limiting vacations in the busy summer period, delaying one hundred or more retirements, changes to the absentee policy, and changes in the way jobs are assigned (e.g., skilled workers are being discouraged from taking less skilled jobs if the jobs needing higher-order skills go unfilled). The Port of Virginia suggested that reducing congestion requires more labor, and praised their local ILA for helping bring in and train new members to the labor force. Citing a compounded annual growth in volume of 6.5 percent, this port official pointed out that the growth in labor hours was 11 percent over the same period, while expenditures on labor grew by 17.9 percent. He

suggested these figures evidence that labor resources are being expanded to help address congestion concerns at the port.

An ILA official at the South Atlantic port forum outlined the challenges of consistently trying to meet terminals' demands for labor. Explaining that the union is required to provide a well-trained workforce on a temporary basis, on short notice, during down times and peak times. This official went on to say that almost every single position covered by the union has mandatory certification and training requirements. For example, he said that in a typical 22-person container operation, there would be only three positions that do not require some form of training. He claimed these are significant challenges and recognized that addressing them adequately puts pressure not only on organized labor but also employers because training is expensive to provide, especially when trained employees subsequently are lost to other competing job markets. Most ports attempt to maintain a stable well-qualified workforce which is relatively easy to achieve if there is a consistent level of work but, if there are sudden surges in work volumes, as there are at most ports, labor shortages often result.[112] According to this participant, the post-9/11 environment resulted in expanded credentialing requirements, which has made it much more difficult to flex the workforce to meet the ups and downs in ocean cargo volumes.

**Stakeholder suggestions and proposed fixes**

At each port forum, consistent calls were made for the FMC to remain engaged with the serious issues impairing international supply chain efficiency. There was a general sense that local port performance task forces had made very good progress in only a short amount of time but it was also recognized that these efforts can go only so far. There was still a need for an extensive national level dialog, for example, about what ports and other parts of the supply chain need from a national freight strategy. Former FMC Chairman Helen Bentley went so far as to suggest that the FMC has a major responsibility now to determine what needs to get done to make progress toward resolving some of the more intractable causes of congestion. In the context of these themes, participants put forward the following suggestions.

- **Keep pursuing the local initiatives now underway.** A representative of major national retailers felt heartened about all the local initiatives because he believed they provide an opportunity to develop best practices with the potential to improve efficiency and reduce shipping cost. He also urged the FMC to encourage and, where appropriate, get involved in these collaborative efforts. These sentiments were echoed by a motor carrier who welcomed hearing the words "collaborative solutions" on several occasions throughout the port forum he attended. In his view, there needs to be consistent on-going collaboration to solve some of the problems.

[112] The substantial variability in container volume month-by-month at different ports around the nation are illustrated in Appendix B. If container volumes were examined week-by-week and day-to-day, the variability observed would be even greater.

- **The FMC should establish an industry-wide CEO-level task force encompassing all stakeholders to address the issues and work towards a common industry solution.** This suggestion was made by a major global ocean carrier. Most of the challenges are well known and most stakeholders have some power to influence the solution, according to this participant, but no one segment can solve it independent of the others. This viewpoint was repeated by another ocean carrier who acknowledged that the more he listens to the problems, the more he believes that an organized group of representative stakeholders across the supply chain is needed to discuss and pursue, in a dedicated way, solutions or accommodations on the major issues. Several shippers too saw an on-going role for the FMC to get all the parties together and facilitate discussion on a national basis.

## Other Issues

Several other important issues were discussed at the forums but less extensively than the topics reported on above, including free time, demurrage and detention; the Class I Railroads; the role of Federal partners in the international supply chain; and the cost of congestion. Although the first of these issues was not discussed at length, discontent with the situation by cargo interests and motor carriers was palpable and, because of the urgency of the problems they were experiencing with free time, demurrage and detention related to congestion issues, this matter was addressed separately in an earlier staff report.[113] Along with the other issues, a brief overview of the discussion of these topics at the FMC port forums is provided here.

### Demurrage & Detention

Demurrage is a charge assessed when a container sits in a terminal beyond a pre-determined time, usually four or five days, following discharge from a ship. This is a charge that, theoretically, is passed on to the shipper, but is often incurred by a trucker, and is collected by a marine terminal operator on behalf of an ocean carrier. If a container has accrued demurrage, it must be paid before exiting the terminal. Detention is charged when equipment is kept by a shipper beyond a pre-determined time before it is returned to the terminal, or to a location set by the carrier. The times for when neither charge is incurred is known as free time. However, shippers and truckers say that on occasions, they are unable to retrieve their containers before demurrage sets in because of inefficiency at the terminal.

According to a review of demurrage and detention charges by the FMC's Office of Consumer Affairs & Dispute Resolution Services (CADRS), it was determined that the Port of New York/New Jersey has the highest combined demurrage and detention rates. Due to weather and technical issues between 2012 and 2014, this port has had many complaints about the demurrage being charged. Rates at other major ports were similar to one another. Demurrage is charged more often when a port is experiencing congestion because free time typically is not extended, yet insufficient numbers of containers are moving through the terminal.

Demurrage has been a major issue at the Port of New York/New Jersey due to the harsh winter of 2013-14 and Hurricane Sandy in 2012. Technical and computer issues have also cropped up, lowering the port's productivity at times. One importer reported having paid a total of $3.5 million in demurrage arising from these events. Due to recent issues at the West Coast ports, congestion has picked up again at the Port of New York/New Jersey because of larger ships calling and increased operational complexity caused by the alliances, with hours-long turn times reportedly occurring on a daily basis.

Truckers had issues with the gates at the ports of Los Angeles and Long Beach, noting that their night openings are not uniform and that the gates will not stay open until the stated times, sometimes closing between midnight and 1:30 am instead of the posted 3 am closure. This has

[113] *Rules, Rates and Practices Relating to Detention, Demurrage, and Free Time for Containerized Imports and Exports Moving Through Selected United States Ports*. Federal Maritime Commission staff report, April 2015.

led to truckers waiting in line to pick up a container or having a container and waiting to exit the terminal being turned away unexpectedly due to early closure, perhaps incurring demurrage if it is at the end of free time. The truckers also noted that ocean carriers' (allegedly) granting 30 days of free time before detention is charged to big box retailers is contributing to the chassis issue the region is facing.

At the Baltimore port forum, there was a suggestion that the FMC could help industry develop a trigger mechanism on productivity that would extend free time for demurrage and detention when terminal productivity drops below a certain level. The CADRS report notes that ocean carriers have the ability to "stop the clock" and to waive, reduce, or compromise fees if their tariff or service contract allows, but their actions may be constrained by Shipping Act provisions if not.[114]

**Class I Railroads**

At the 2014 port forums, several ocean carriers were vocal in their frustrations with the railroads, as increased oil production has altered railroad service patterns in several ways. The surge in oil production has strained rail services, as the railroads prioritize that cargo over intermodal cargo. Most of the oil is shipped toward the Northeast, but nonetheless affects the entire system. A Port of Mobile representative expressed his worries about the ability of the Class I railroads to serve an intermodal container transfer facility the port is building, due to oil having priority on the system. The surge in oil has also led to a shortage of railcars, delaying cargo throughout the rail system. However, due to production of railcars that can transport oil, new box cars will not be added to the system until 2016 at the earliest.

The forum at the Port of Charleston featured a rail panel, who primarily discussed some recent trends in the business and projections. Representatives from Norfolk Southern and CSX insisted that congestion was not an issue in the Southeast, particularly when compared to the Northeast. Norfolk Southern stated their volume was up five percent year-over-year and year-to-date in 2014 and CSX mentioned a nine percent increase. According to CSX, the company usually plans for a 2.5 percent annual increase. Both railroads mentioned forthcoming deliveries of locomotives at the end of 2014 and the beginning of 2015 that they hoped would relieve some pressure on their systems. That panel also had a representative from Florida East Coast Railway, which connects Miami to the Class I railroads in Jacksonville. That company has been preparing for larger ships that may call in Miami with the Panama Canal expansion by purchasing more locomotives and expanding onto the Port of Miami with an on-dock rail spur. One trucker mentioned encountering delays at the rail ramp in Charleston, but CSX countered saying that volume increased from 65,000 to 100,000 containers in the course of a year and that they are increasing the number of lift machines at their facility there from three to five.

[114] Op. cit. FMC staff report, pp. 31-33.

**Federal Partners in U.S. International Supply Chains**

At various points throughout the 2014 port forums, the role of federal departments and agencies in U.S. international supply chains was touched upon. Industry stakeholders recognized and generally appreciated the roles that various federal government agencies play in strengthening and reinforcing U.S. supply chains to help protect the welfare and interests of the American people and enhance the nation's prosperity. Attendees also welcomed government agency efforts to streamline and harmonize government processes that facilitate trade and their efforts to engage with industry by increasing coordination and awareness of issues of mutual interest.

Although ports in the Gulf and South Atlantic have fared better with respect to most congestion issues compared to large port complexes in Southern California and the northeast, stakeholders in the former regions, more so than those in the latter regions, expressed worries that delays in the federal government actions will adversely affect them. In particular, there was some frustration with Customs and Border Protection (CBP) and the agency's hours of service at certain Gulf and South Atlantic ports. The Port of Houston, for example, noted that CBP is open from 7 am until 6 pm Monday through Friday, limiting the flow of cargo in and out of the port. Parties could pay to extend those hours but that can be prohibitively expensive. One participant also mentioned the agency's box scanning technology and how it has not improved since the agency took over those functions following 9/11. Furthermore, one participant at the Charleston forum mentioned that CBP over relies on hard copies for its documents and suggested that the agency move toward electronic documentation systems for processing cargo moving through the port.

The issue of chassis oversight was brought up at each forum. The Federal Motor Carrier and Safety Administration (FMCSA) set the rules regarding the roadability aspects of chassis; however, numerous participants bemoaned an apparent lack of enforcement from the agency when it comes to ensuring chassis are roadable before being exchanged with the motor carrier on port terminals. A participant at the West Coast forum mentioned that some of her imports have encountered delays of nine to ten days for containers to go through a CBP Vehicle and Cargo Inspection System (VACIS) exam, due to the lack of chassis.

There was also concern about infrastructure funding and the federal approval process, which some participants assert can result in long project delays. A representative of the Port of Houston noted that the port funded the deepening and widening of a federal ship channel (necessary due to the Panama Canal expansion and larger ships being brought into the trade) because relying on the federal government to provide the funds could have extended the project by ten to fifteen years. Port stakeholders mentioned that they really would like to see a continuation of grant programs from the federal government that would allow terminal operators to modernize terminals and equipment fleets, allowing them to better handle the forthcoming larger ships. A DOT official at the West Coast port forum noted that the TIGER program has distributed over $500 million to port facilities, but that overall, federal dollars likely will be scarcer in the future.

At several of the forums, attendees mentioned that the FMC could play a convening role, bringing together various stakeholders at the ports and marine terminals to help them look at their operations from a systems perspective. For instance, there is an initiative at the Port of Baltimore, the Federal Agency Quality Work Group, led by CBP, which brings together multiple federal agencies monthly to facilitate information sharing and empower agencies to coordinate operational responses as exigent issues arise. However, it was reported that these sorts of groups, that help coordinate the government's efforts on facilitating cargo efficiently, do not exist at other ports.

It was suggested the FMC could partner with other agencies such as CBP, Census, and FDA, to conduct preventative outreach and education to protect shippers and OTI's against problematic practices that might lead to otherwise avoidable inspections and related demurrage costs. For example, it was noted that the Trusted Trader Program, a pilot program of CBP, CPSC, and FDA which strengthens collaborations among those agencies to manage more efficiently the security of imports, could be advertised more to interested parties. Finally, a participant noted that Coast Guard has done relevant work in re-opening ports following disaster events and clearing up the congestion that results from those events. Following Hurricane Sandy, for example, the Coast Guard met with Port of New York/New Jersey officials on their reopening procedures and have been sharing this information with captains of ports across the country.

**Congestion Costs**

Increases in transportation costs caused by congestion hurts the U.S. economy and the nation's international competitiveness. Cargo and supply chain interests, particularly those that depend on just-in-time performance, are substantially affected by congestion. Trucking costs are particularly susceptible to the effects of delays brought about by congestion because those delays directly reduce driver and truck productivity.[115] Ocean carriers also suffer higher costs arising from delays and when those delays accumulate they may ultimately lead to ships and cargo being diverted to other competing ports, including foreign ones. Delays caused by congestion increase supply chain costs directly by causing inbound and outbound freight distribution costs to rise. These delays also indirectly increase supply chain costs by forcing importing and exporting companies to increase order fulfillment lead times and hold greater inventory levels. Such delays result in lost revenue due to slowed production, spoiled and unsaleable cargo, missed sale opportunities, increased stock-outs, and delayed introduction of new products. In addition, such delays may reduce U.S. international market share in various economic sectors and reduce U.S. GDP. Depending on the extent, duration, and nature of these delays, the national indirect cost impact of congestion is likely to surpass by a wide margin the direct impact of delays on freight distribution costs.

Surprisingly, at the forums there was little discussion of the cost of congestion either on the international supply chain as a whole or individual players within that system. The absence of

[115] Estimates by the Tioga Group indicate that drayage-related delays cost that industry $348 million annually. (D. Smith, *Managing Port Drayage*, Agricultural Transportation Coalition (AgTC) Conference, San Francisco, CA. June 2014.)

commentary on this specific issue is surprising in the sense that many isolated examples of how congestion affects individual companies are widely reported in the trade press and it is commonly supposed that congestion results in enormous costs to the economy and to individual shippers, ocean carriers, and others involved in U.S. ocean commerce. Yet, no one at the port forums engaged this topic in any substantive way. Given the dearth of information regarding congestion costs presented at the port forums, some examples taken from the literature and trade press are provided here simply to illustrate the potential variety and magnitude of congestion-related cost impacts.

A recent Drewry analysis suggested that delays in the time taken to turnaround ships at the SPB ports in the fourth quarter of 2014 cost the ocean carriers serving the ports $150 million, or $600 million on an annualized basis.[116] APL reported back in 2006 that a one day delay in its eastbound transpacific services would increase its use of containers and chassis by 1,300, which would add $4 million annually in costs from this one source.[117] Updated to reflect higher daily chassis and container rental cost (but only slightly higher TEU volumes) that figure today would be about $10 million annually. The sportswear company Nike reportedly spends $4 million per week (or more than $200 million annually) to carry an extra 7 to 14 days of inventory (2010 values).[118] Repeated across many national retailers and other importers, these extra carrying costs would amount to a very substantial sum. The carrying cost of pipeline inventory could increase nationally by $500 million annually if, for example, cargo took two days longer in transit on average because of congestion delays.[119] A Congressional Budget Office (CBO) report issued in 2006 on the economic costs of disruptions in container shipments estimated that a week-long disruption to container movements at the SPB ports would cost the U.S. economy between $65 and $150 million per day.[120] Updated to reflect the increased value of commodities moving through the ports, this range today would be between about $90 and $200 million per day.[121]

Shippers' willingness to pay to avoid delay was measured empirically by Hummels.[122] He estimated that each day saved in shipping is worth to an importer 0.8 percent of the value of the goods being shipped. As the average commodity value of a 40 ft. container imported into the U.S. in 2014 was $62,000, Hummels' estimate implies that shippers would be willing to pay just under $500 to avoid a one day delay in the shipment. Based on this research, the high value shippers accord to the avoidance of delays calls into question the need of MTOs and VOCCs to

[116] Container Insight Weekly, Drewry, March 15, 2015. The article noted that for the quarter in question average turnaround time was 5¼ days compared to 2½ days at Los Angeles in the prior quarter and 3 days at Long Beach.
[117] Bowe, J. *The High Cost of Congestion*. TRB Freight Roundtable, October 24, 2006
[118] Isbell, J. *Maritime and Infrastructure Impact on NIKE's Inbound Delivery Supply Chain*. TRB Freight Roundtable, October 24, 2006
[119] This estimate is based on an assumed figure of ten percent cost of capital.
[120] Congressional Budget Office, *The Economic Costs of Disruptions in Container Shipments*, March 2006.
[121] These estimates are based on loss of production (GDP) and are considerably lower than similar estimates from non-government sources because they assume the U.S. economy and trade flows would adjust to a port closure, whereas most other estimates are static in nature. A study sponsored by the National Retail Federation, for example, estimated that a 10-day shutdown of the SPB ports would cost the country $2.1 billion daily.
[122] Hummels, D. *Time as a Trade Barrier*. Purdue University, July 2001.

impose high demurrage to incentivize shippers to clear cargo off the docks. This empirical research demonstrates shippers already give cargo a high time value and, therefore, are intrinsically incentivized to get cargo off the docks quickly.

Given the recurring bouts of congestion U.S. ports have experienced over the last decade or two, and the likelihood of future occurrences should the status quo remain, it seems remiss that no systematic attempt has been made to quantify the impact of port congestion and congestion in other parts of the international supply chain on the economy overall and different participants in the intermodal system. When discussing a variety of potential causes of this congestion and suggested solutions, a common refrain heard throughout the public forums was: "What is the cost of doing nothing?" The harsh reality is that nobody really knows. There appear to be plenty of regional and national studies of the impact of *highway* congestion on domestic trucking as well as studies of the economic cost of *urban* congestion, but there appear to be no equivalent studies of the economic consequences of congestion within the nation's ports and intermodal system.[123] The findings of such a study could help decide what areas future discussions of port congestion should focus on and which of the potential available solutions to prioritize.

[123] Senator Deb Fischer, chairman of the Senate Subcommittee on Surface Transportation and Merchant Marine Infrastructure, Safety and Security, recently requested the Government Accountability Office (GAO) to examine the impact of service disruptions at West Coast ports on the U.S. intermodal transportation network and to submit a report by August 2016. (The Hill, *GOP Senator Wants Investigation of West Coast Ports Standoff*, April 15, 2015.)

**Port/Supply Chain Congestion Diagnostics as Identified by FMC Forum Participants**

| Causes | Consequences | Challenges & Solutions |
|---|---|---|
| Cargo growth | Continued growth in U.S. international trade seems to be outpacing investment in new capacity at terminals and "last mile" connectors to ports. | U.S. liner cargo could double in volume sometime between 2025 and 2029. U.S. involvement in global trade is increasing. Continued growth will further stress the operating limits at U.S. ports, terminals, connector roads, and other supply chain facilities. |
| Investment constraints | Public funding sources are constrained by fiscal considerations. Traditional investors in ports and terminals are relinquishing their assets to new types of investors who are looking for full commercial returns on these investments. | More investment is needed to meet expected future demand. Examine public-private partnerships as a possible partial solution to the shortage of public sector funding. Examine ways to better access the public funding that is available for infrastructure development. Consider collaborative ventures with neighboring ports to maximize the impact of available resources. |
| Larger ships | Usually, larger ships exchange a greater number of containers at each call. If more gantries are deployed to handle the bigger ships to minimize time spent in port, the volume of containers moving from ship to container yard will increase, and will need more of the terminal's equipment and labor resources. The remaining resources may be insufficient to clear out containers that accumulate in the yard within available free time. | Containership size will continue to grow. Usually, this means there will be more containers coming off and going onto the ship in any given period of time. Container yards need to be configured to accommodate the larger flow of containers exchanged and to adjust the resources required to handle this greater volume to ensure container are cleared out of the yard before it becomes congested. |
| Ocean carrier alliances | Formation of new alliances and larger alliances is increasing operational complexity within the terminals and is resulting in more movement of IPI containers among and between terminals within a port complex. | Greater coordination among the alliance members, including possible negotiation of joint terminal service agreements and re-examination of stowage and discharge procedures could improve matters. Better communication among alliance members and chassis providers to allow chassis needs to be identified well in advance of vessel arrival. |

| Causes | Consequences | Challenges & Solutions |
|---|---|---|
| Vessel bunching | Schedule reliability has deteriorated due to more congested conditions in terminals and ocean carriers' generally seem unwilling to speed up ships to get back on schedule while freight rates remain low. | Today's relatively low cost of fuel should give ocean carriers more latitude to speed up ships that fall behind schedule. Reconsider the effect on resources where vessel bunching is built into the vessel calls schedule at a terminal. |
| Chassis shortages, supply imbalances and dislocations, and interoperability issues | In addition to alliances resulting in more dispersed chassis operations, increased terminal congestion has led to longer street dwell times and some hoarding of chassis. In turn, chassis shortages lead to delays inside the terminal. This cycle has to be broken. The chassis business is still in flux which adds operational complexity. The number of marine chassis seems adequate, but there may be too many out of service chassis. | Interoperability can help solve the chassis shortage problem. More gray chassis pools are needed, and at port complexes where more than one pool operates they are coming together to form a "pool-of-pools" or "market pool" to provide greater interoperability. Chassis providers are becoming few in number, raising competition concerns. Several issues involving M&R, if addressed, could improve chassis availability. |
| Terminal performance | Random access to terminals by drayage drivers places more demand on resources compared to a more planned truck arrival system, such as an appointment system. As container yard congestion builds, more shuffling and sorting of boxes occurs in order to locate specific ones. This situation leads to delays for trucks (long turn times). Alliances may require a bigger surface footprint in the terminal as a result of needing more segregated stacks. In already congested terminals, this expanded footprint only would be achieved by increasing stack heights, which leads to more sorting. | Appointment systems are not popular among the motor carrier community. Appointment systems tied to terminal service commitments that compensate truckers when those commitments are not met may be more palatable. Dynamic appointment systems that allow seamless communication between the trucker's intentions and the marine terminal are worth exploring. Dedicated container stacks to facilitate "free-flow," "dray offs" and other such schemes could help de-clog congested terminals. |
| Gate operating hours | Generally, it is felt that gates are open an insufficient number of hours, which adds to congestion. Inconsistent hours across terminals and closure of gates on short notice reduces the effective size of the drayage fleet by increasing the proportion of unproductive trips. This too adds to congestion. | Terminals are adding "flex" gates which means gates open earlier than normal and are keeping them open during break times. Some terminals are adding extra hours to the gates or providing weekend gates to help ease congestion. Attempts could be made to standardize terminal operating hours within a port complex and provide longer advance notice of changes in hours or gate closures. |

| Causes | Consequences | Challenges & Solutions |
|---|---|---|
| Free time | Granting more free time would increase the effective supply of the drayage fleet because it would reduce unproductive trips. But longer in-terminal dwell times would add to terminal congestion. Some terminals, without prior notice, refuse to accept empties, restrict the time for storing export loads, and close off parts of the terminal to truck traffic which may result in late charges (demurrage and detention fees) which has become a sore point for shippers and motor carriers. | Apply an automatic trigger mechanism that would extend free time when service or productivity levels fall below some percentage of a defined standard for the terminal. Keep gates open for longer periods of time, up to and including 24/7 gate operations. |
| Drayage truck supply | Lengthy wait times, lack of metrics, and the absence of service standards at most terminals, are major concerns for motor carriers. Changes in chassis ownership and operation, the effects of recent developments in vessel operations, and certain terminal practices have exacerbated truck and driver shortages. | Establish an agreed upon metric for truck turn-time, to include the time trucks spend waiting to enter terminal gates. Make this information public. The metric could vary from port to port. Compensate truckers for excessive wait times. Expand gate hours. Provide consistent and standard hours of operation within a port complex. |
| Labor availability | Large variation in cargo volume between peaks and troughs challenges manpower availability. Most positions require training and certifications which may limit labor flexibility. Congested terminals result in more shifting and sorting of containers and increases the need for more labor. Working the gates through meal breaks or adding “flex” gates also increases the need for more labor. | Port authorities should work closely with maritime labor and employer associations to ensure a sufficiently skilled and productive workforce is available when needed. Labor should be invited to participate in local initiatives aimed at finding solutions to congestion problems. |
| Inadequate communication and lack of broad-based collaborations | Effective communication on a timely basis by, with, and between all participants in the port community has not occurred in most places. Port and supply chain effectiveness, reliability and resilience depends on continual adaptation to the changing dynamics of global supply chains, and this demands clear channels of communication. | Institute on-going dialog among all port stakeholders regarding how best to improve processes and operations. Keep pursuing all the local initiatives currently underway aimed at improving efficiency. Consider establishing an industry-wide CEO-level task force or advisory committee to work towards industrywide solutions at the national level. |