# Status of PDMT Panel Project on Short Sea Shipping

John Malone
Dr. Matthew P. Tedesco

PDMT Panel Meeting
Marinette, WI
June 5, 2007

# Background

- **Short Sea Shipping (S3): The initiative to reduce highway congestion through increased use of short-haul seaborne cargo shipping between U.S. ports.**
- **Marine Transportation System National Advisory Council (MTSNAC) recommendation: Establish a joint working group among interested parties (shipyards, ship owners, ship operators, shippers, etc.) to explore the possibility of sharing requirements for future marine transportation system capabilities and the development of generic ship designs that could meet such requirements.**

# Background

- **ECB Task Statement: Bring together experts in the requirements for the design, building and operation of Short Sea Shipping Vessels for the purpose of providing a listing of characteristics for several classes of ships that would fulfill the needs for Short Sea Shipping. Include representatives from prospective owners, operators, shipbuilders, naval architects, maritime labor, MTSNAC, and the US Navy to provide their insight into the requirements listing. Requirements shall include payload, speed, range (endurance), cargo handling/stowage configuration, port rotation for each case studied or identified, and some assessment of the business potential for each ship type (i.e., how many ships built over what time period for how many different owners).**

# PDMT Project: Shipbuilding Opportunities in Short Sea Shipping (S3)

**Goal:** Accelerate the shipbuilding opportunities associated with potential U.S.-based Short Sea Shipping (S3) operations.

**Objectives:**

1. Increase the engagement of U.S. shipbuilders in the broader industry dialogue pertaining to potential S3 operations in the U.S.

2. Develop a "roadmap" for the realization of shipbuilding contracts to support S3 operations in the U.S.

3. Stimulate partnerships between shippers (notably the trucking industry), ship owners/operators, U.S. shipbuilders, ship design agents, government interests and other key constituents that may result in cross-functional industry teams to address market-specific shipbuilding initiatives and/or internally or externally funded R&D projects to develop technologies that will accelerate the realization of U.S. S3 opportunities.

# PDMT Project: Shipbuilding Opportunities in Short Sea Shipping (S3)

**Tasks:**

1. **Select a core planning team (5 or 6 people) consisting of representatives from the principal S3 constituencies**
2. **Prepare a "current state" document summarizing the key aspects and issues of S3 including the viewpoints of each constituency. The core team will also identify invitees to an NSRP-sponsored workshop.**
3. **Plan and conduct a workshop that will bring together representatives of all constituencies that are key to a successful SSS implementation. Attendance at the workshop will be by invitation only, with a target of 20-35 participants.**
4. **Prepare draft report of findings (S3 "Roadmap")**
5. **Prepare final report incorporating comments by workshop attendees.**

# Progress To Date

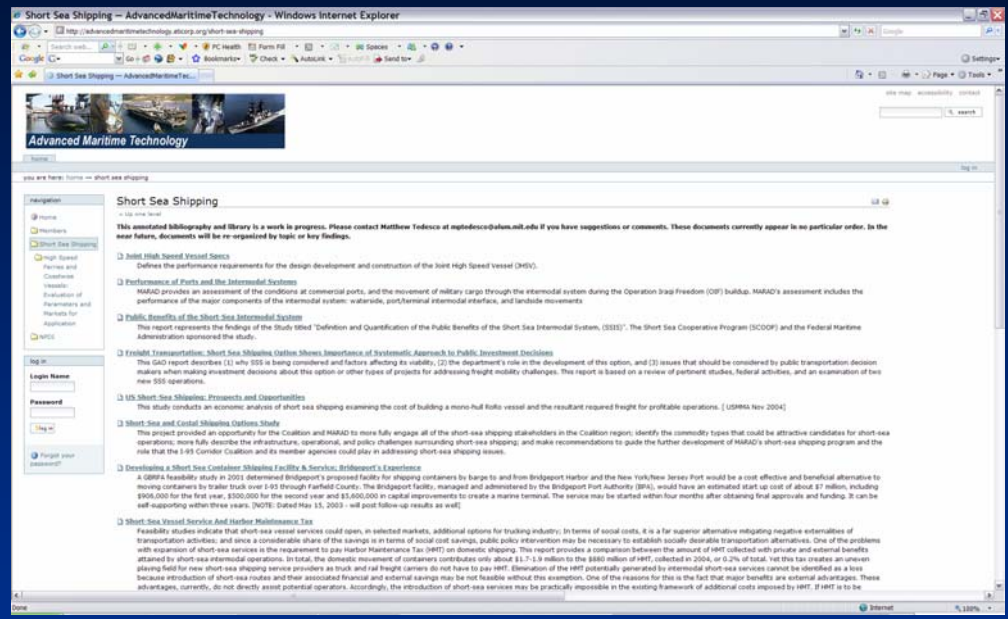
- Established core team
- Established S3 project website where project participants can post and download S3 documents
- Populated the S3 site with documents forming the basis of the “Current State” report; documents continue to be added to the site
- Prepared and published the Current State Document
- Planned and executed the NSRP S3 Workshop on April 19-20, 2007 in Orlando, FL (including the Workbook)
- Compiled and published results of the S3 survey that was completed by workshop attendees during and after the event
- Currently preparing a Workshop Summary Document
- Currently preparing S3 Roadmap

# Core Planning Team

- John Malone – Vice Chair, PDMT Panel
- Dr. Matthew Tedesco – Consultant
- Harvey Walpert – Bender Shipbuilding
- Brian Carter – NASSCO
- Ron Silva – Westar Transport
- Stephen Flott - SeaBridge
- Mark Yonge – Maritime Advisors/SCOOP

# S3 Document Database

- **Online Short Sea Shipping Library**
  - Central, annotated, library available to the NSRP community
  - References for the “Current State” document under development
  - Supports workshop planning
- **37 documents posted to date**
  - Topics include market analysis, ship types, and potential business models from 2000 to present
- **Summarized key findings in “Current State” document**




- Visit http://advancedmaritimetechnology.aticorp.org/short-sea-shipping
- Contact mptedesco@alum.mit.edu to recommend additions or to comment on documents

# Current State Document

**Addressed the following subjects:**

- **Markets for Short Sea Shipping**
- **Operator and Stakeholder Perspectives**
- **Lessons Learned Overseas**
- **Short Sea Shipping Vessels**
- **Military Considerations**
- **Regulatory and Legislative Considerations**
- **Labor Considerations**
- **Building Short Sea Shipping**
- **Port Infrastructure**
- **Public Benefits of Short Sea Shipping**
- **Economics of Short Sea Shipping**

# NSRP S3 Workshop

- **Objectives**
  - Review draft "Current State" document
  - Document stakeholder visions for Short Sea Shipping
  - Document roadblocks and gaps
  - Identify R&D priorities applicable to the NSRP
  - Develop draft roadmap for engaging shipbuilders in SSS market
- **Time & Place**
  - Immediately following the 4th Annual Journal of Commerce (JoC) Short Sea Shipping Conference
  - April 19 and 20
  - Caribe Royale Resort Hotel – Orlando, FL
- **Attendees (see next slides)**
- **Agenda (see next slides)**

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# NSRP S3 Workshop – Attendees

| First Name | Last Name | Title | Organization | Ship Owners / Operators | Trucking | Port Representatives & Terminal Operators | Statutory & Regulatory Experts | Waterfront Labor Issues | Maritime Economic & Cargo Market Analysis | Financial Community Representatives | Ship Design Agents / Naval Architects | Shipbuilders - Big 6 | Shipbuilders - 2nd Tier | Other Non-Government Organizations | MARAD & U.S. Navy & Other Govt Orgs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bilyana | Anderson | Deputy Program Manager | Naval Sea Systems Command, PMS-325B | | | | | | | | | | | | 1 |
| John | Avis | Director of Business Development, Strategic Programs | BMT Designers & Planners, Inc. | | | | | | | 1 | | | | | |
| Dan | Bagnell | Director of Naval Architecture | CDI Marine Systems Development Division | | | | | | | 1 | | | | | |
| Richard | Berkowitz | Director, Pacific Coast Operations | Transportation Institute | | | | 1 | | | | | | | | |
| Tim | Bresnahan | Vice President, Business Development & Finance | TECO Transport Corp. | 1 | | | | | | | | | | | |
| Patrick | Carlton | Director, Marine Highway and Passenger Services | MARAD Office of Intermodal and System Development | | | | | | | | | | | | 1 |
| Brian | Carter | Manager, Commercial Business Development | General Dynamics NASSCO | | | | | | | | 1 | | | | |
| H. Clayton | Cook | Counsel, Corporate Finance Group | Seward & Kissel LLP | | | | | | 1 | | | | | | |
| Cole | Cosgrove | General Manager, Ship Management | Crowley Liner Services, Inc. | 1 | | | | | | | | | | | |
| Carlos | del Real | Marketing Manager - Government Programs | Marinette Marine Corporation | | | | | | | | | 1 | | | |
| Maurizio | De Pellegrini | Chairman, Technical Dept., SCOOP | International Marketing & Business, Inc. | | | | | | | 1 | | | | | |
| Stephen | Flott | Chairman | SeaBridge, Inc. | 1 | | | | | | | | | | | |
| James | Fowler | NSRP Program Manager | Naval Sea Systems Command, 05DM | | | | | | | | | | | | 1 |
| Jim | House | Technical Director, NSRP | Advanced Technology Institute (ATI) | | | | | | | | | | 1 | | |
| William | Kruse | Consultant | TranSystems / Manalytics International | | | | | 1 | | | | | | | |
| Robert | Latorre | Professor, Naval Architecture and Marine Engineering | University of New Orleans | | | | | | | | | | 1 | | |
| John | Malone | Principal Consultant | Malone Consulting Services | | | | | | | 1 | | | | | |
| Dan | McGreer | Manager, Advanced Analysis | AkerYards Marine, Inc. | | | | | | | 1 | | | | | |
| Darshan | Murphy | Doctoral Candidate | University of Central Florida | | | | | 1 | | | | | | | |
| Chuck | Nugent | Vice President of Marine Fabrication | Atlantic Marine Florida LLC | | | | | | | | | 1 | | | |
| Torey | Presti | President | National Shipping of America, Inc. | 1 | | | | | | | | | | | |
| John | Reeve | President | Reeve & Associates | | | | | 1 | | | | | | | |
| Jay | Reichgott | Chief, Marine Division | McLaren Engineering Group | | | 1 | | | | | | | | | |
| Dave | Sanford | Director of Navigation Policy and Legislation | American Association of Port Authorities | | | 1 | | | | | | | | | |
| Ron | Silva | Chief Executive Officer | Westar Transport | | 1 | | | | | | | | | | |
| Matthew | Tedesco | Consultant | Matthew P. Tedesco | | | | | 1 | | | | | | | |
| Rick | Thorpe | Senior Principal | Herbert Engineering Corp. | | | | | | | 1 | | | | | |
| Harvey | Walpert | Senior Advisor, Military Affairs | Bender Shipbuilding & Repair Co., Inc. | | | | | | | | | 1 | | | |
| Dave | Wood | Engineering Project Manager | Northrop Grumman Ship Systems | | | | | | | | 1 | | | | |
| Steven | Wynn | Ship Design Manager, Joint High Speed Ship (JHSS) | Naval Sea Systems Command, 05D1 | | | | | | | | | | | | 1 |
| Mark | Yonge | Managing Member | Maritime Transport & Logistics Advisors, LLC | | | | | 1 | | | | | | | |
| | | | | 4 | 1 | 2 | 0 | 1 | 5 | 1 | 6 | 2 | 3 | 2 | 4 | 31 |

= Primary constituency

= Secondary constituency

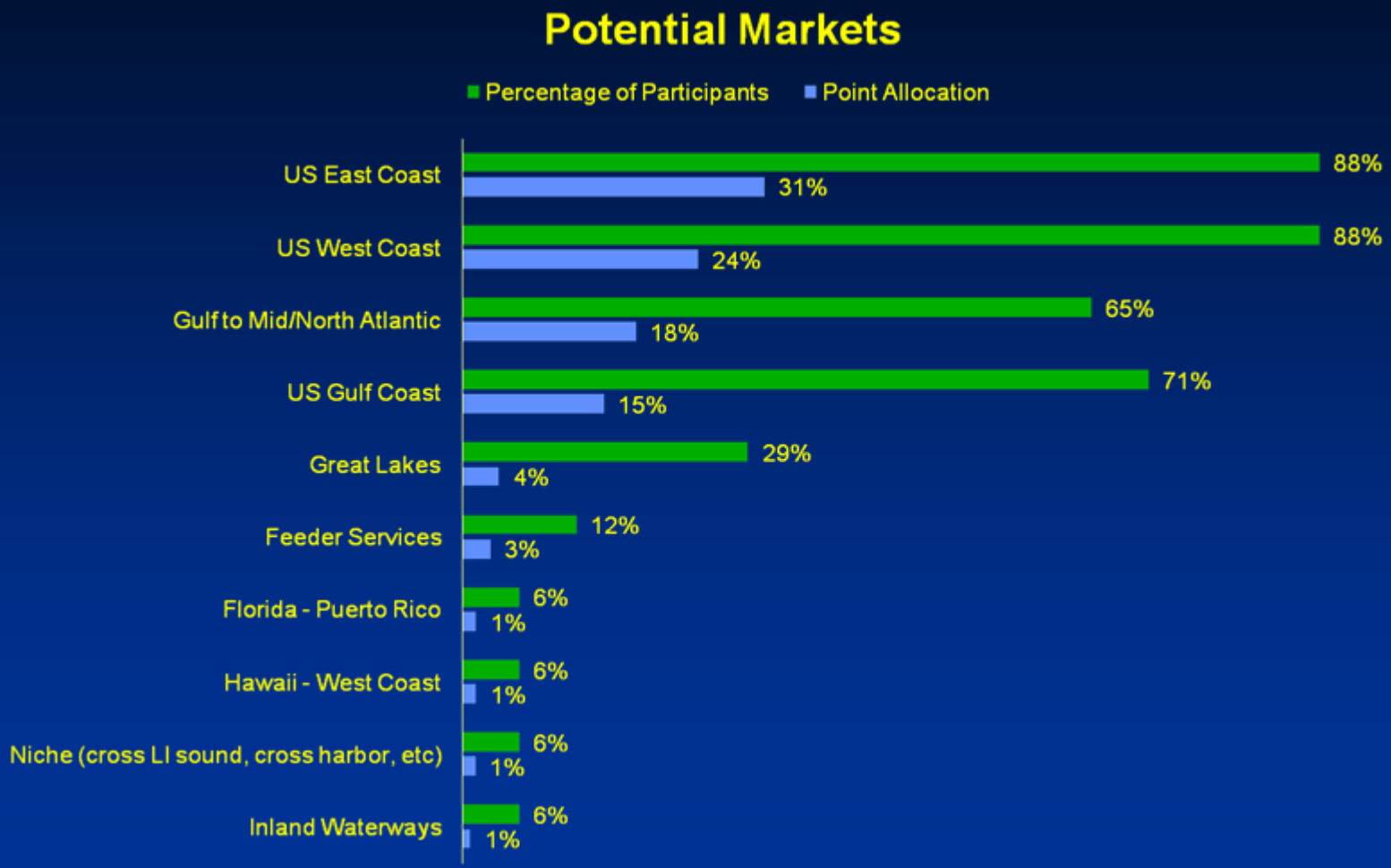
# NSRP S3 Workshop – Agenda, April 19

| | | |
|---|---|---|
| 7:00 – 7:30 | Check-in & Continental Breakfast | |
| 7:30 – 8:00 | Welcome & Workshop Overview | John Malone – Vice Chair, PDMT Panel<br>Harvey Walpert – NSRP Executive Control Board<br>Dr. Matthew Tedesco – Consultant |
| 8:00 – 10:00 | Markets for Short Sea Shipping in the U.S. (Breakouts) | John Reeve – Reeve & Associates<br>Bill Kruse – TranSystems / Manalytics |
| 10:00 – 10:15 | Break | |
| 10:15 – 11:30 | Operator's Perspectives | Cole Cosgrove – Crowley Liner Services<br>Torey Presti – National Shipping of America<br>Ron Silva – Westar Transport |
| 11:30 – 12:30 | Lunch<br>Lessons Learned Overseas | <br>Mark Yonge – Maritime Advisors |
| 12:30 – 2:45 | Short Sea Shipping Vessels | Dr. Matthew Tedesco – Consultant<br>Dan Bagnell – CDI Marine Systems Development<br>Rick Thorpe – Herbert Engineering Corporation<br>John Avis – BMT Designers & Planners<br>Marty Toyen – Seaworthy Systems |
| 2:45 – 3:00 | Break | |
| 3:00 – 4:30 | Military Considerations | Bilyana Anderson – NAVSEA PMS 325B<br>Steven Wynn – NAVSEA 05D1 |
| 4:30 – 5:00 | Day 1 Synopsis & Plan for Day 2 | John Malone – Vice Chair, PDMT Panel |
| 5:45 – 6:45 | Reception | |
| 6:45 – 8:30 | Dinner | |

# NSRP S3 Workshop – Agenda, April 20

| | | |
|---|---|---|
| 7:00 – 7:30 | Continental Breakfast | |
| 7:30 – 7:45 | Overview of Day 2 Agenda | John Malone – Vice Chair, PDMT Panel |
| 7:45 – 8:30 | Regulatory and Legislative Considerations | Stephen Flott – SeaBridge, Inc.<br>David Sanford – American Assn of Port Authorities |
| 8:30 – 9:15 | Labor Considerations | Richard Berkowitz – Transportation Institute |
| 9:15 – 9:30 | Break | |
| 9:30 – 11:30 | Building Short Sea Shipping | Harvey Walpert – Bender Shipbuilding<br>Brian Carter – General Dynamics NASSCO<br>H. Clayton Cook – Seward & Kissel LLP |
| 11:30 – 12:15 | Port Infrastructure | Jay Reichgott, McLaren Engineering Group |
| 12:15 – 1:15 | Lunch<br>Public Benefits of Short Sea Shipping | <br>Dr. Robert Latorre, University of New Orleans |
| 1:15 – 3:15 | Economics of Short Sea Shipping | Mark Yonge – Maritime Advisors<br>Dr. Matthew Tedesco – Consultant |
| 3:15 – 3:30 | Break | John Malone – Vice Chair, PDMT Panel |
| 3:30 – 5:00 | Conclusions and Roadmap | Dr. Matthew Tedesco – Consultant<br>John Malone – Vice Chair, PDMT Panel |

# Markets for Short Sea Shipping

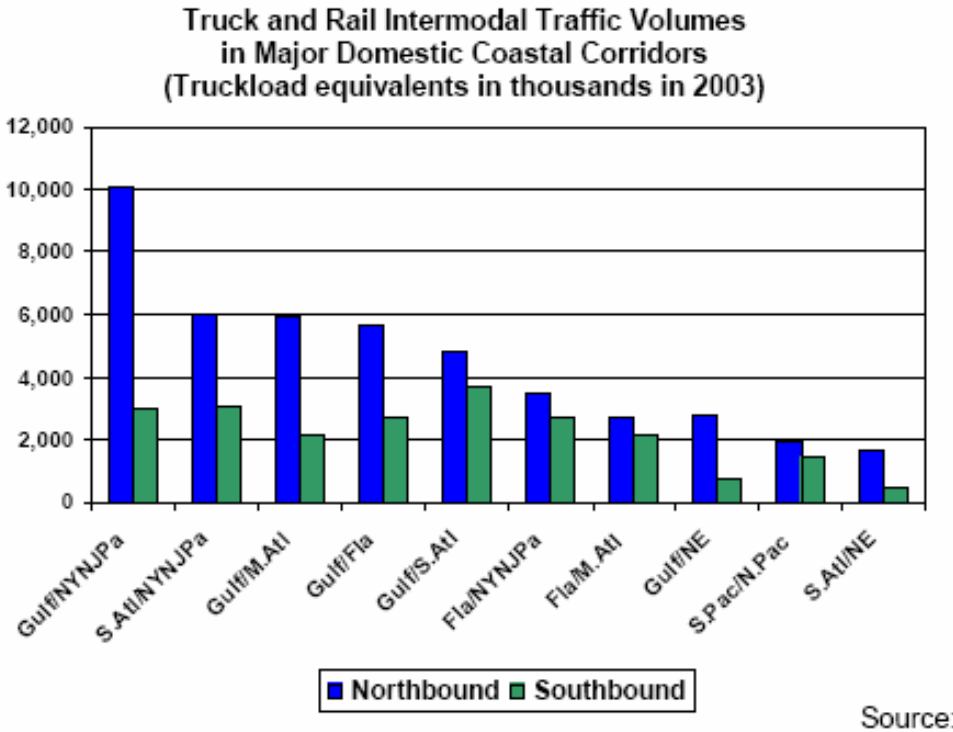


# Markets for Short Sea Shipping, Cont.

## Almost 80 million trailer loads of road freight move along U.S. coasts

- 78.2 million trailer loads of ground freight moved between coastal origins and destinations over 500 miles apart along the U.S. contiguous coasts in 2003 (15% of total US intercity market)

- Flows are significantly imbalanced – northbound flows of 51.8 million trailer-loads versus 26.4 million trailer-loads southbound




Source: Global Insight

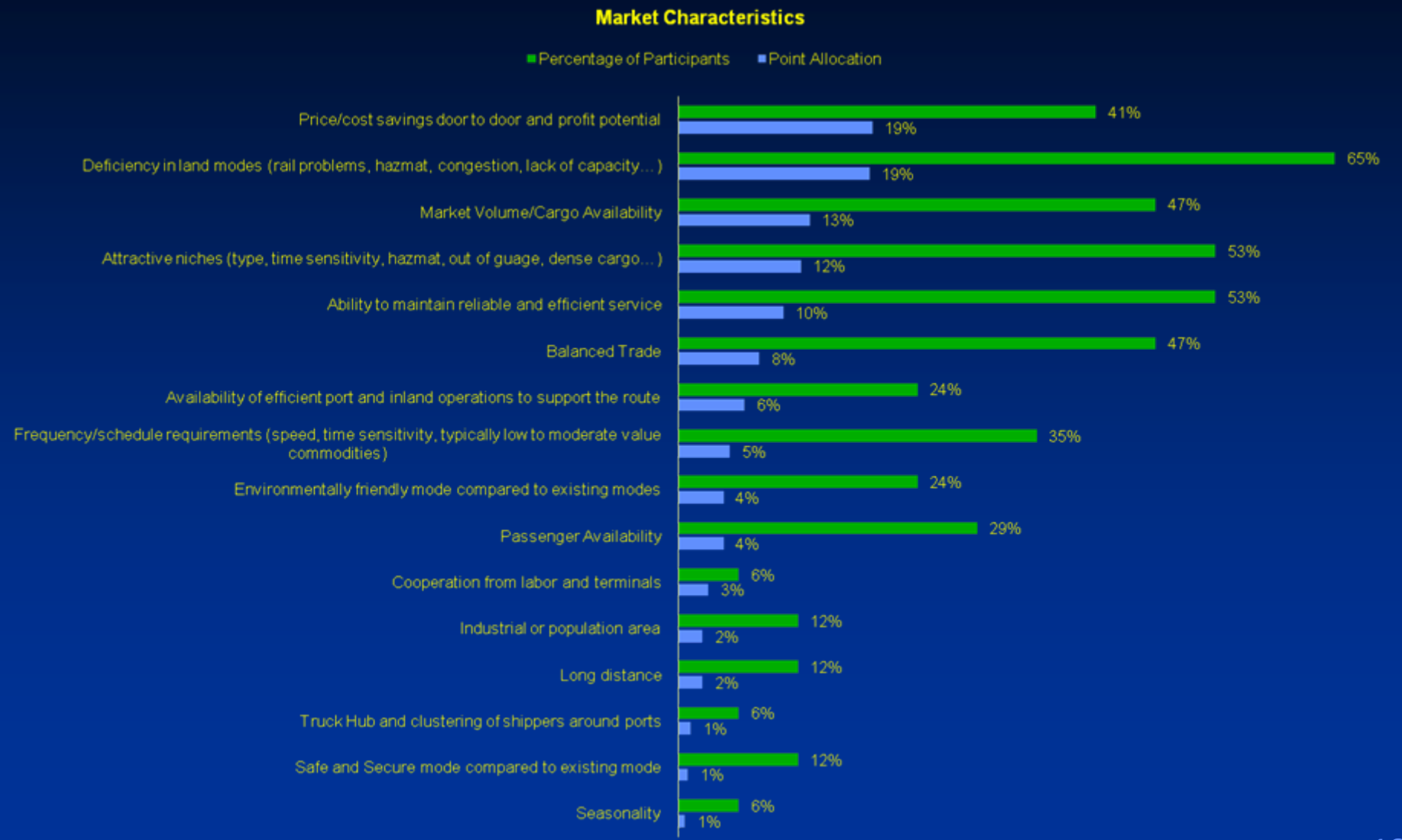
# Markets for Short Sea Shipping, Cont.

| 2004 Estimated "Filtered" Truckload (000's) Flows by Origin / Destination | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Origin BEA | | | | | | | | |
| Destination BEA | Los Angeles, CA | San Francisco, CA | San Diego, CA | Seattle, WA | Sacramento, CA | Portland, OR | Richland, WA | Other | Total |
| Boise, City, ID | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 |
| Eugene, OR | 35.5 | 9.1 | 2.0 | 203.5 | 4.3 | 61.5 | 1.5 | 1.1 | 318.5 |
| Fresno, CA | 0.0 | 0.0 | 12.6 | 25.2 | 0.0 | 19.4 | 93.9 | 18.4 | 169.6 |
| Los Angeles, CA | 146.5 | 7,160.0 | 1,382.9 | 444.6 | 1,355.8 | 416.6 | 110.8 | 439.5 | 11,456.7 |
| Pendleton, OR | 89.5 | 1.8 | 0.2 | 0.0 | 0.5 | 0.0 | 0.0 | 0.5 | 92.4 |
| Portland, OR | 102.4 | 143.3 | 8.3 | 396.8 | 23.2 | 0.0 | 0.0 | 136.7 | 810.7 |
| Redding, CA | 218.2 | 0.0 | 21.7 | 40.1 | 0.0 | 3.6 | 0.0 | 0.0 | 283.6 |
| Reno, NV | 17.5 | 0.0 | 6.9 | 0.4 | 0.0 | 0.6 | 0.0 | 0.0 | 25.5 |
| Richland, WA | 17.6 | 17.7 | 0.6 | 0.0 | 2.6 | 0.0 | 0.0 | 6.8 | 45.3 |
| Sacramento, CA | 1,327.9 | 0.0 | 142.7 | 29.6 | 0.0 | 25.4 | 17.8 | 17.5 | 1,560.8 |
| San Diego, CA | 1,020.8 | 734.6 | 0.0 | 29.6 | 126.2 | 26.4 | 4.5 | 46.4 | 1,988.6 |
| San Francisco, CA | 7,218.4 | 0.0 | 799.1 | 240.3 | 0.0 | 132.2 | 266.1 | 109.9 | 8,765.9 |
| Seattle, WA | 238.8 | 97.9 | 10.3 | 252.0 | 27.7 | 233.0 | 0.0 | 96.1 | 955.7 |
| Spokane, WA | 33.5 | 9.8 | 0.7 | 0.0 | 2.7 | 0.0 | 0.0 | 2.5 | 49.2 |
| Grand Total | 10,467.5 | 8,174.3 | 2,388.1 | 1,662.3 | 1,542.8 | 918.7 | 494.5 | 875.3 | 26,523.5 |

*Source: Global Insight, Reebie Transearch Database, 2004, Manalytics International*

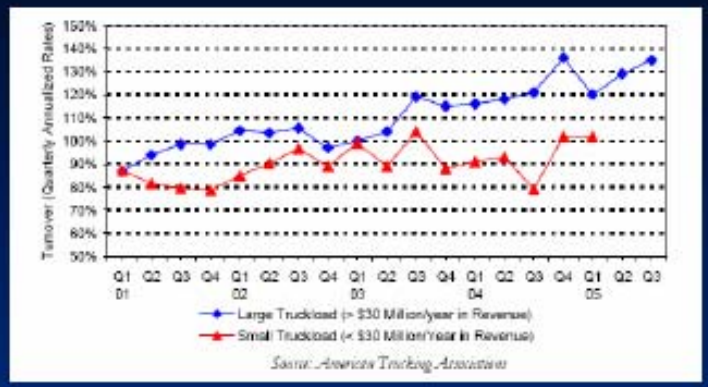
- **Promising West Coast volumes**
- **Diversion may be impacted by shipper receptivity**
  - Only 43% of respondents in recent CCDOTT study were receptive

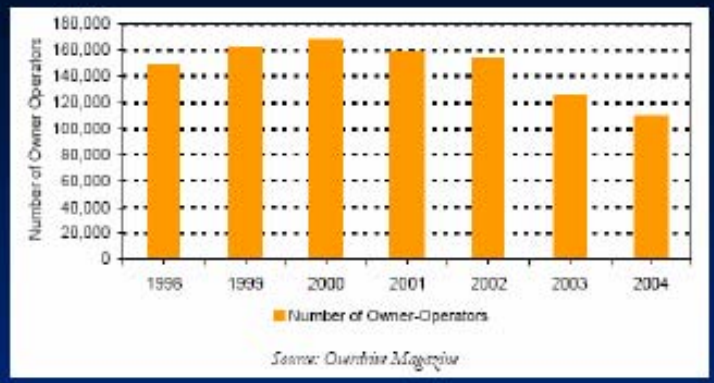
# Markets for Short Sea Shipping



# Operator and Stakeholder Perspectives

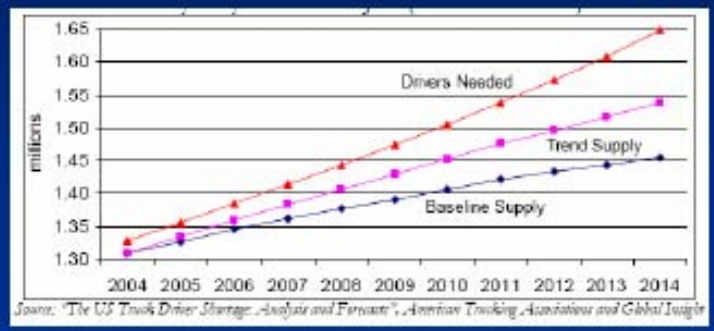
## Trucking Interest in SSS




| Component | Pre-2004 Rules | 2004 Rules |
|---|---|---|
| Total On-Duty Hours | 15 non-consecutive hours | 14 consecutive hours |
| Driving Hours | 10 | 11 |
| Consecutive Hours Off-Duty | 8 | 10 |
| Activity Counted as On-Duty Time | Driving time and planning time | All time except sleeper berth |
| Weekly Hours | 60/70 hours on-duty in 7/8 days; no restart provision | 60/70 hours on-duty in 7/8 days; restart after 34 hours |

Source: Federal Motor Carrier Safety Administration




- **Driver turn-over and shortages**
- **Congestion**
- **Hours of service**

# Operator and Stakeholder Perspectives, Cont.

## Technical, Legal and Economic Barriers


CROWLEY
People Who Know

# Operator and Stakeholder Perspectives, Cont.

## Short Sea Opportunities

- Hazardous Materials
- Enhanced Cargo Security
- Highway Sustainability
- Intermodal standardization
- OG / large volume - low value cargo
- Minimize environmental pollutants
- Decrease metropolitan congestion
- Reduce highway fatalities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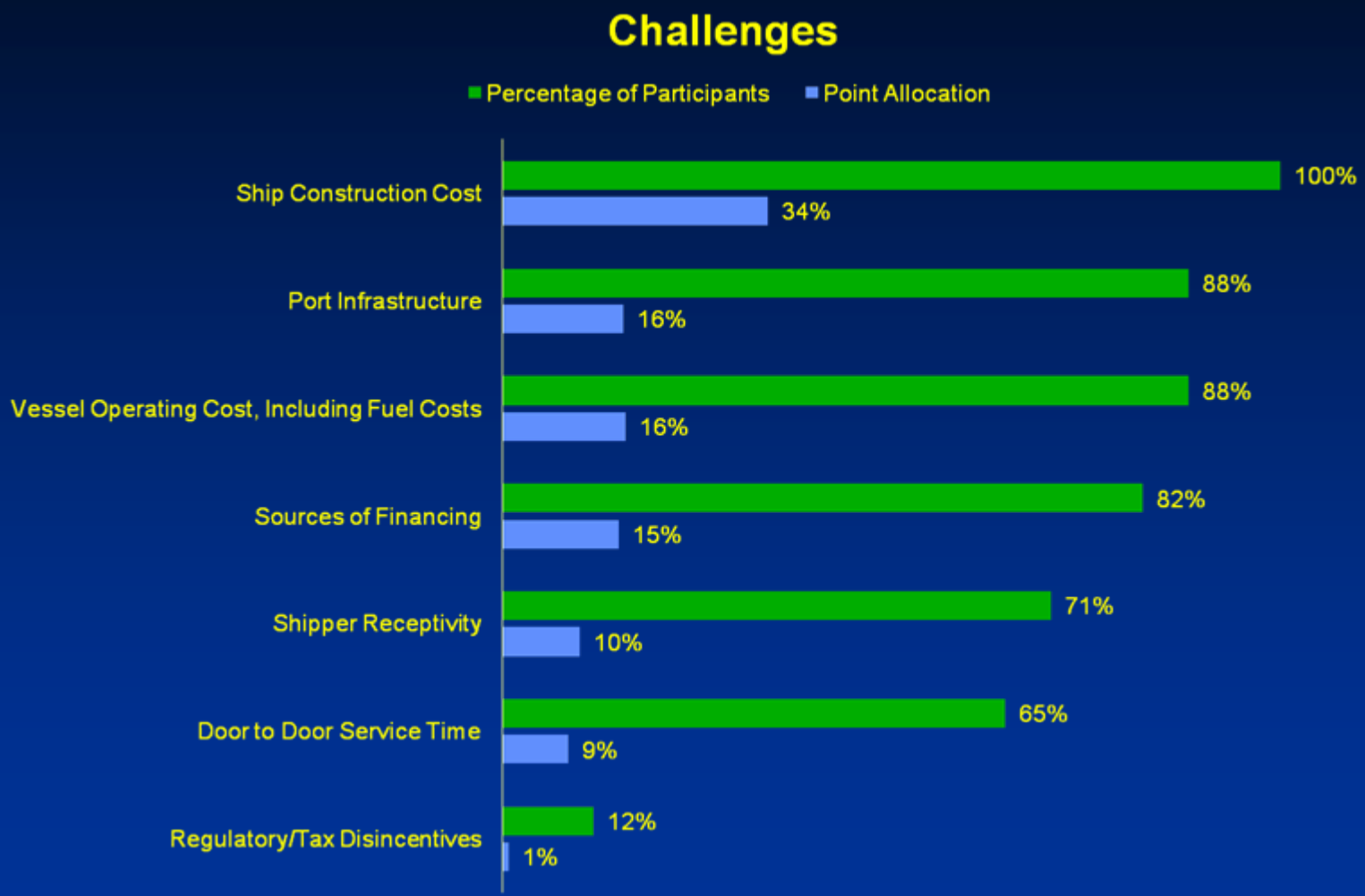
People Who Know

# Operator and Stakeholder Perspectives, Cont.



# Lessons Learned Overseas

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Short Sea Shipping

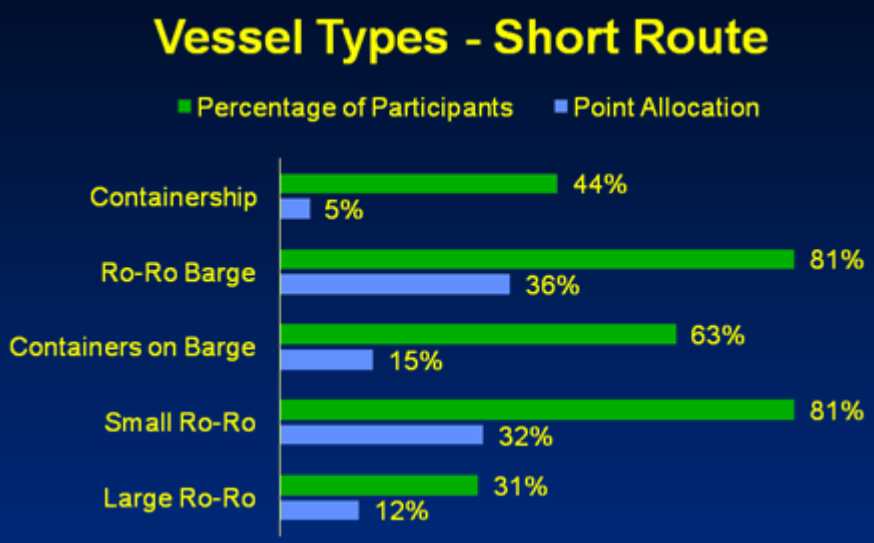
*Short Sea Shipping*
*Comparison to other markets*

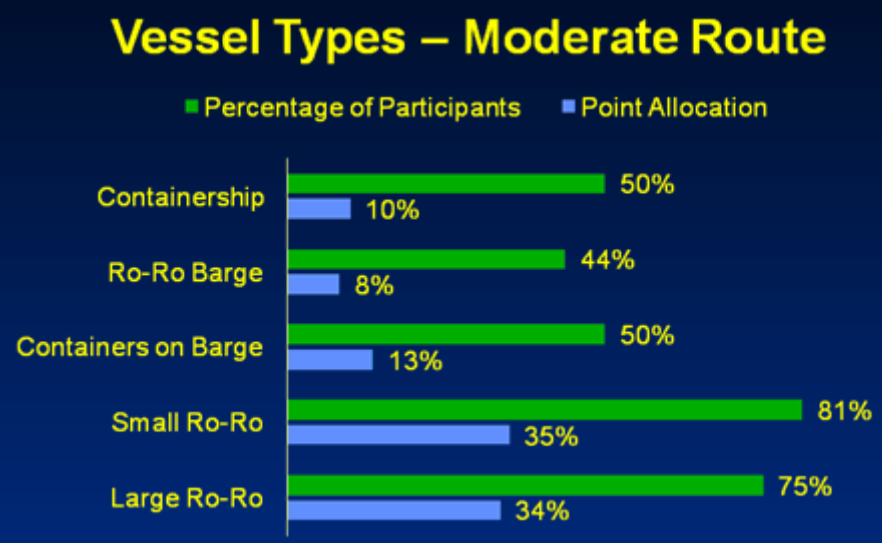
| U.S. | Europe/UK | Asia |
|---|---|---|
| Road and rail infrastructure has been preeminent | Long history of inter-European freight movements on sea and river routes | Long history of freight movements on sea and river routes |
| Little geographic impetus for coastwise shipping | Earlier pressure due to inadequacy of road system and congestion | Hub and spoke feeder ship traffic used extensively – fallout of E/W line-haul containership services |
| Niche markets exist | EU backs services (including start-ups) with subsidies | Many locations have non- existent or underdeveloped road/ rail alternatives |
| Worsening congestion and larger vessels on E/W trades may impel development | Many sea routes have historically faced no land-based competition | |
| Cabotage laws protect some trades | | |

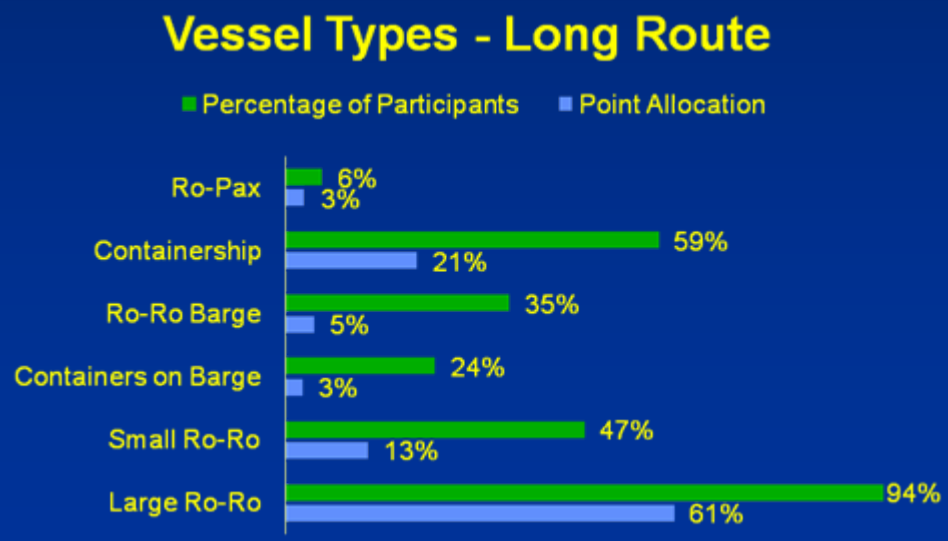
Source: The Economics of Domestic Short Sea Shipping Workshop, Transportation Research Board, Washington DC, Sept. 28, 2004.

- **EU has made S3 a policy issue**
- **Several programs exist to further S3 in Europe**

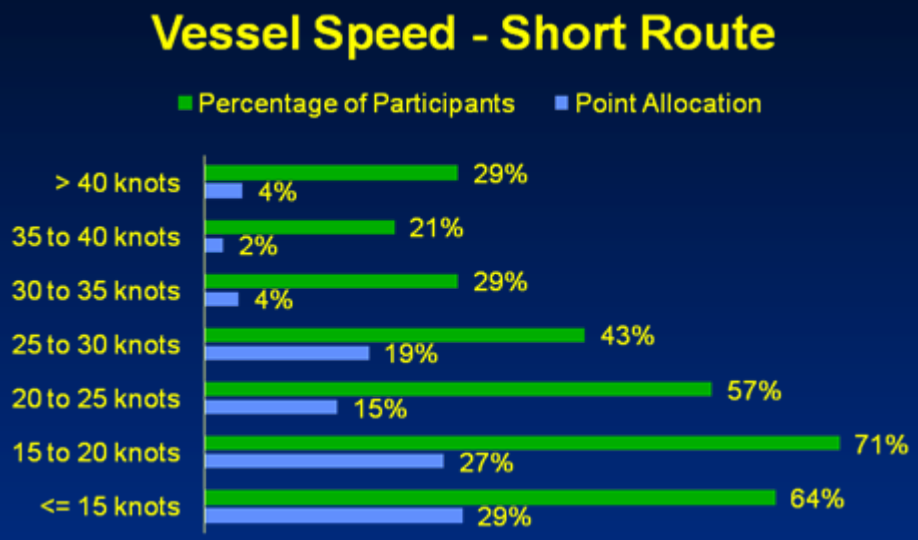
# Short Sea Shipping Vessels

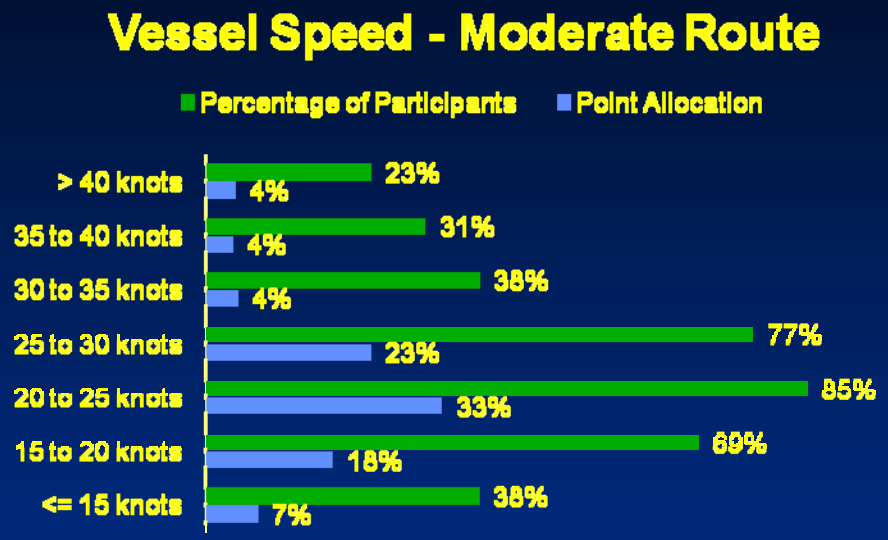


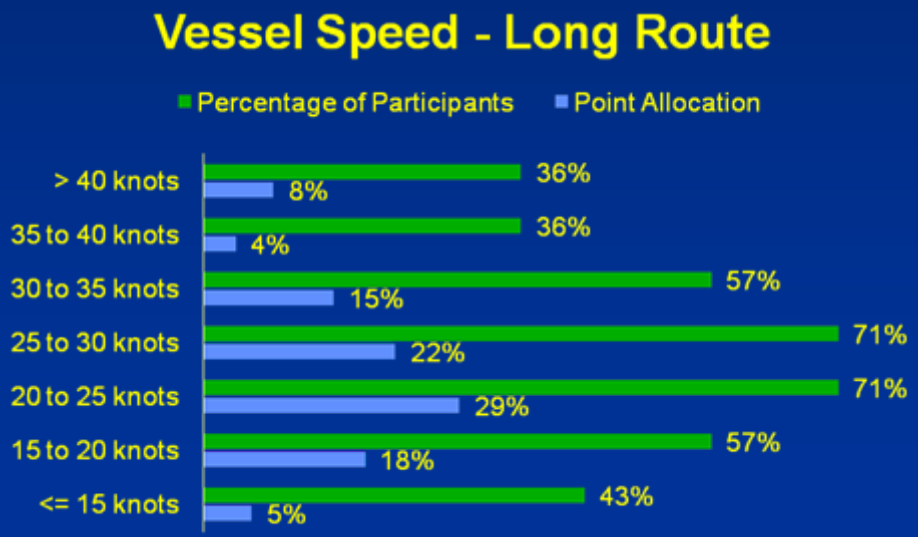



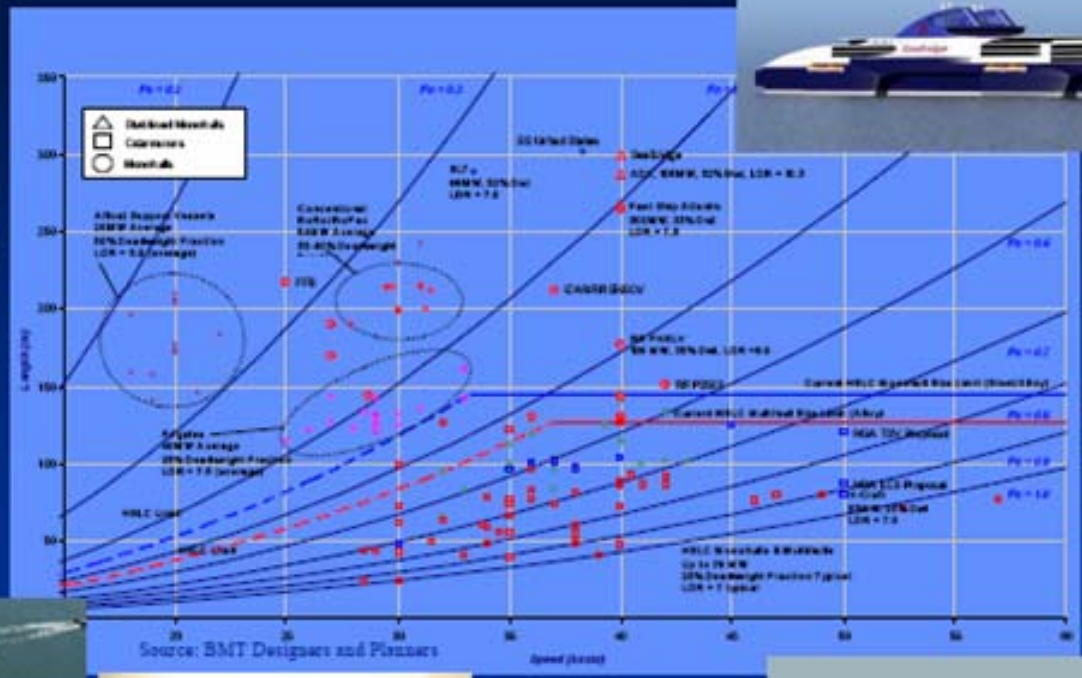
# Short Sea Shipping Vessels, Cont.



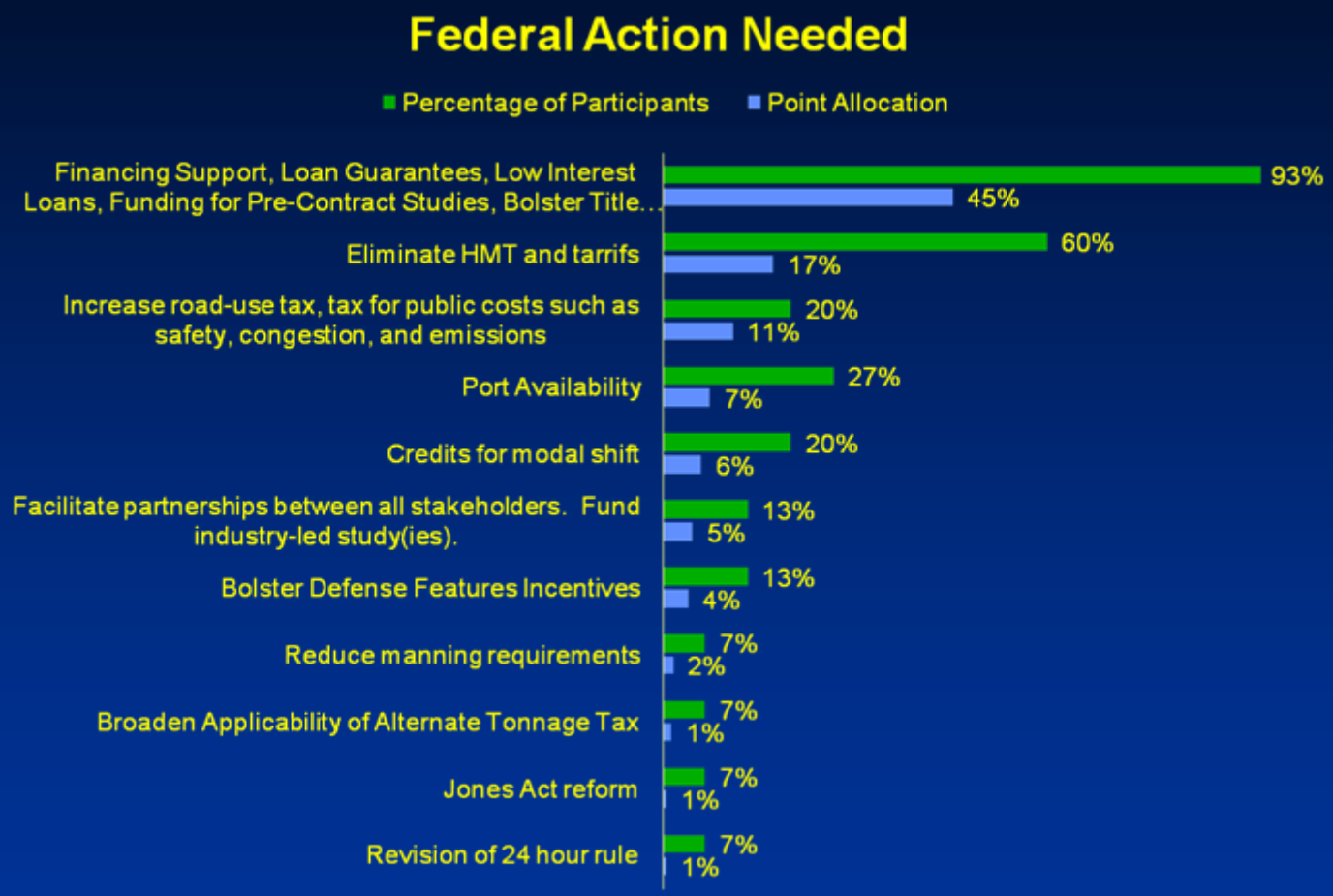
# Short Sea Shipping Vessels, Cont.

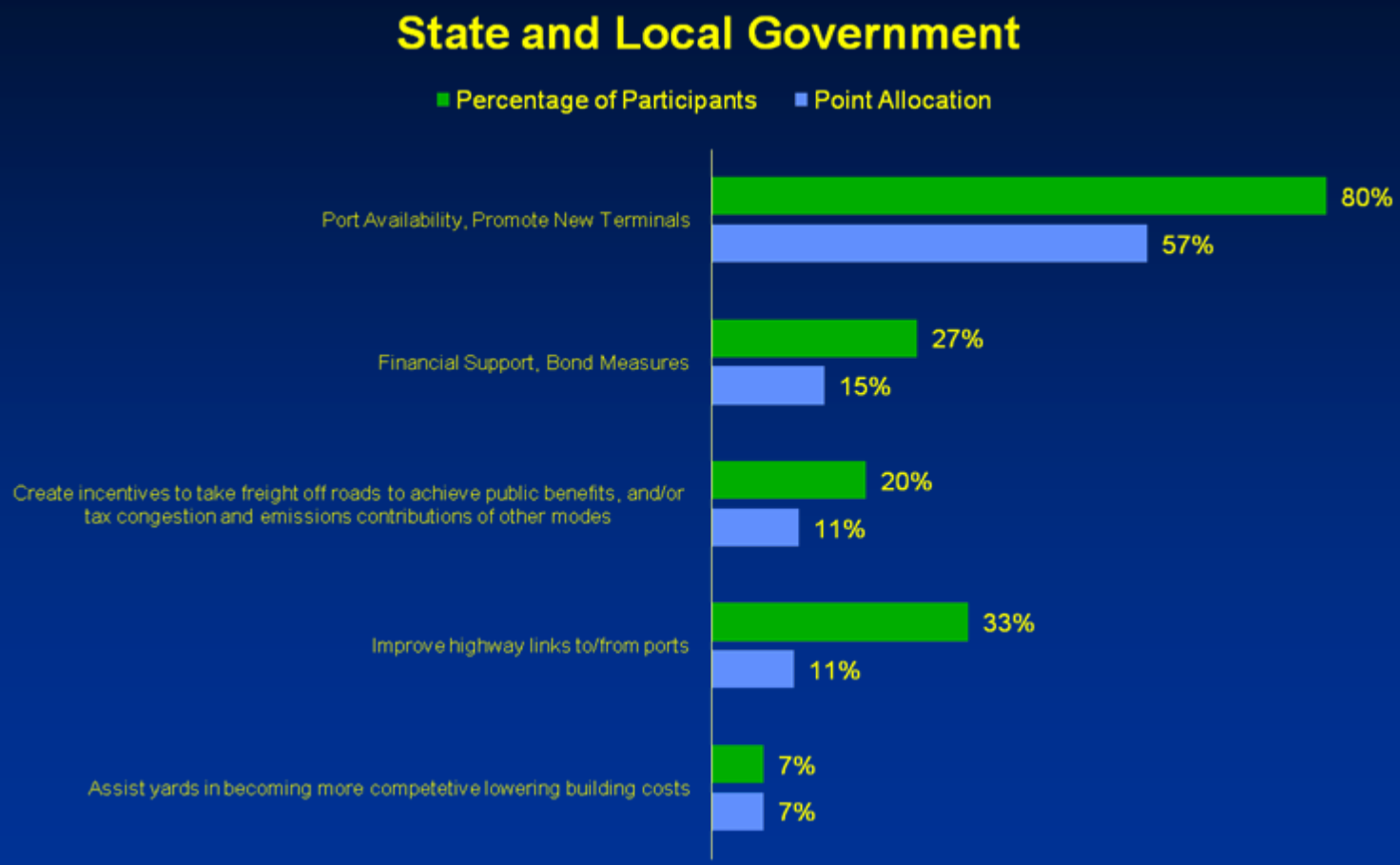

# Military Considerations

- **Navy briefs provided on JHSV and JHSS programs**
  - Available on website
- **Commercial and military requirements dictate different design solutions**
- **Opportunities exist to leverage specific design elements and technologies**
  - For example power, propulsion, emissions mitigation, fuel efficiency, and cargo handling
- **Uncertain if sufficient incentive exists for incorporation of militarily useful features on S3 vessels**

# Regulatory and Legislative Considerations



# Regulatory and Legislative Considerations, Cont.



# Labor Considerations

- **Included trucking, in-port, and shipboard labor**
- **It is believed that labor will be supportive if brought in as partners early**
  - Need to be presented with a compelling business case
  - Needs to be new business, not competitive business
- **Can be an ally in lobbying for S3**

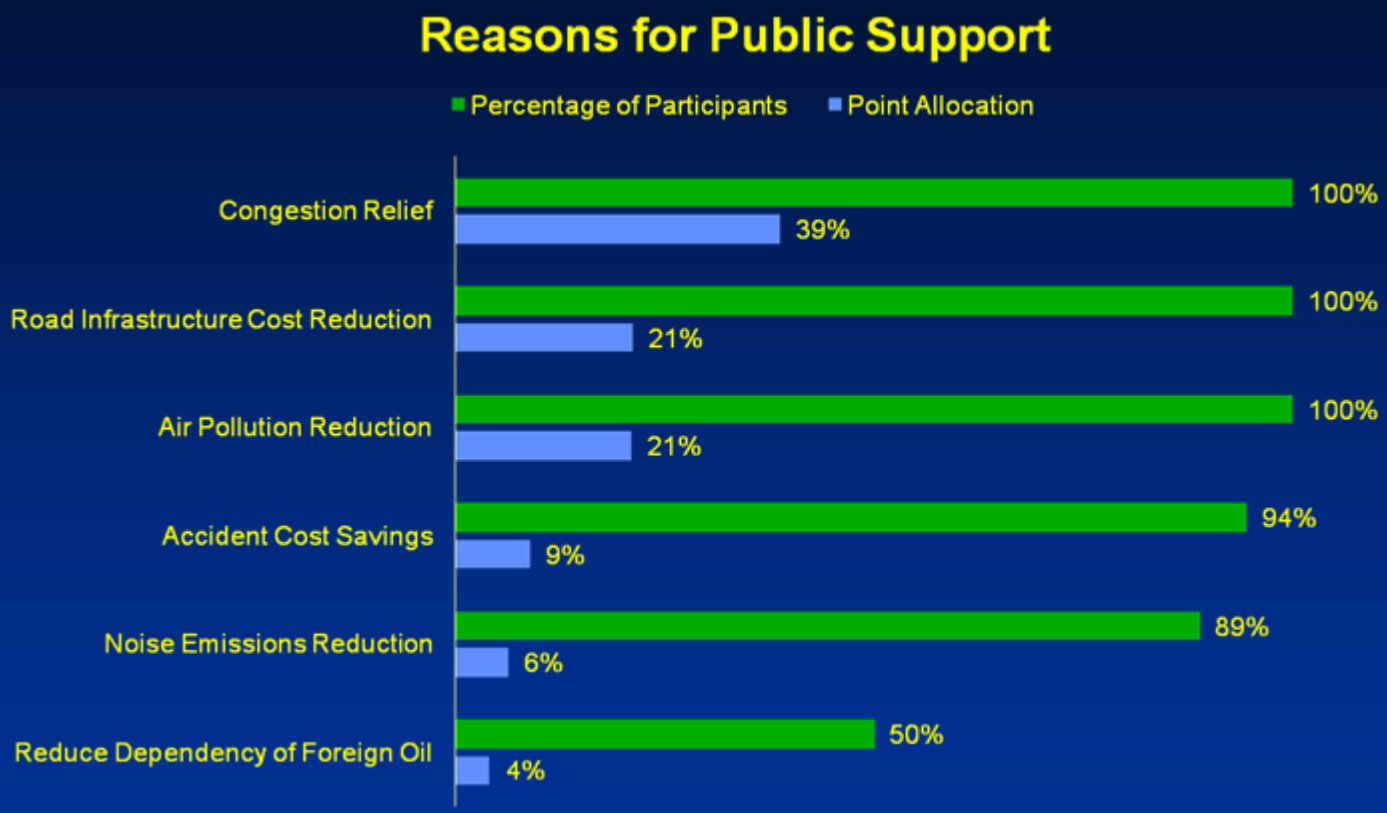
# Building Short Sea Shipping

- **Ship construction costs are perceived to be a significant roadblock for S3 in the U.S.**
  - Broad support for follow-on NSRP projects that target reduction of ship construction costs for Short Sea Shipping vessels
  - Perception that shipbuilders overseas have designs, construction methods, and supply chain practices that may be leveraged
  - While on a percentage basis, ship construction costs are not the driver of S3 economics, they are a disincentive to investment
- **Two strategies explored**
  - "Virtual Shipyard"
  - Collaboration with foreign shipyards
- **Series construction is required to manage costs**
- **Financing perceived to be a roadblock**
  - Lack of continued support for Title XI
  - Need to extent CCF to contiguous U.S. trades

# Port Infrastructure

- **Availability on West Coast a major challenge**
- **Port throughput and velocity a key determinant in economic viability of S3**
- **Port access, constraints and characteristics will be a driver of S3 designs in alternative markets**
- **Port infrastructure considerations:**
  - Environmental forces
  - Landside operational support
  - Waterside operational support
  - Port structures
  - Permitting

# Public Benefits of Short Sea Shipping

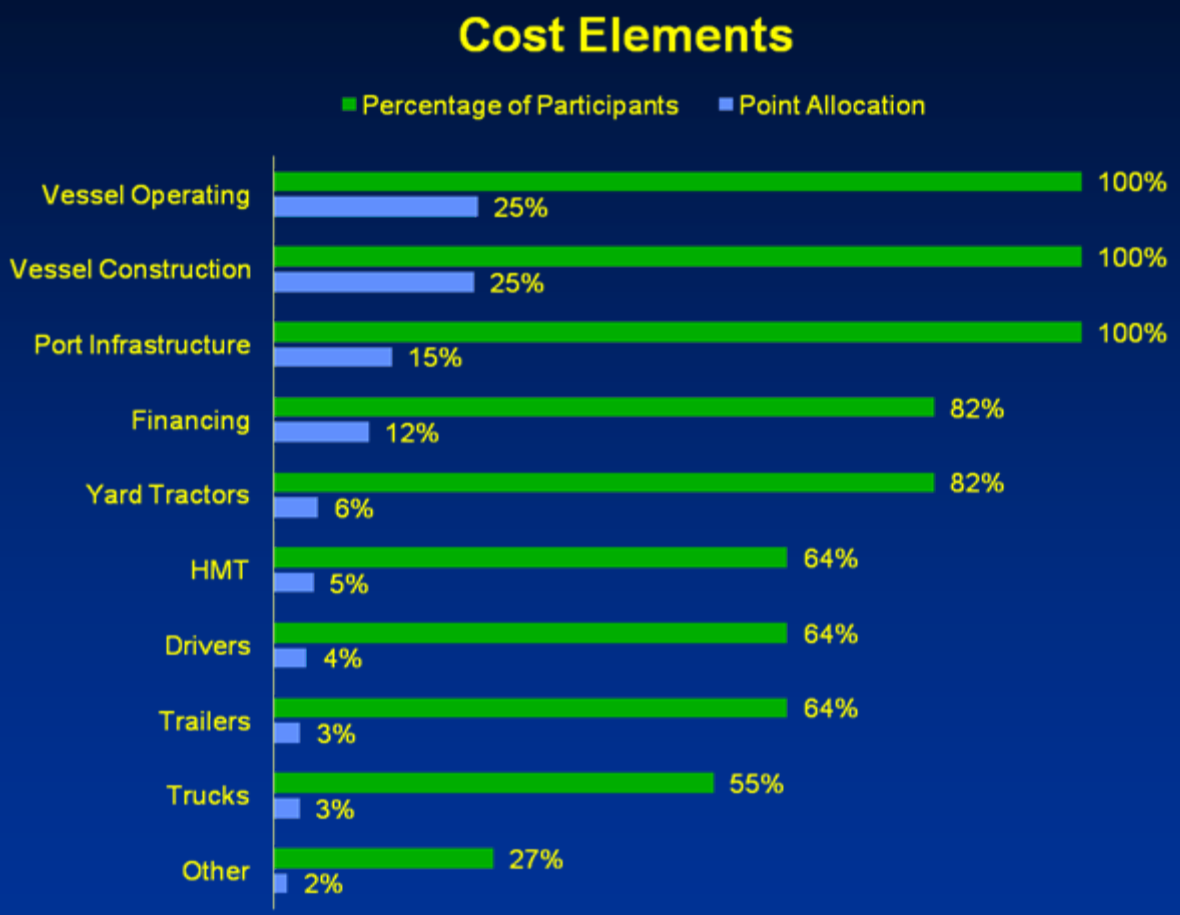


# Public Benefits of Short Sea Shipping, Cont.

| External Costs | NYC-Boston | | |
|---|---|---|---|
| | Per truck trip | Per truck-mile | Cost Share |
| | Dollars | | (%) |
| Infrastructure | 20.52 | 0.09 | 16 |
| Air pollution | 12.53 | 0.06 | 10 |
| Congestion | 77.08 | 0.34 | 59 |
| Noise | 5.64 | 0.03 | 4 |
| Accidents | 14.94 | 0.04 | 11 |
| Fuel cost savings | 0.46 | 0.002 | --- |
| Total | 131.17 | 0.56 | 100 |

Source: The Public Benefits of the Short Sea Intermodal System

# Economics of Short Sea Shipping



# Economics of Short Sea Shipping, Cont.

Figure 1: Cost per Load by Category, Northern California to Southern California

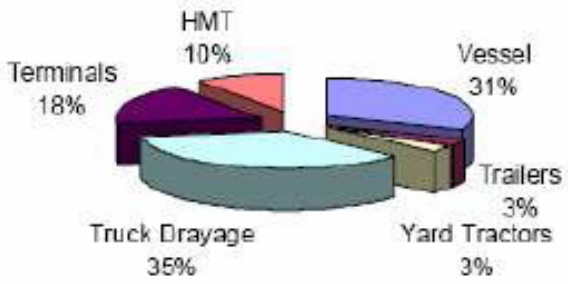



Figure 2: Cost per Load by Category, Northern California to Pacific Northwest

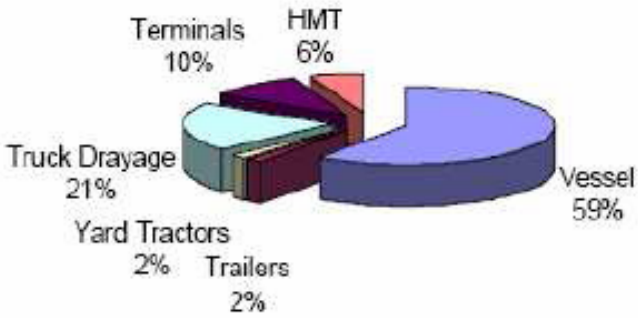
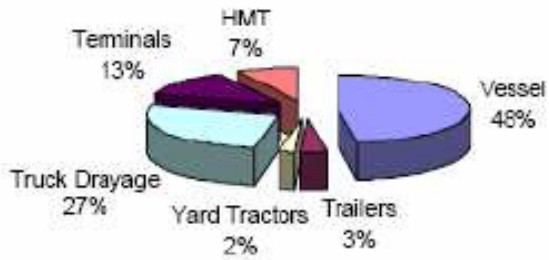



Figure 3: Cost per Load by Category, Southern California to Pacific Northwest




Source: Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast; CCDOTT Manalytics, CDI Marine, Westar Transport, M.P. Tedesco

# Economics of Short Sea Shipping, Cont.

Figure 4: Vessel Cost by Category, Northern California to Southern California

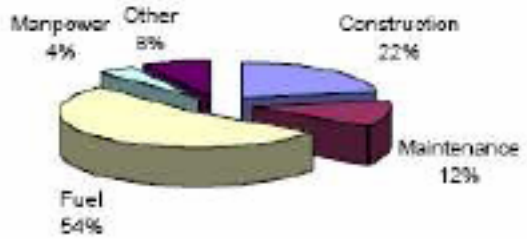



Figure 5: Vessel Cost by Category, Northern California to Pacific Northwest

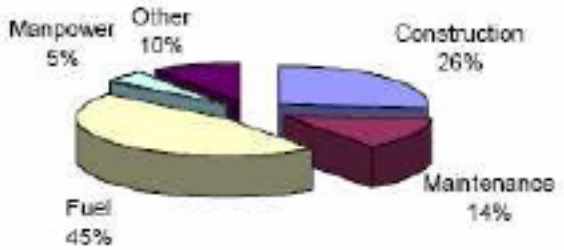
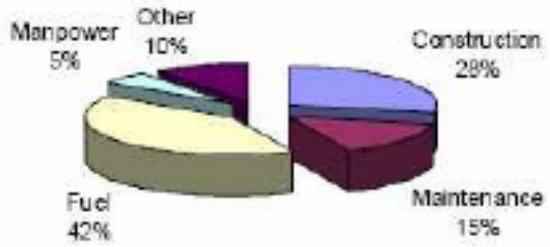



Figure 6: Vessel Cost by Category, Southern California to Pacific Northwest




Source: Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast; CCDOTT Manalytics, CDI Marine, Westar Transport, M.P. Tedesco

# Workshop Observations

- **Ship construction costs are perceived to be a significant roadblock for S3 in the U.S.**
  - Broad support for follow-on NSRP projects that target reduction of ship construction costs for Short Sea Shipping vessels
  - Perception that shipbuilders overseas have designs, construction methods, and supply chain practices that may be leveraged
- **Promising markets are most characterized by:**
  - Recognized deficiencies in the existing land-mode (congestion, lack of capacity)
  - Rates that permit S3 to be price competitive
- **East coast and West coast are perceived to be the best targets for S3, however the East Coast is perceived to be more likely in the near term**
  - Primarily driven by lack of port availability on the West Coast and the perception that congestion and lack of capacity is worse on the East Coast
- **General consensus that "one size will not fit all"**
  - However, there are significant series production opportunities for a number of vessel types and designs in a number of markets
- **General consensus that Ro-Ro's and Ro-Ro barges will be most prevalent for S3**

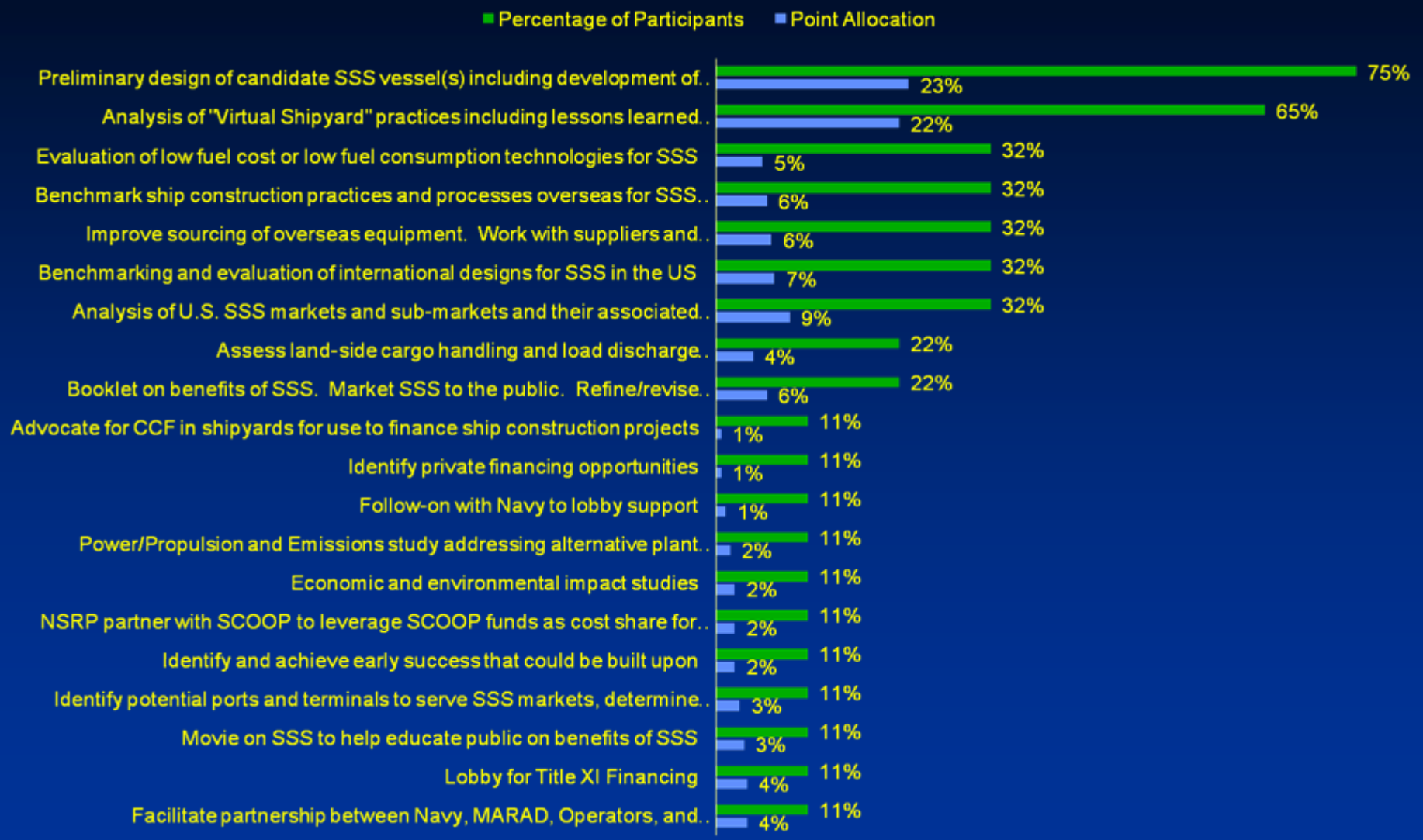
# Workshop Observations, Cont.

- **Speeds from 20 to 30 knots are believed to be required, except in short routes where feeder vessels may operate at slower speeds below 15 knots**
  - Service standards of trucking being competed with in a given market, and port location and landside throughput, will dictate required vessel speed
- **Survey respondents are optimistic about opportunities for series construction**
  - Series up to 30 vessels for long routes
  - Series up to 20 vessels for moderate routes
  - Series up to 10 vessels for shorter routes which may be more “niche”
- **Vessel construction, vessel operating, and port infrastructure costs are perceived to be the most significant contributors to S3 required rates**
- **Strong consensus that Federal action is required to further S3**
  - Revitalized Title XI, application of CCF to contiguous trades, elimination of HMT
- **Role for State and Local Government is facilitating availability of ports and landside infrastructure**
  - State and local support may be required to ensure access

# Workshop Observations, Cont.

- **Congestion relief, road infrastructure cost mitigation, and air pollution reduction are believed to be the most compelling public benefits**
  - Congestion relief is perceived to be the most certain benefit
- **Broad support for follow-on NSRP investment in S3, including:**
  - Analysis of application of "Virtual Shipyard" partnering and construction methods
  - Development of S3 designs applicable to multiple markets
    - » Analysis of markets and development of S3 vessel requirements
  - Leveraging of foreign designs for S3
  - Leveraging of foreign case studies for construction methods, supply chain management for S3, and partnership with foreign shipyards
  - Analysis of power and propulsion options for S3, means to mitigate fuel costs, and means to mitigate vessel emissions
- **Recommendations to be detailed in NSRP PDMT S3 Roadmap**
  - Proposing near-term follow-on project focused on reducing construction costs associated with S3 vessels

# Recommendations




* Does not include additional general recommendations such as follow-on RA project and follow-on workshop
** Not all recommendations are within NSRP scope

# Project Schedule

- **Workshop Summary Document**
  - Discussion notes, presentation highlights, and survey results
  - Targeting as read-ahead material for June ECB meeting
- **Draft Roadmap: June 15, 2007**
  - For inclusion in ECB read-ahead material
- **Final Roadmap**
  - Current schedule July 31, 2007
  - Requesting no-cost extension to September 30, 2007
    - » Increased level of detail and pre-planning for next steps
    - » Maintain momentum until ECB decisions related to future S3 projects
    - » Outreach to additional participants
    - » Supports final project briefing at PDMT meeting September 25-26