NOAA HYDROGRAPHIC SERVICES REVIEW PANEL

Hydrographic Services Review Panel
HSRP NY/NJ Public Meeting

Grand Hyatt New York *February 25, 2014*

Current & Future Trade & Transportation Trends for Global Shipping

M. John Vickerman

VICKERMAN & ASSOCIATES, LLC

Williamsburg, Virginia

Have the HSRP Public Meeting Audience…

"*See Into the Future of the MTS*"

RDML Gerd Glang

NOAA Director, Office of Coast Survey

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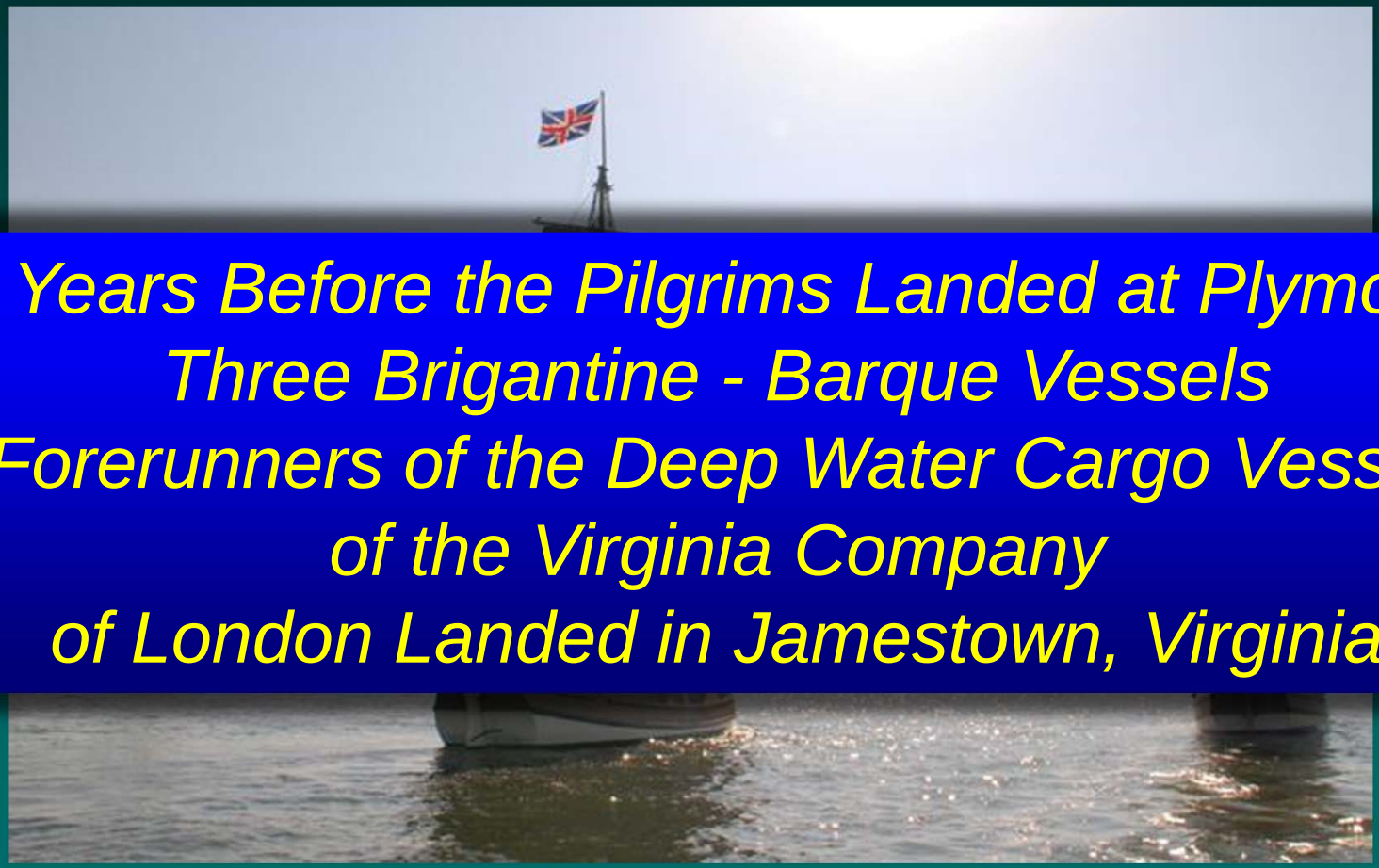
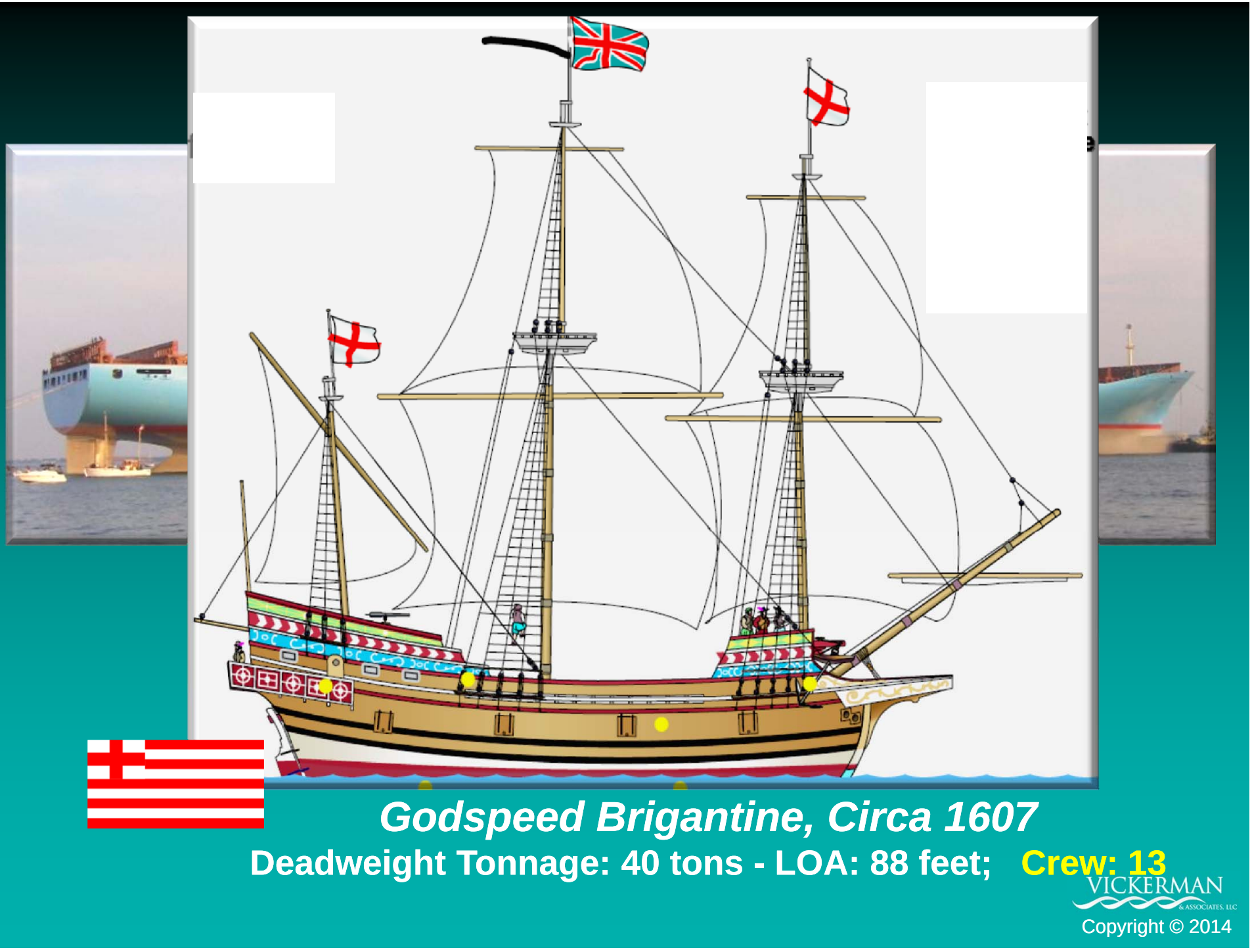
405 Years Ago

A Voyage of Three Vessels Created the First Permanent English Port in Jamestown, VA



13 Years Before the Pilgrims Landed at Plymouth,
Three Brigantine - Barque Vessels
(Forerunners of the Deep Water Cargo Vessel)
of the Virginia Company
of London Landed in Jamestown, Virginia



Godspeed Brigantine, Circa 1607

Deadweight Tonnage: 40 tons - LOA: 88 feet; Crew: 13

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M/S EMMA MÆRSK

Circa 2009

Godspeed Brigantine, Circa 1607

Vessel Cargo Handling Circa 1955

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Cargo Handling Circa 2010

US Navy Fast Frigate Circa 2045

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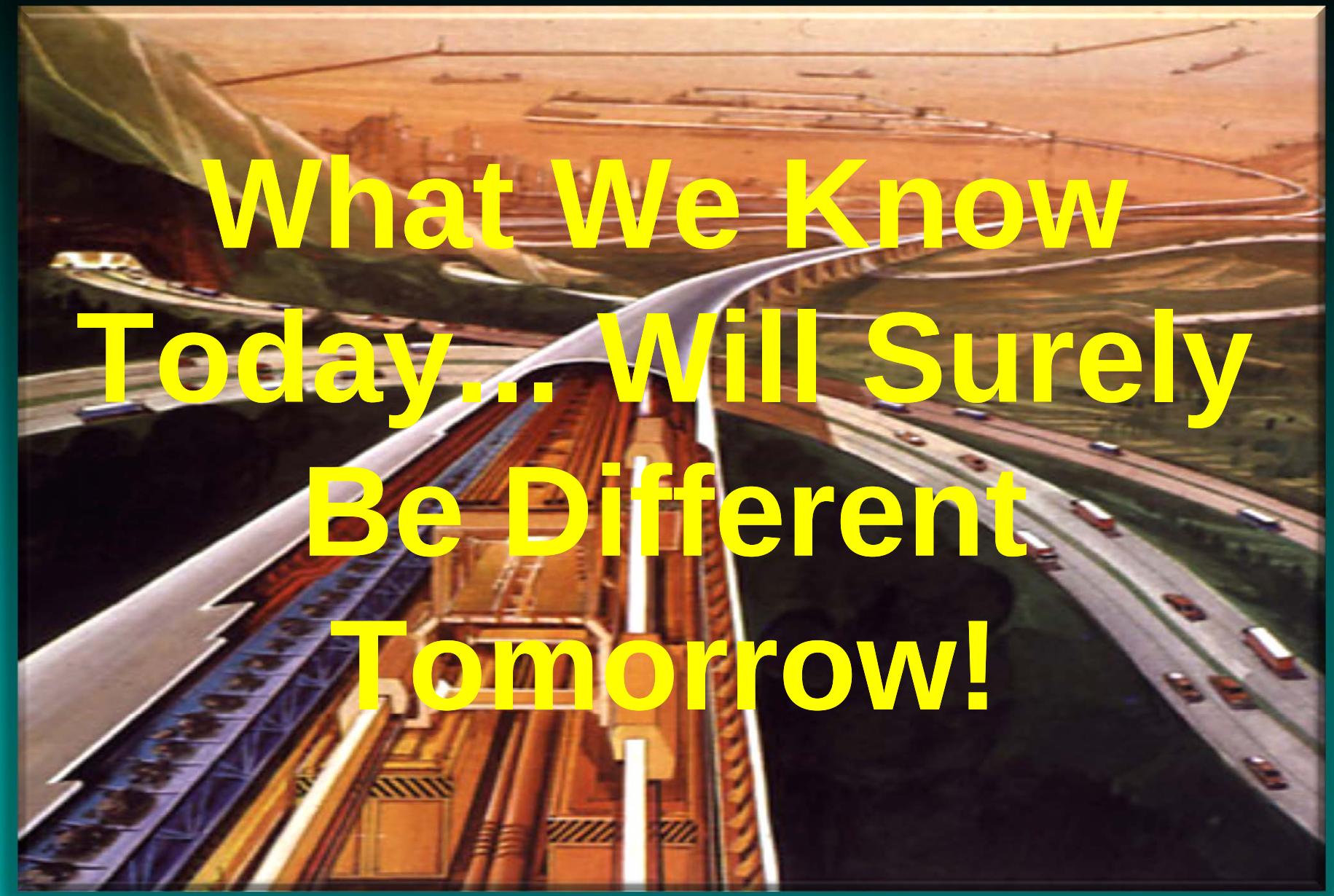

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The Evolution of Today's Global Shipping Lanes
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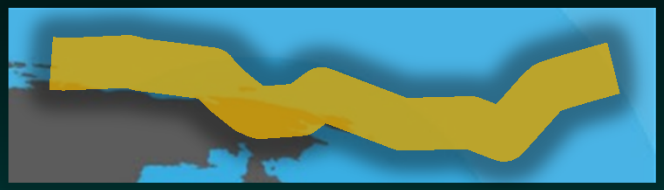
The World's Primary Shipping Routes



The Marine Silk Road

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The Maritime Silk Road Replaced the Overland Silk Road as the Primarily Trading Route Across Eurasia After the Yuan Dynasties (618 to 907)

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The Marine Silk Road was a Precursor to:

Today's Modern supply chain logistics, distribution and shipping transportation networks

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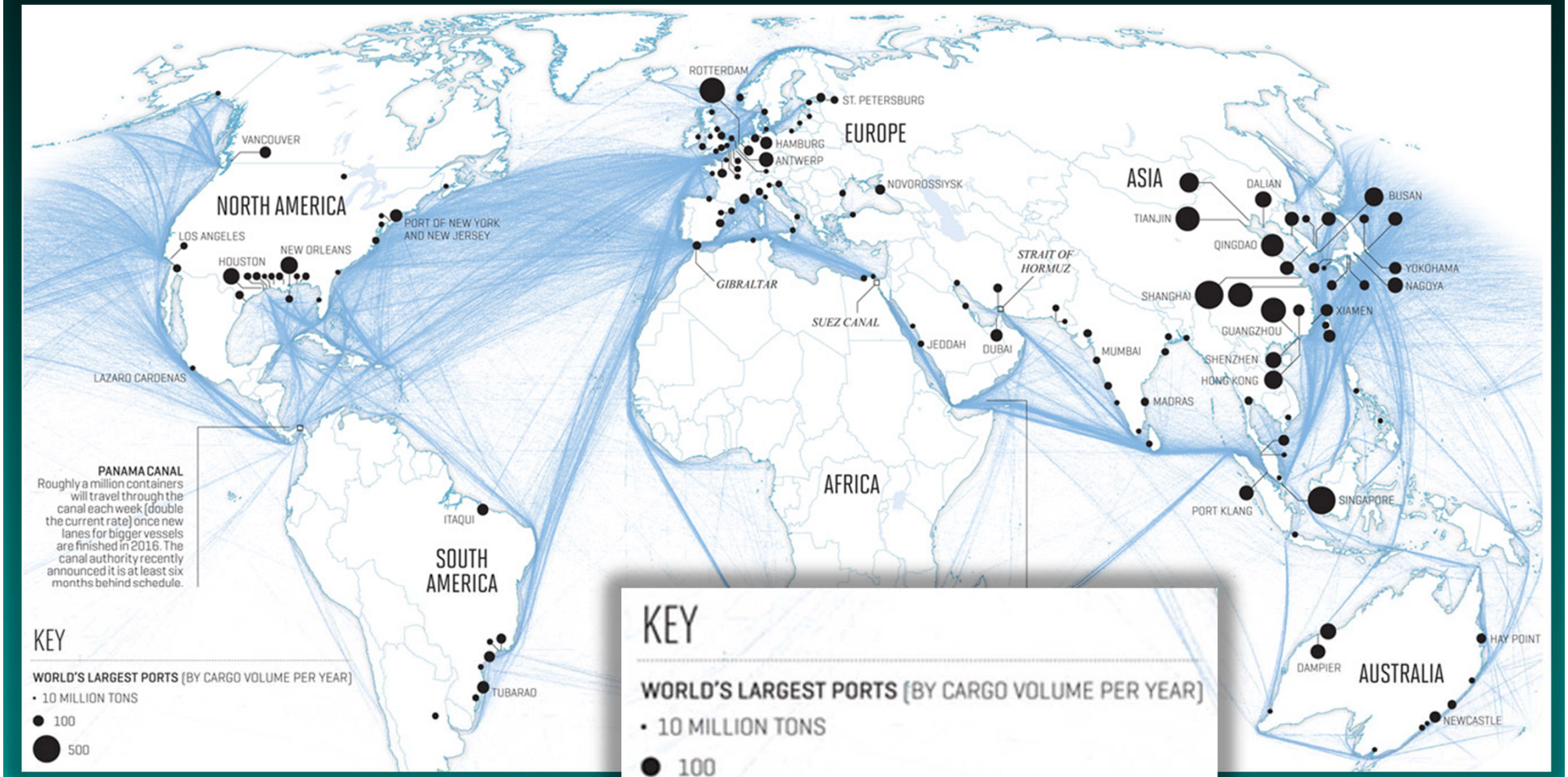
The World's Largest Ports Are Connected Via The Marine Silk Road



KEY
WORLD'S LARGEST PORTS (BY CARGO VOLUME PER YEAR)
• 10 MILLION TONS
100
500

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90% of Global Trade is Carried Out by Shipping

The Majority of Today's Ocean Trade is Conducted on the Marine Silk Road

Indian Ocean Electric Blue Shipping Lane Trails From the Marine Silk Road

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Shorter – Faster Arctic Ocean Route

2+ Months A Year Using Convoys

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International Port External Industry Pressures Driving Today's Logistics
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More than 98% of everything we consume, wear, eat, drive and construct is brought to us via ships through the North American port system.

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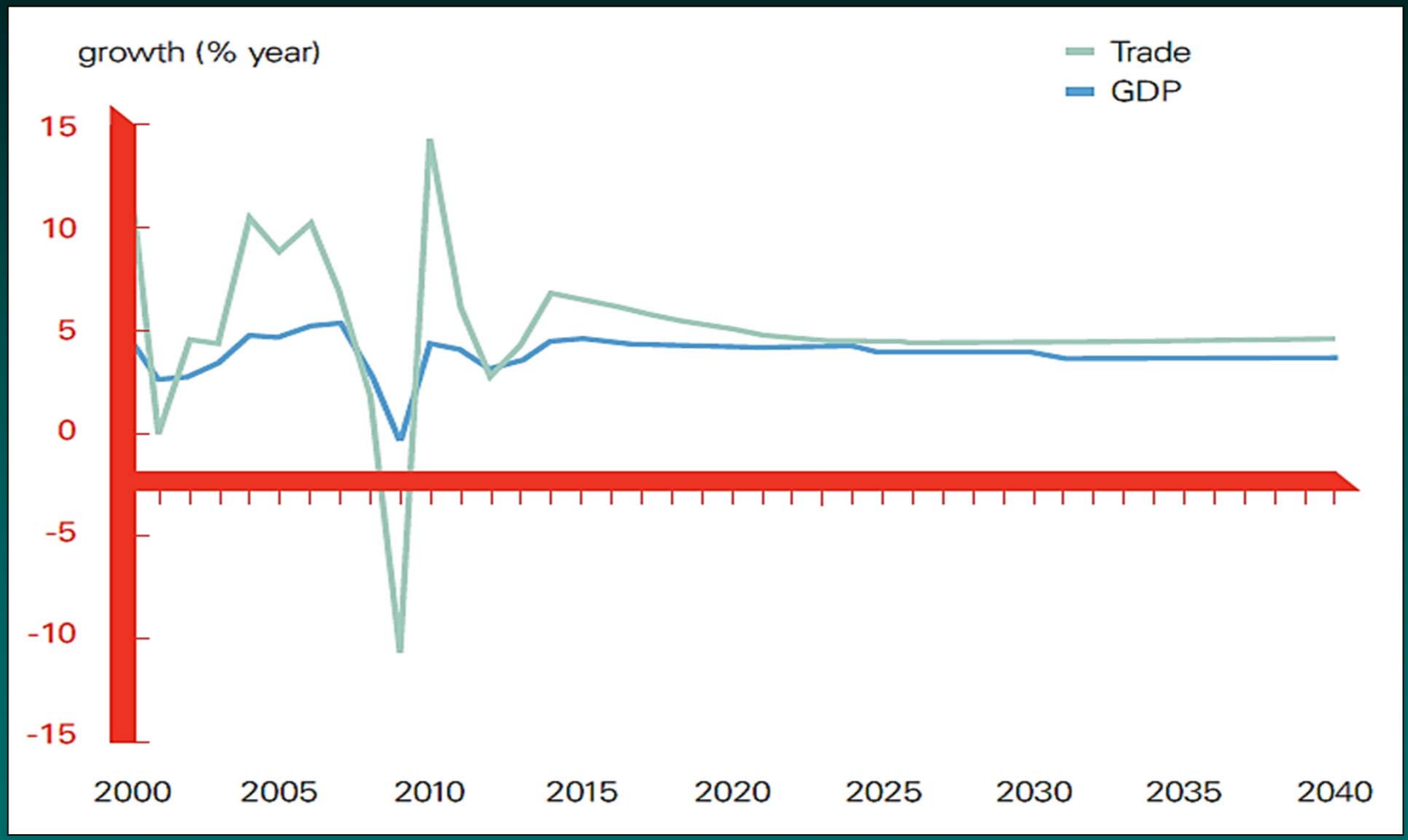
Growth in GDP and World Trade

World trade will grow by 73% in the next 15 years. With merchandise trade volumes in 2025 hitting $43.6 trillion compared to today's $27.2 trillion



Source: Oxford Economics 2013

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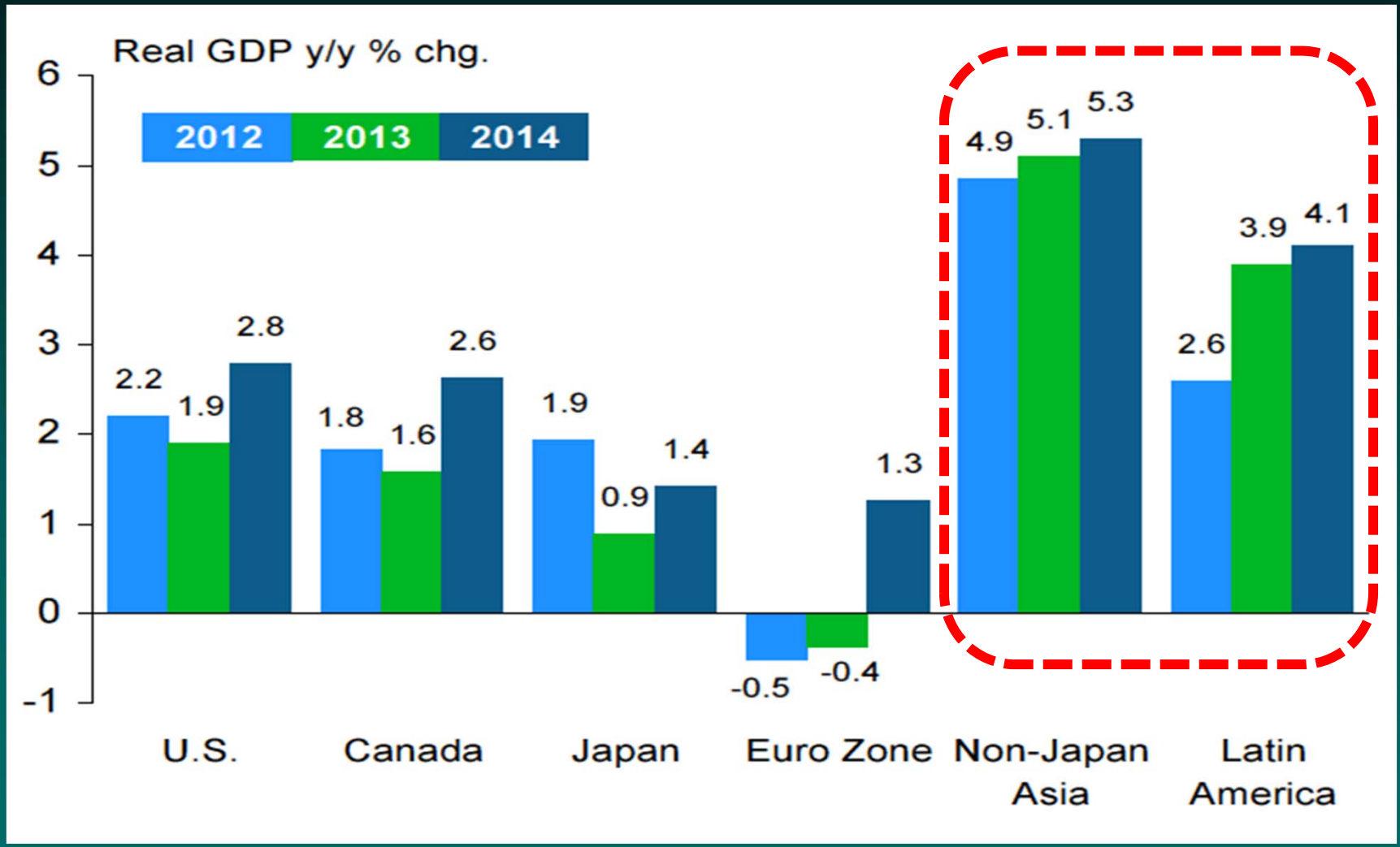
Continuing Economic Global Growth

International trade is set to significantly grow despite current economic uncertainty in the U.S. and elsewhere around the world



Source: TD Economics Forecast as of March 2013

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Cargo Will Flow "*Downhill*" to the "*Lowest Cost - Best Service Levels*"

(Total Logistics Costs From Origin to Destination)

More Competitive Regions will End up with the Cargo

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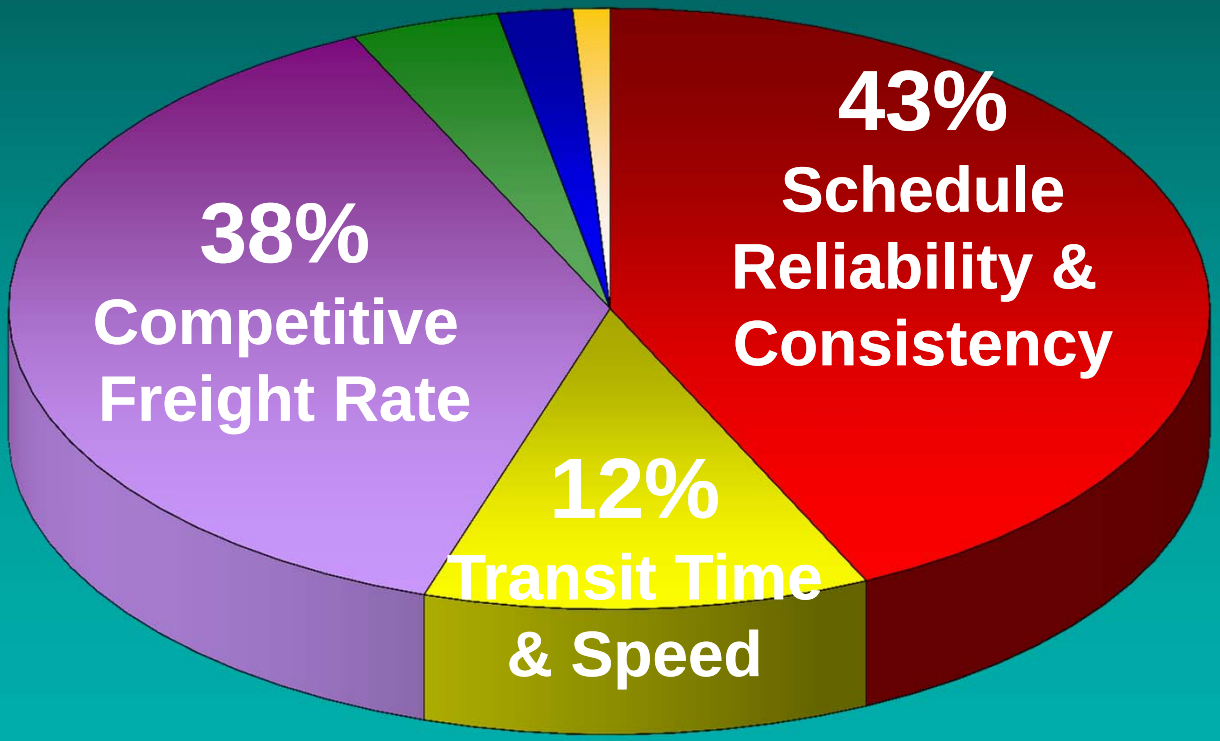
Poll of the Top 1000 "Blue Chip" Multinational Shipper Priorities



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Today's Logistics Truth:

"The customer wants more and is always willing to pay less for it."

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International Maritime Cargo Demand Trends
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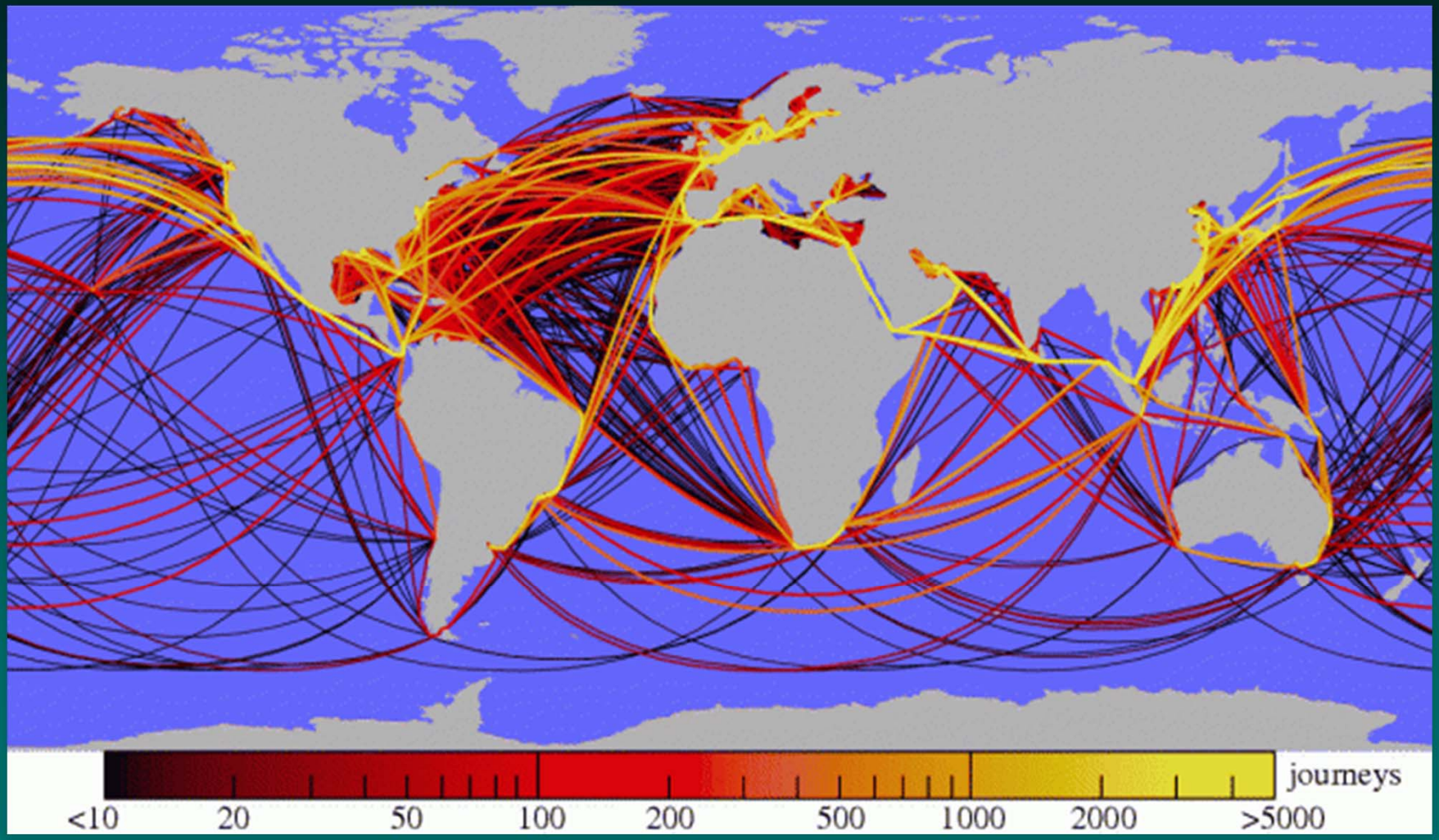
Global Shipping Routes Plotted by AIS GPS

2010 Busiest Routes:

(1) Panama Canal, (2) Suez Canal, (3) Shanghai Port



Source: Wired Science January 2010 Journal of the Royal Society: Interface

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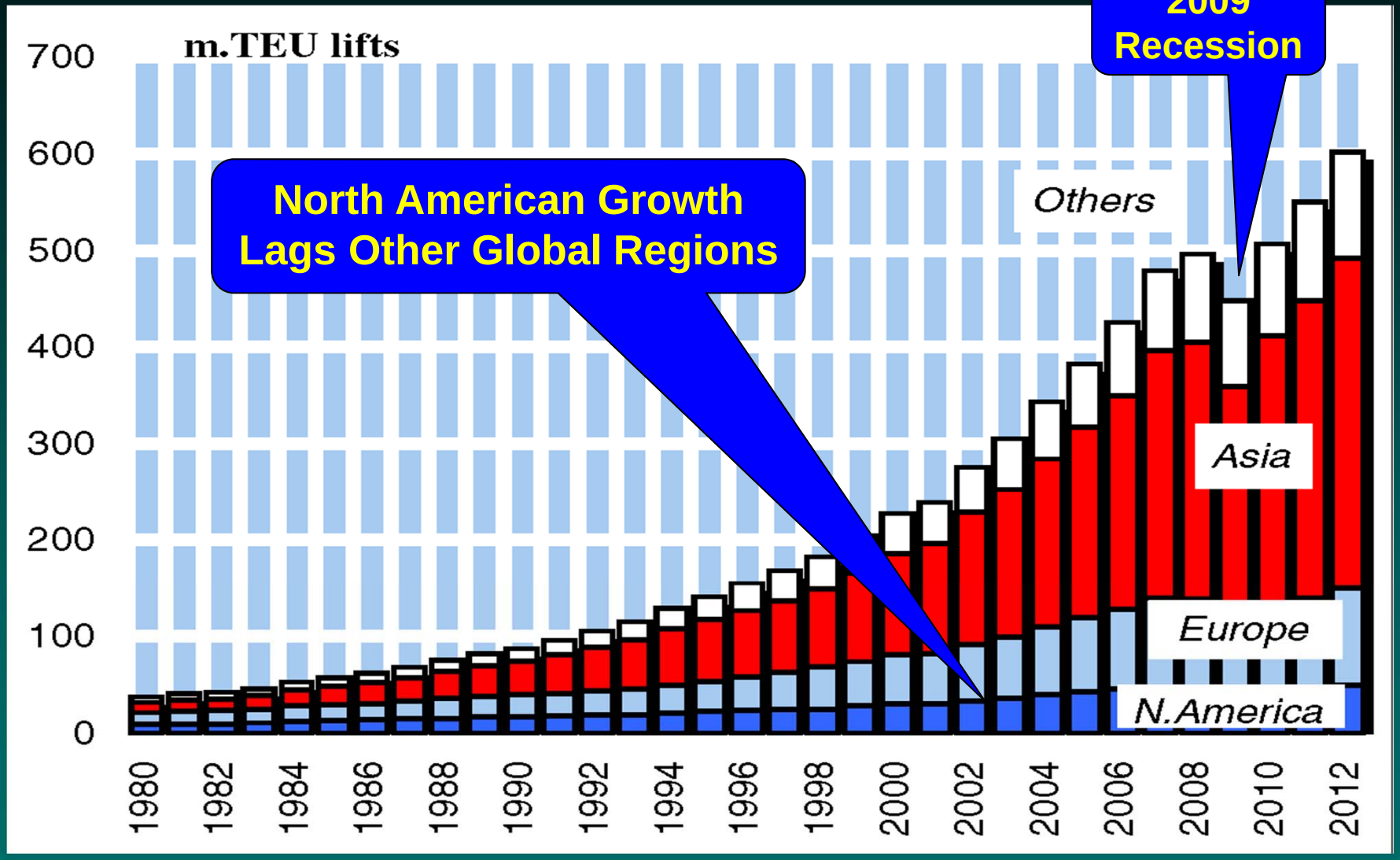
Historical Global Container Market Demand

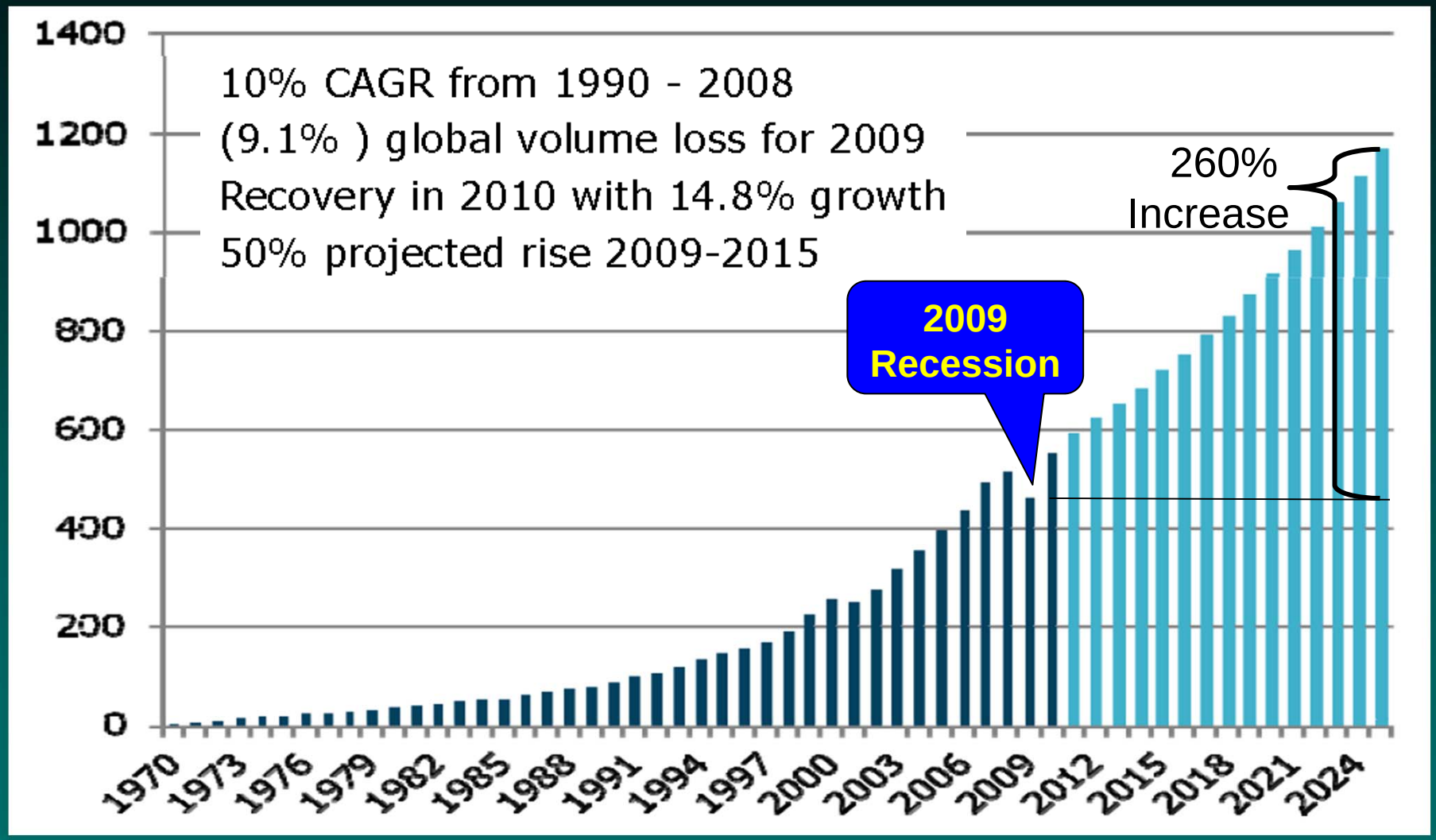
(Millions of TEUs)



Source: Drewry Shipping Consultants

2025 World Container Port Market Demand

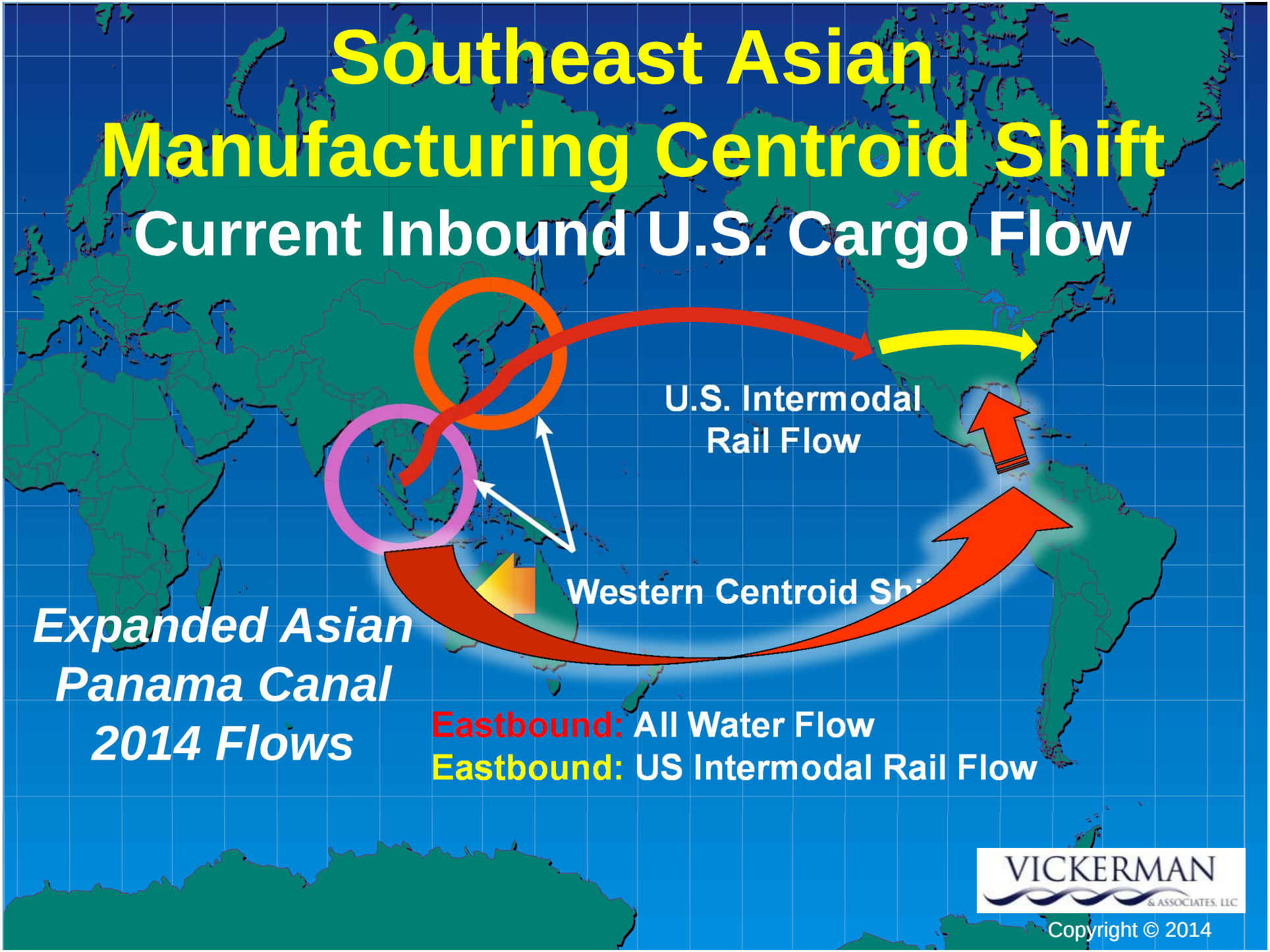
(Millions of TEUs)



Source: Drewry Shipping Consultants October 2011

Southeast Asian Manufacturing Centroid Shift

Current Inbound U.S. Cargo Flow



Expanded Asian Panama Canal 2014 Flows

Eastbound: All Water Flow
Eastbound: US Intermodal Rail Flow

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Southeast Asian Manufacturing Centroid Shift

Cu Flow

U.S. In
Rail Fl

With Manufacturing Centroid Shifts Into Vietnam and/or India, The North American East Coast will See Dramatically More Westbound Suez Traffic

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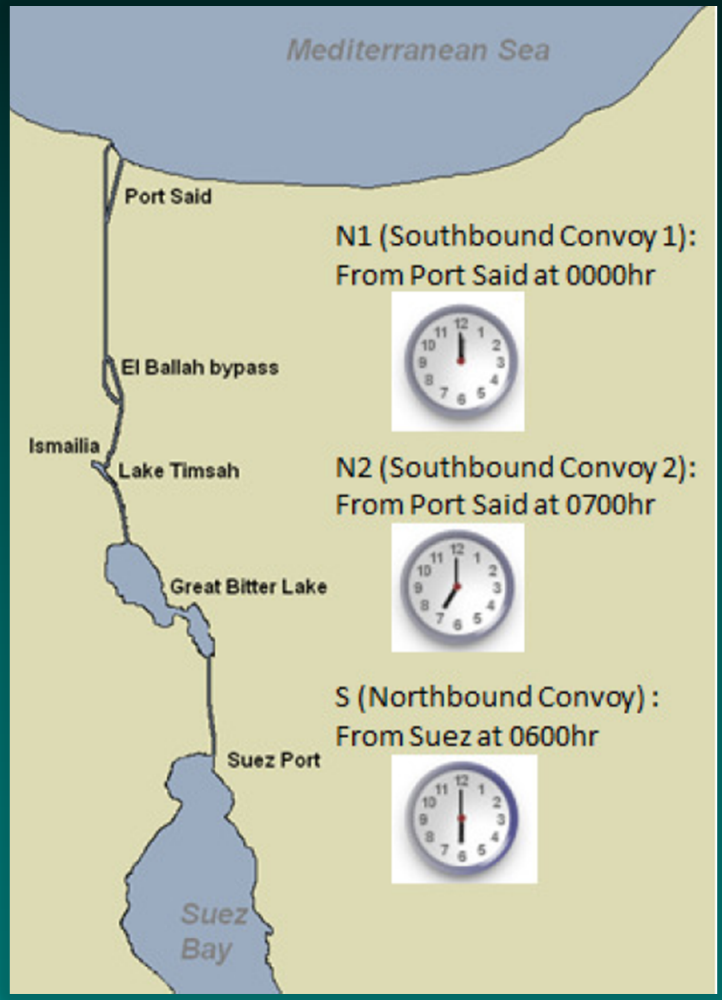
Suez Canal Container Vessel Convoy Traffic

(Ships Currently Transit the Suez Canal in 3 Daily Convoys)



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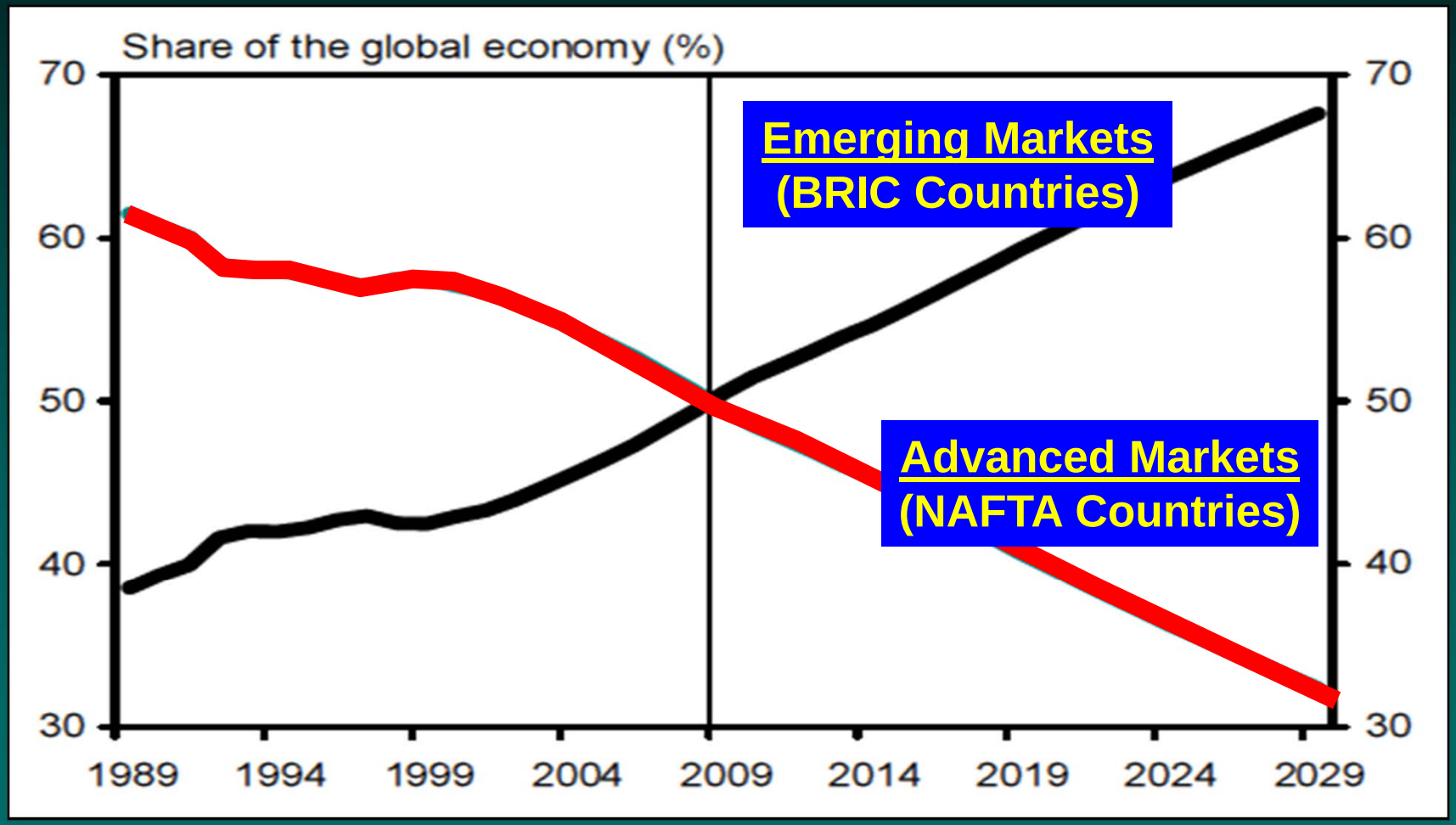
A Turning Point in Global Economic History

The Advanced Economies Will Decline From 2/3 share of the Global Economy to a 1/3 Global Share. The Global Economy Will See Higher Average Pace of Growth in the Future…



Source: IMF - Forecast by TD Economics, December 2009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The Growing Asian Import Trade Challenge
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Container Transhipment World Records

Of the 10 busiest ports in the world in 2011, Nine are in Asia; of the top 10, Six are on the Chinese mainland

The Port of Shanghai is No. 1, and The Port of Singapore is No.2

These Two Ports are Larger Than All North American Ports Combined

China-US: Twin Engines of the World

Population:
US: 314 million
China: 1,344 million
(1/5 World)

The number of Chinese children in elementary school is equivalent to the total US population.

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Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park

New Logistics Park

20 Mile New Port Access Bridge Constructed in 3 yrs

54 New Berths

交通部第三航务工程勘察设计院制

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Shanghai International Shipping Center

Yangshan Deep Port - 20 Mile Bridge Access

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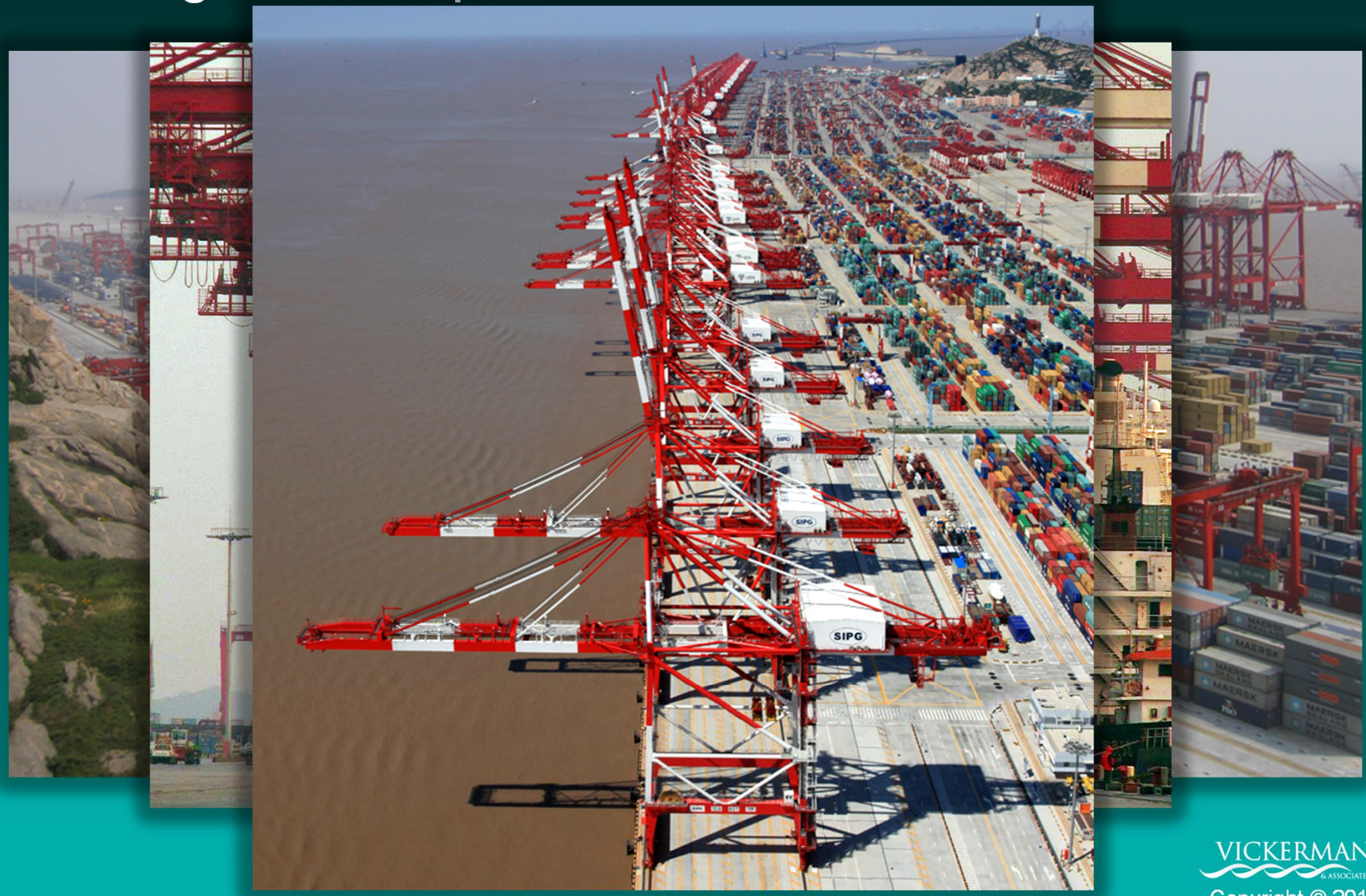
Shanghai Yangshan Deep-Water Harbour

Yangshan Deep Port – 54 Berths East China Sea



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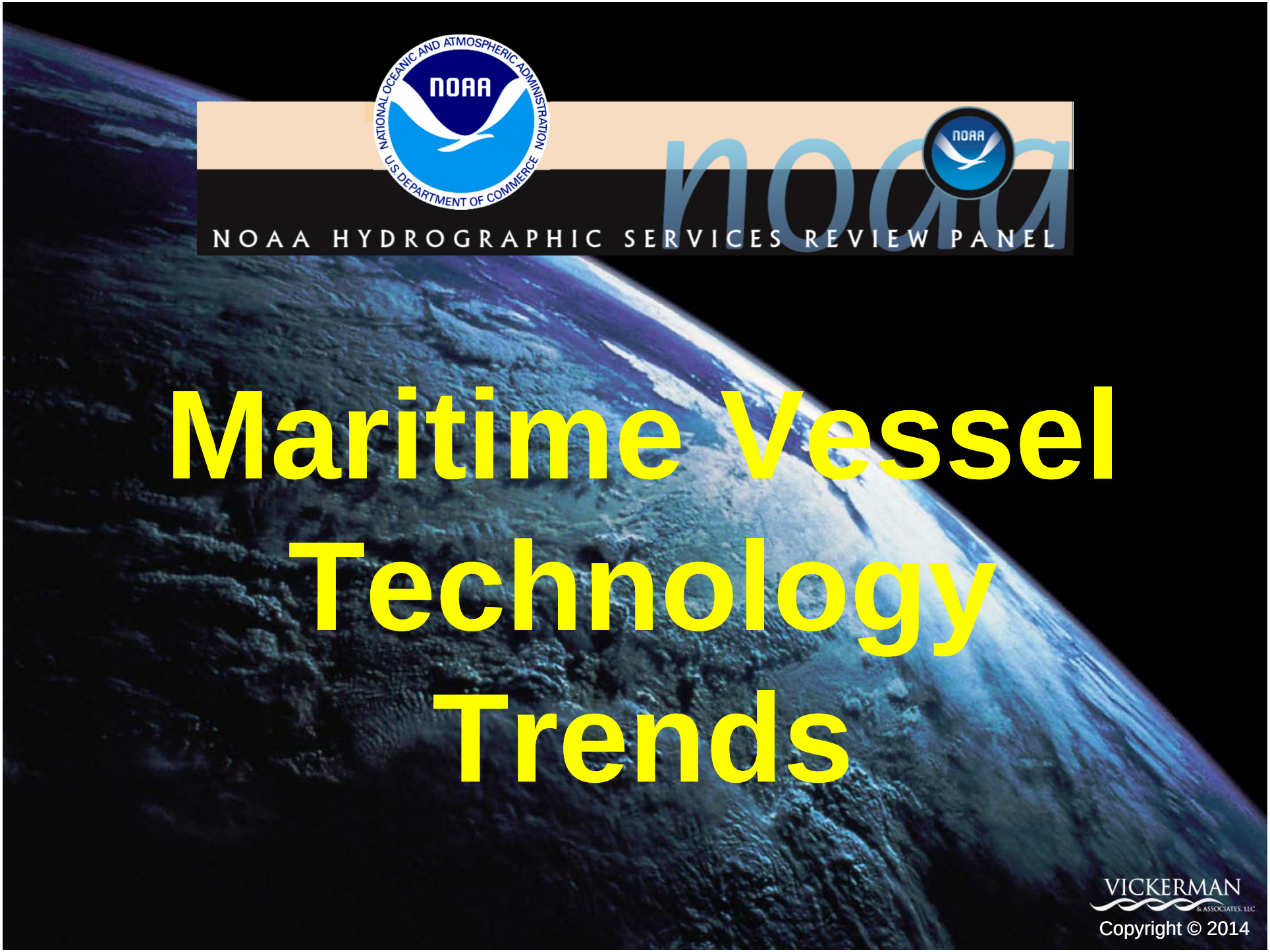
Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park

Shanghai Port Set a 2011 Record by Handling over 30 million TEUs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Maritime Vessel Technology Trends
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April 26, 1956

58 Modified 35-foot Truck Containers

April 2006: 50 Year Anniversary of the Container

In 1955 Malcolm McLean, sold McLean Trucking, and secured a bank loan of US$42 million to build the world's first container ship.

World Container Ship Evolution

1st Generation (Pre-1960 - 1970)

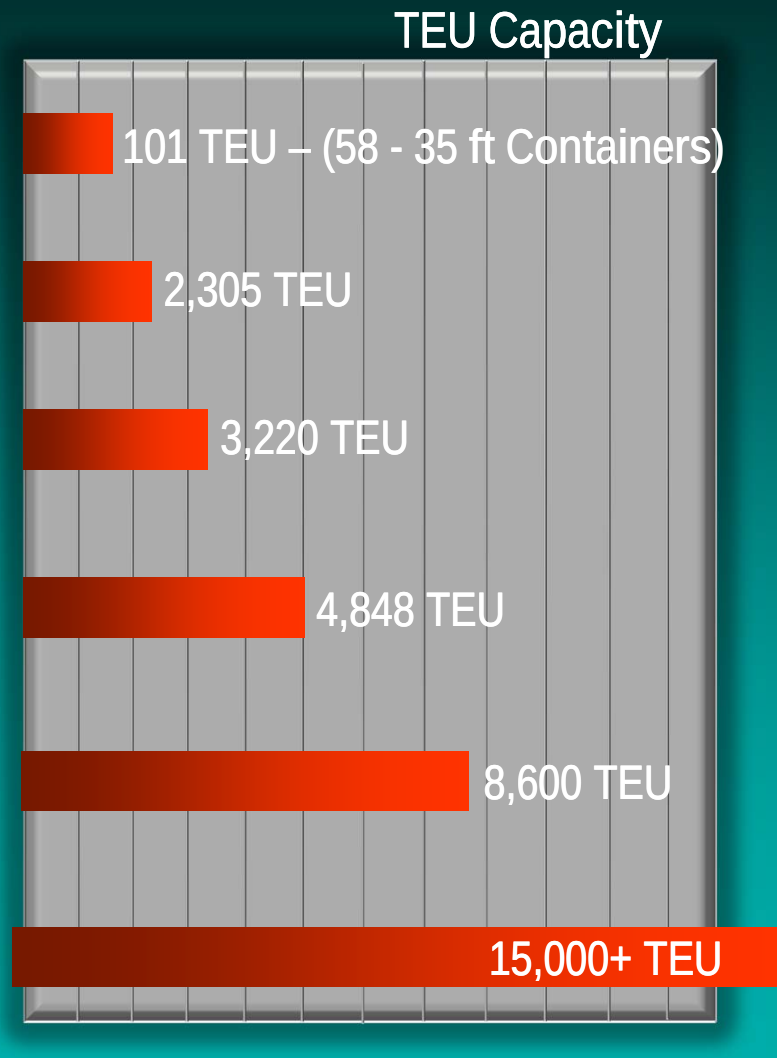
2nd Generation (1970 - 1980)

3rd Generation (1985)

4th Generation (1986 - 2000)

5th Generation (2000 - 2006)

6th Generation (2006 - 2012)



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World Container Ship Evolution

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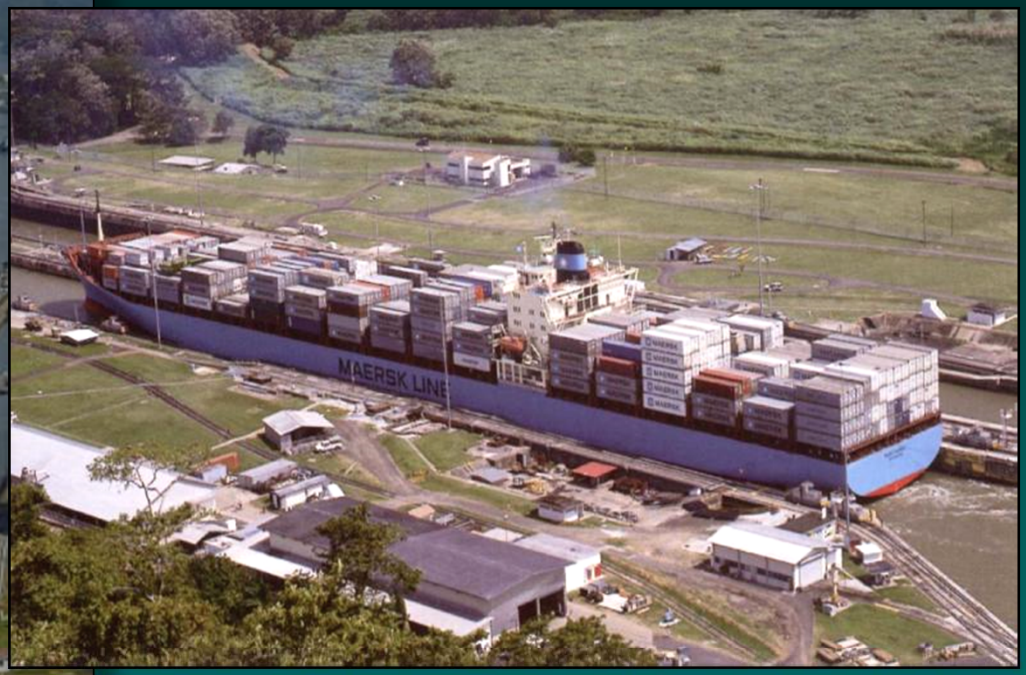
Madison Maersk (3,928 TEUs) in the Panama Canal

(Current Max Panamax Vessel Approx. 4,800 TEUs)



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*Maersk's New 30 Vessels (ordered) are **4** Times the Current Size of the Panama Canal & **1.5** times the Size of the Expanded Panama Canal*

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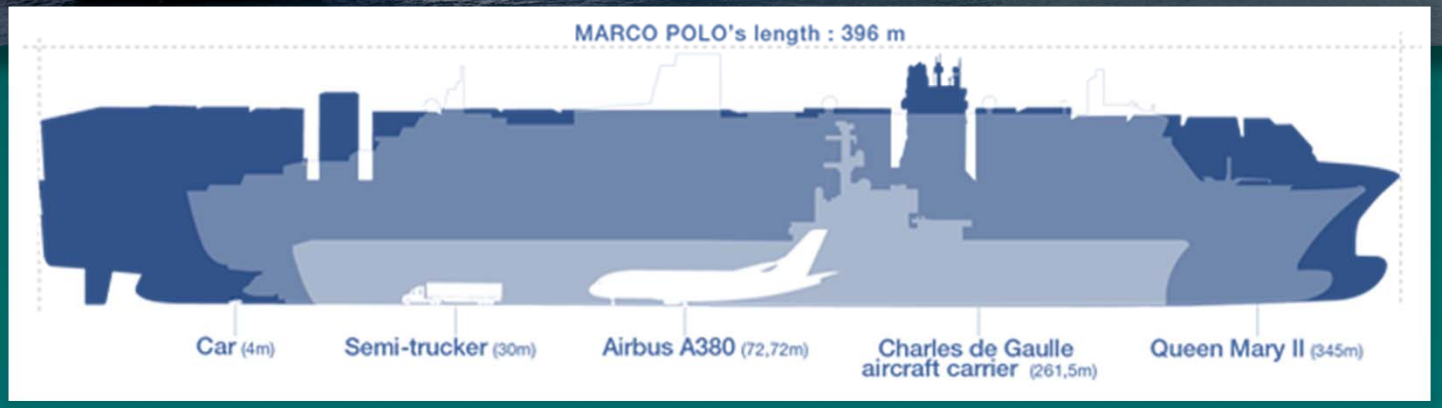
CMA-CGM's Marco Polo – 16,020 TEUs

Built by Daewoo Shipbuilding and Marine Engineering (DSME) in South Korea – January 2013

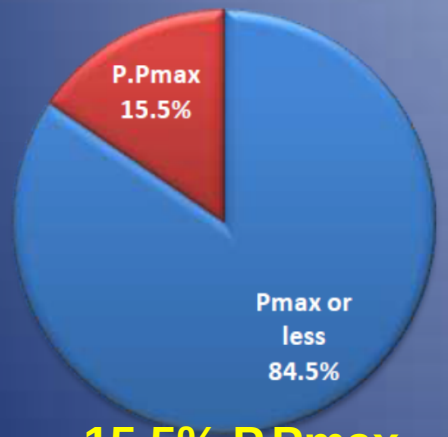


, 396 metres in length, 54 metres in width, and boasts a draft of 16 metres

Global Container Fleet Capacity & Vessel Size

(P.Pmax = Post Panamax Vessel)

Containership Fleet 2000
(4.79 million TEUs)

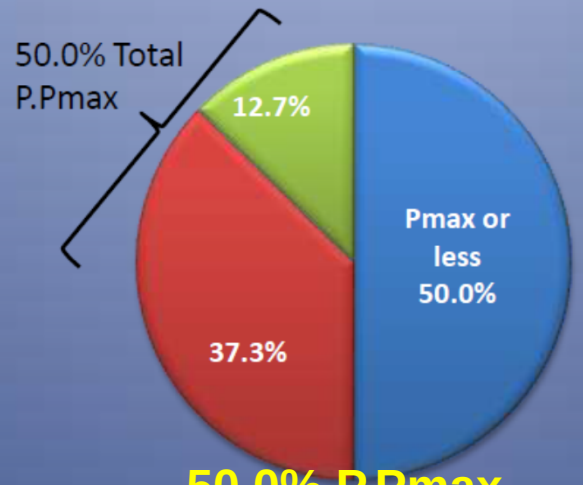


15.5% P.Pmax

0-4,000+ teu 4,000-6,000+ teu

371 Panamax vessels
134 Post Panamax vessels

Containership Fleet 2012
(16.2 million TEUs)

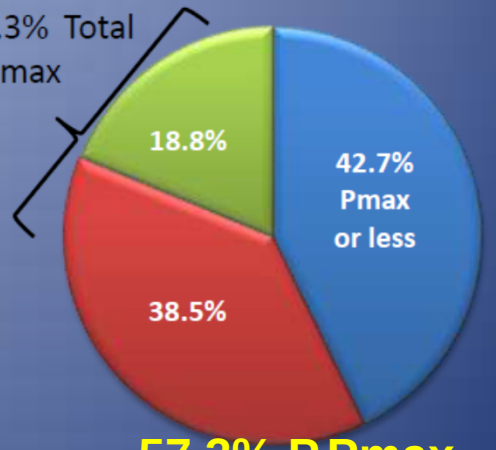


50.0% P.Pmax

0-5,000 teu 5-10,000 teu 10,000+ teu

949 Panamax vessels
1,048 Post Panamax vessels

Containership Fleet 2016
(19.7 million TEUs)



57.3% P.Pmax

0-5,000 teu 5-10,000 teu 10,000+ teu

974 Panamax vessels
1,397 Post Panamax vessels

Dramatic Increase in Post Panamax Container Ship Sizes

Source: Clarkson's Research Studies – December 2012

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NYK LOGISTICS & MEGACARRIER

NYK Super Eco Ship

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NYK LOGISTICS & MEGACARRIER

NYK Super Eco Ship

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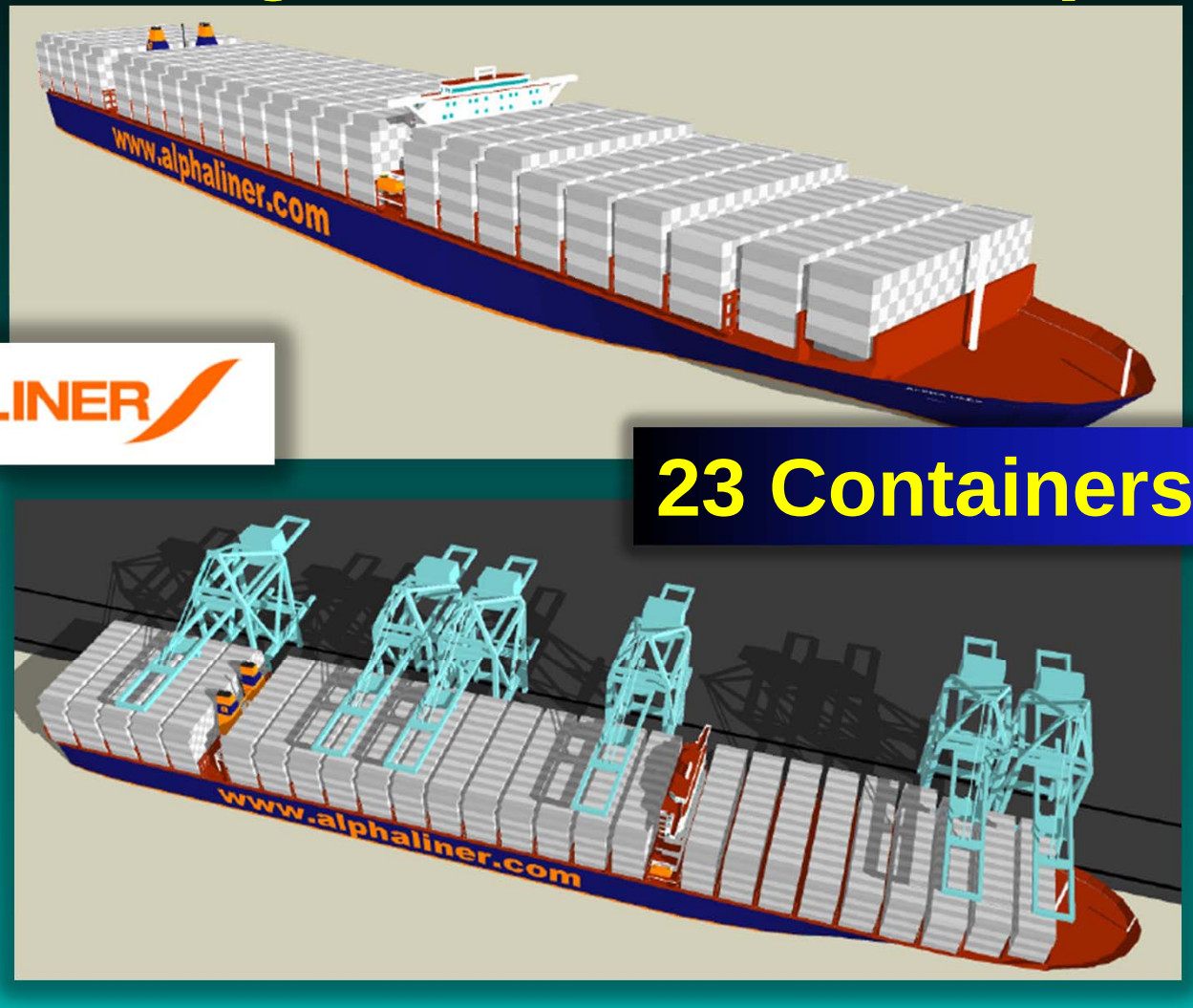
21,000 TEU Ultra Large Twin Engine Container Ship - 2012



ALPHALINER

23 Containers Wide

Source: Alphaliner Newsletter Volume 2011 Issue 4

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Future Container Vessel Characteristics:

Capacity = up to 22,000 TEUs
Deck Stow: 23 wide & 7- 9 Containers above hatch
Length = up to 1,445 ft (4.5 Football Fields)
Beam = up to 194 ft
Deadweight Tonnage = 220,000 Long Tons
Draft = up to 54 ft

Far Exceeds the 2014/15 Panama Third Lane Capacity

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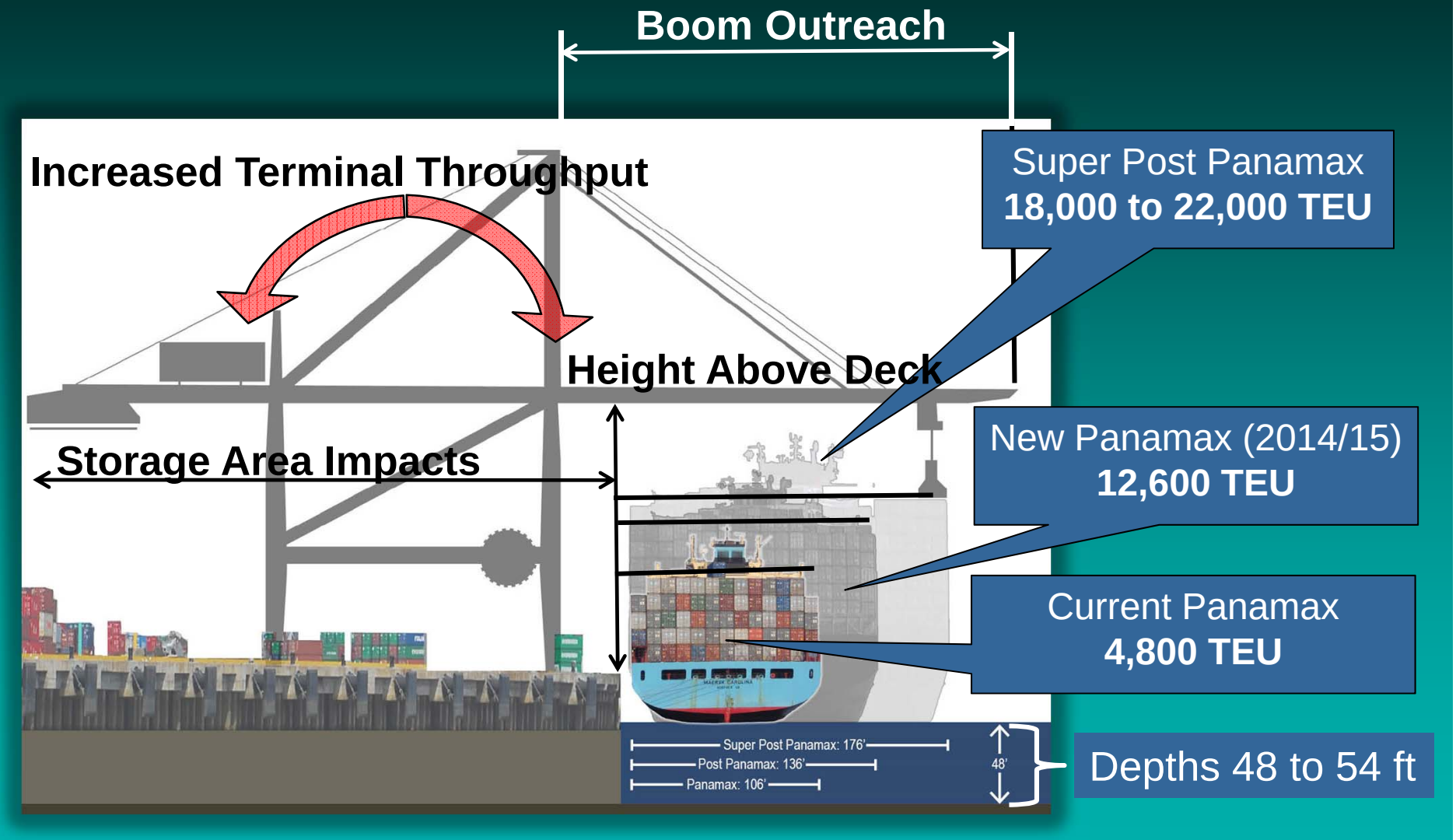
Vessel Size Expansion - Terminal Impacts

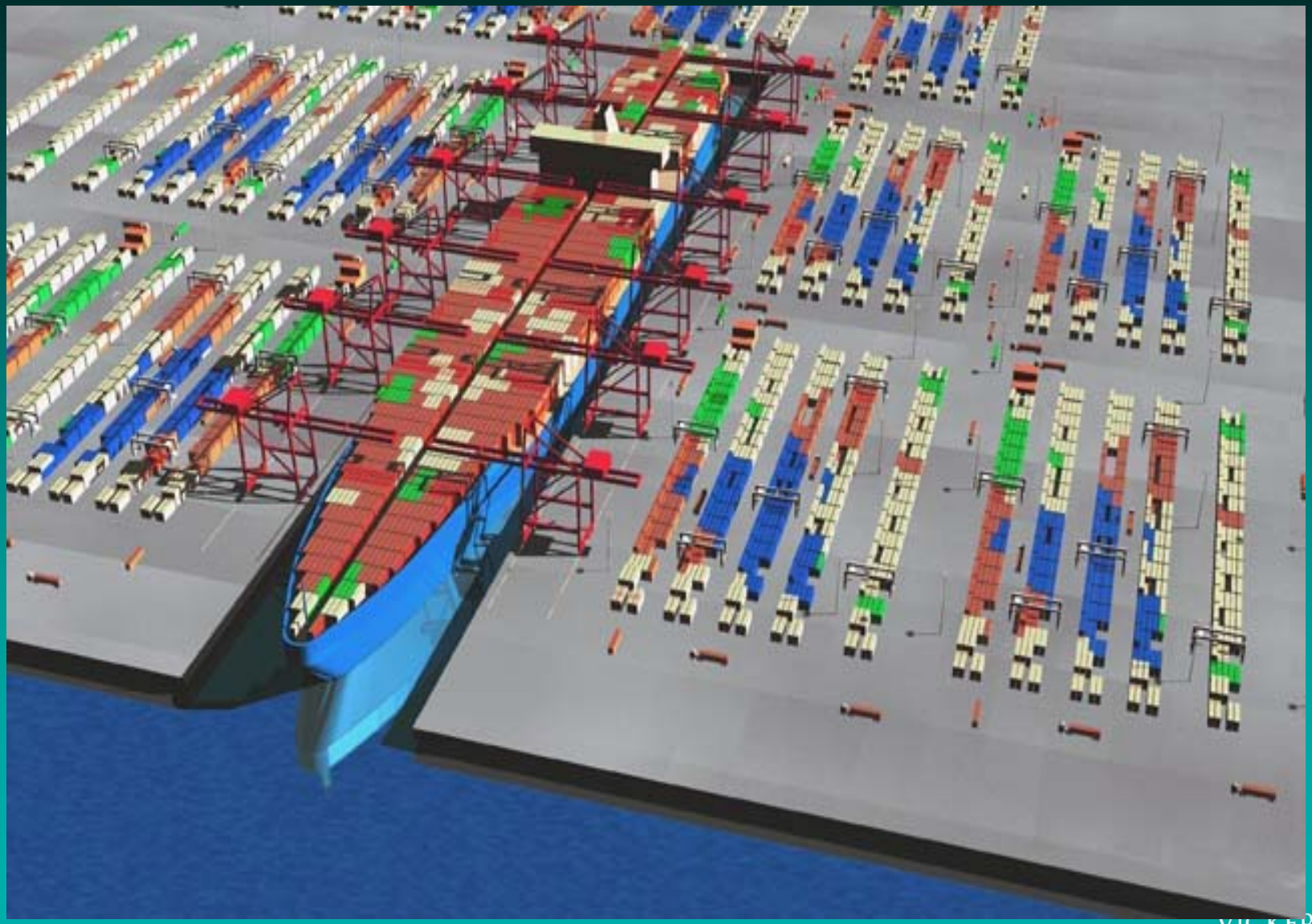
(Port Terminal Infrastructure & Equipment Geometry Impacts)



Source: Georgia Ports Authority and Vickerman & Associates

Port of Amsterdam Ship in a Slip (Ceres Terminal)

Container Ship-in-a-Slip Concept



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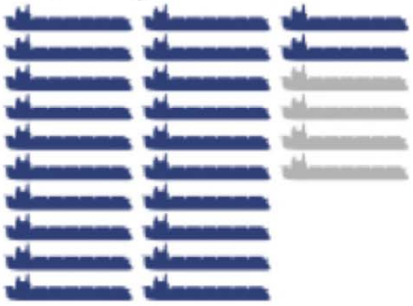
P3 Operating Alliance Network Carriers:

(Maersk Line, Mediterranean Shipping and CMA CGM) Starts 2nd Qtr. 2014

Collective shares across all East-west trades

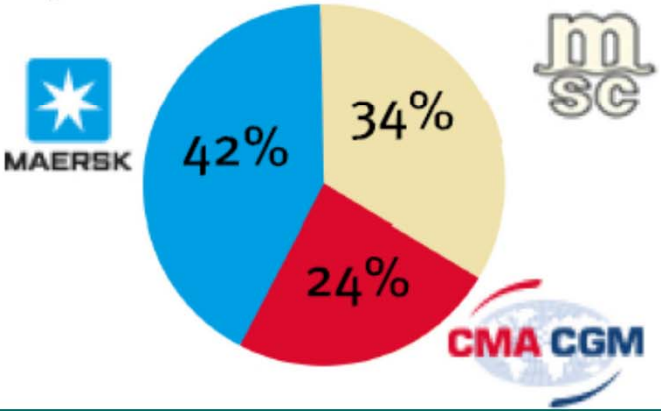
	Total teu deployed	Trade share
Maersk	1,137,945	15.9%
CMA CGM	663,488	9.3%
MSC	889,924	12.4%
Total	2,691,357	37.6%

Capacity:



Initially 255 vessels of 2.6m teu deployed on 29 routes

Ship contributions:




Cipher
Information Into Knowledge
Maritime
Simulation
Institute
A division of the United States Maritime Resource Center
A 501(c)(3) Non-profit Corporation
One Day Structured Interactive Seminar on
MODERN MARITIME CONTAINER PORT
TERMINAL OPERATIONS
New Era of LNG Vessels
is on the Horizon:
Will LNG be the Fuel of the
Future for Shipping ?
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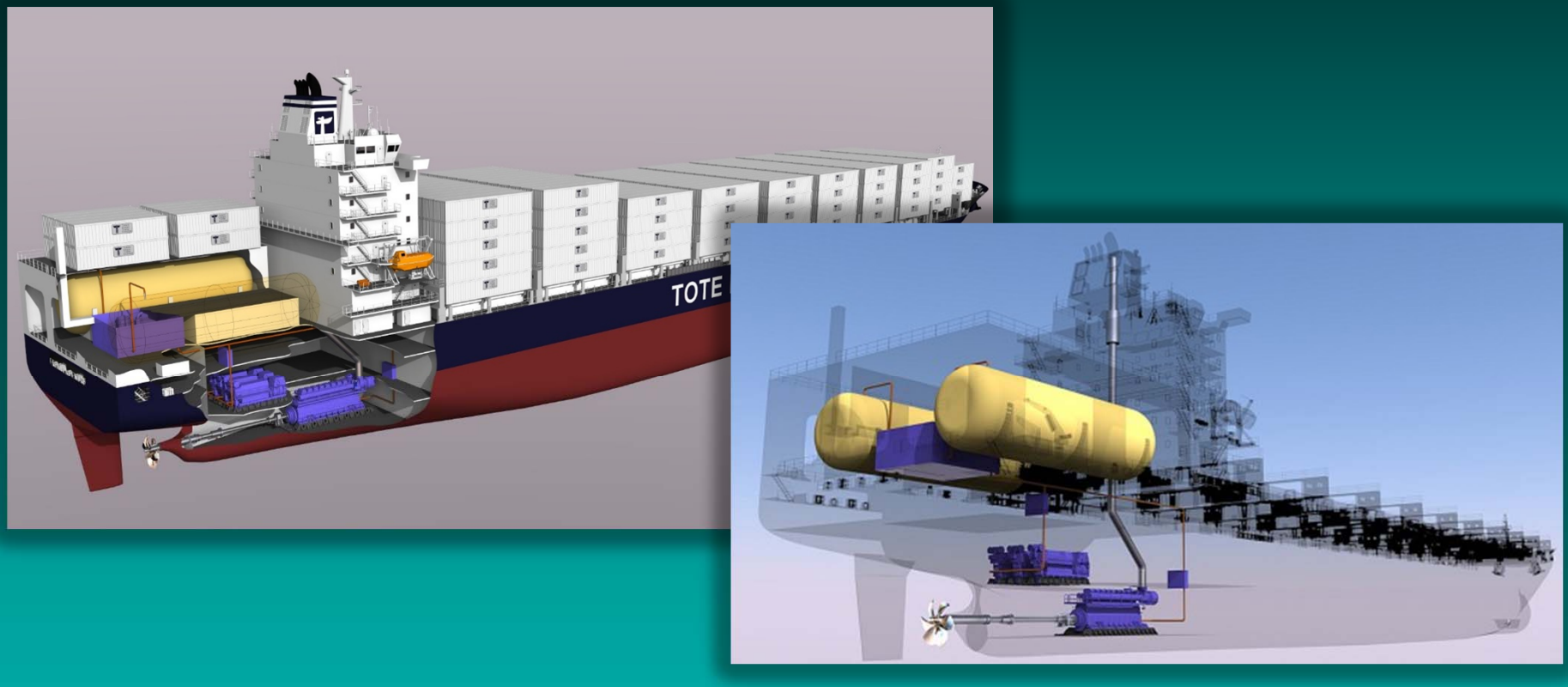
TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World

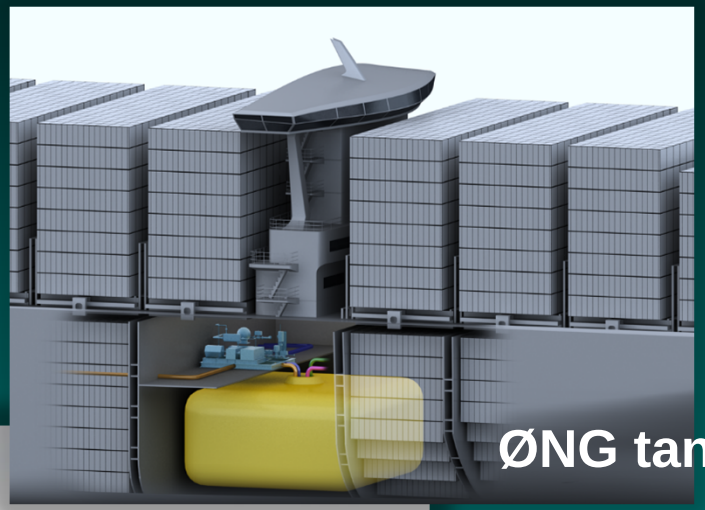
These ships will be the largest ships in the world powered primarily by Liquefied Natural Gas (LNG).

TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World



Two 839-foot Orca-class vessels to liquefied natural gas-diesel dual fuel operation for Seattle-Alaska service and two 764-foot new-builds for the Florida-Puerto Rico trade

Kawasaki Heavy Industries 9,000 TEU container ship Fuelled by LNG



A new type of LNG tank that provides more space for container cargo.

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Germanischer Lloyd (GL) & IHI Marine United Inc. (IHIMU)

Concept Study 13,000 TEU Container Vessel Fuelled by LNG

The eFuture 13000C design (©IHIMU)

LNG Vessel Bunkering: *North American Ports Are Not Prepared…*

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Shell's FLNG

The Largest Floating Structure in the World

Shell's Floating Liquefied Natural Gas Facility,

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Panama Canal Expansion: New Capacity
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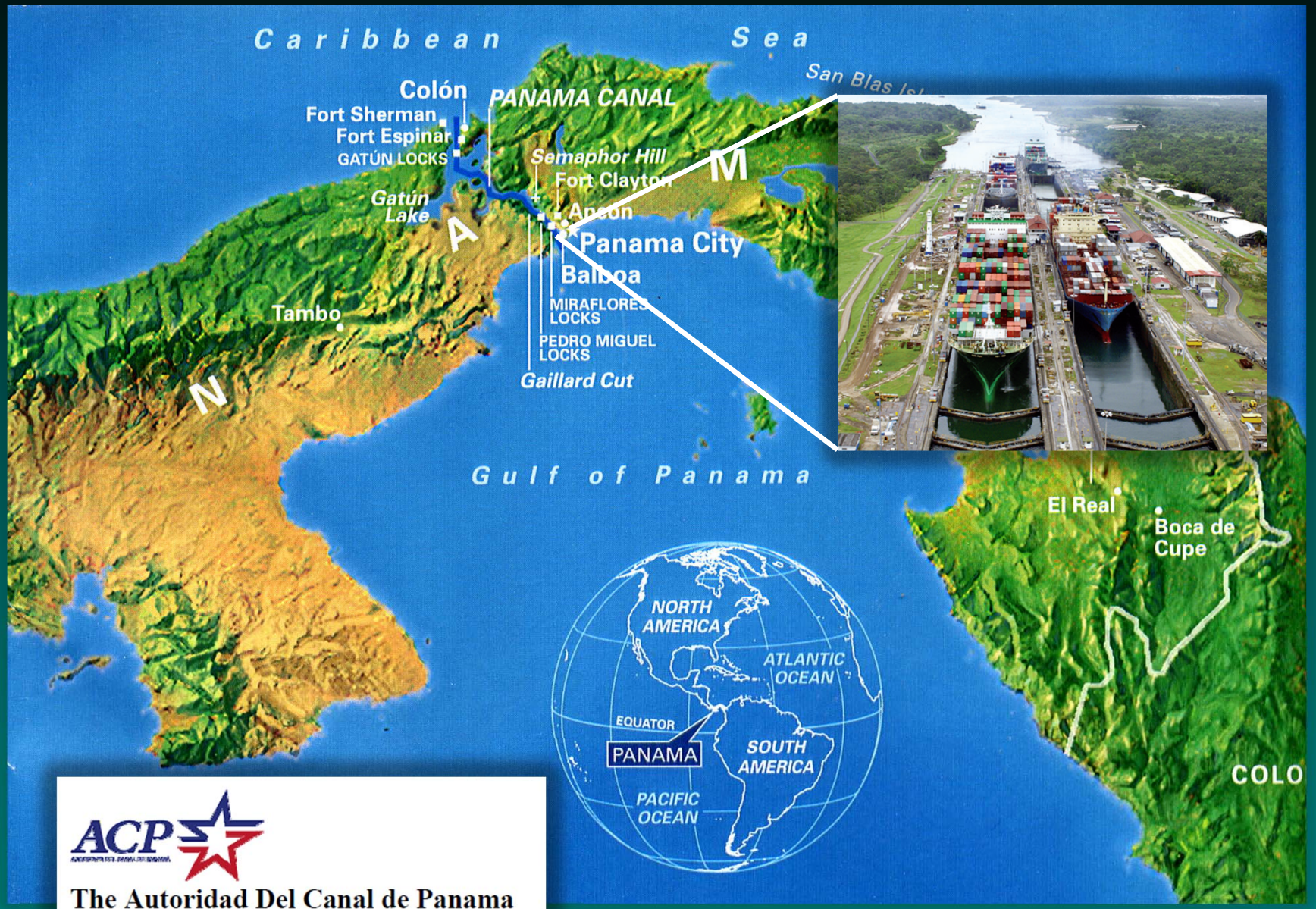
Panama Canal Route



ACP

The Autoridad Del Canal de Panama

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Panama Canal Third Lane Expansion
Circa Late 2015 – Early 2016

Panama Canal Third Lane Expansion

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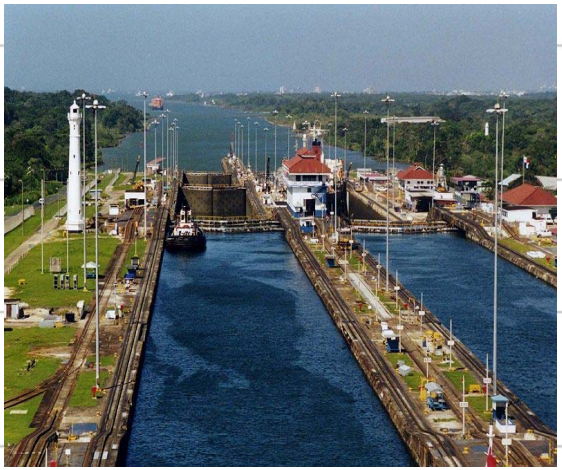
Panama Canal Historical Tonnage Traffic



Source: ACP Data

The Panama Canal Circa 1914

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Panama Canal Today

The Autoridad Del Canal de Panama

A Larger Share of Other Vessels Will be Able to Transit the Canal - Fully Loaded

Crude Oil - 0% to 42%

LNG - 10% to 90%

Dry Bulk - 55% to 80%

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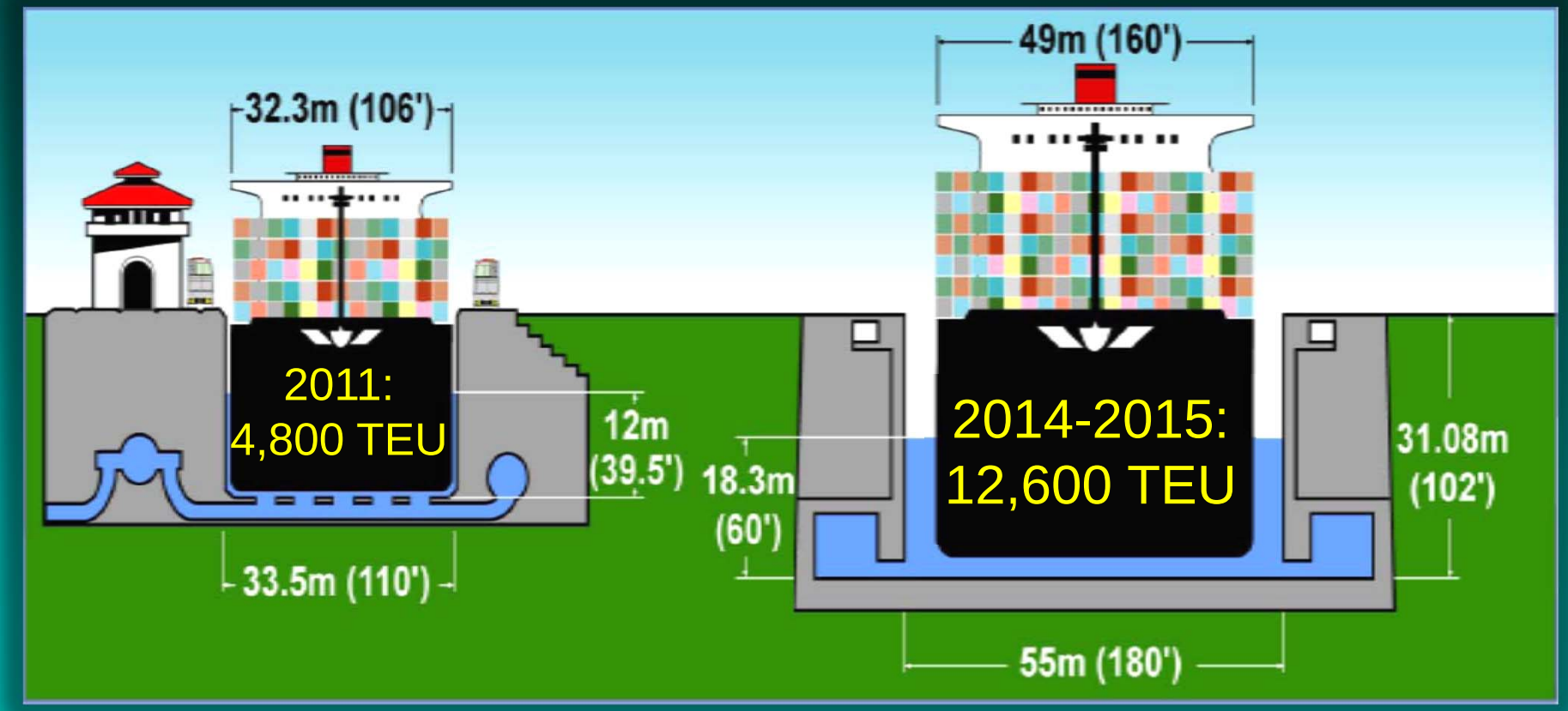
The Autoridad Del Canal de Panama

Panama Canal Third Lane Expansion Capabilities



Source: ACP Expansion Project

January 6, 2014: "Panama Canal Contractor Accused of Slow-Down Tactics"

Grupo Unidos por el Canal (GUPC)

(current $3.2 billion fixed-price contract):

- January 19, 2014: Suspension of Work if GUPC is not reimbursed $1.6 billion in cost overruns
- Current Schedule: Start of commercial transits: fourth quarter of 2015.

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Emerging New Caribbean Transhipment Center
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Panama Ports Annual *Transhipment Growth*

Proposed New Port Projects Would More Than Double the Total in 5 Years

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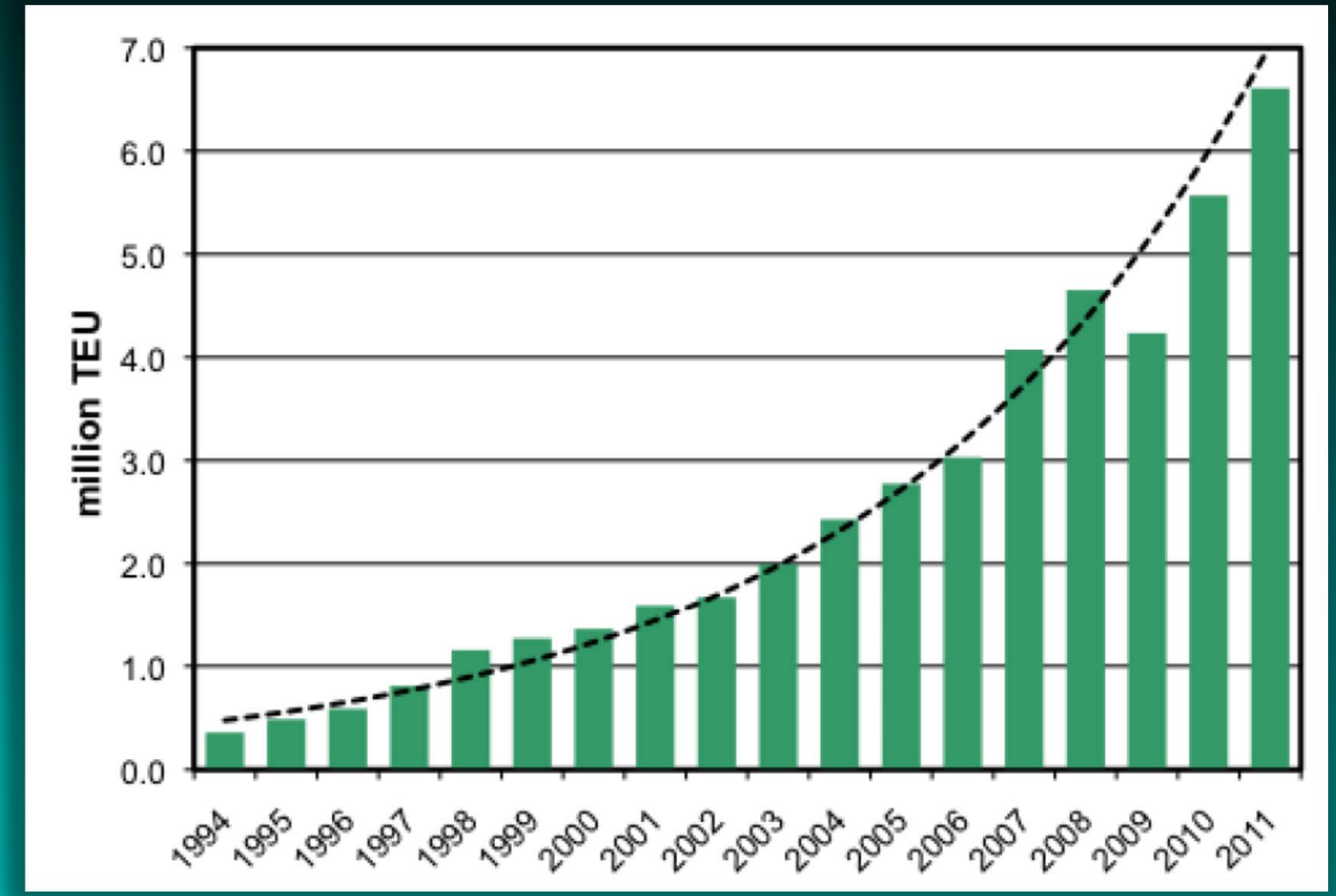
Panama Ports Container *Transhipment Growth*



6.8 Million TEUs – 18.5 % Growth Rate

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Non-Transit Panama Canal "Feeder Services"

May Be the Real Boom from the Canal Expansion

Weekly Through Transits

Feeder Services – No Transit

Source: ACP and Compare , 2008 Data

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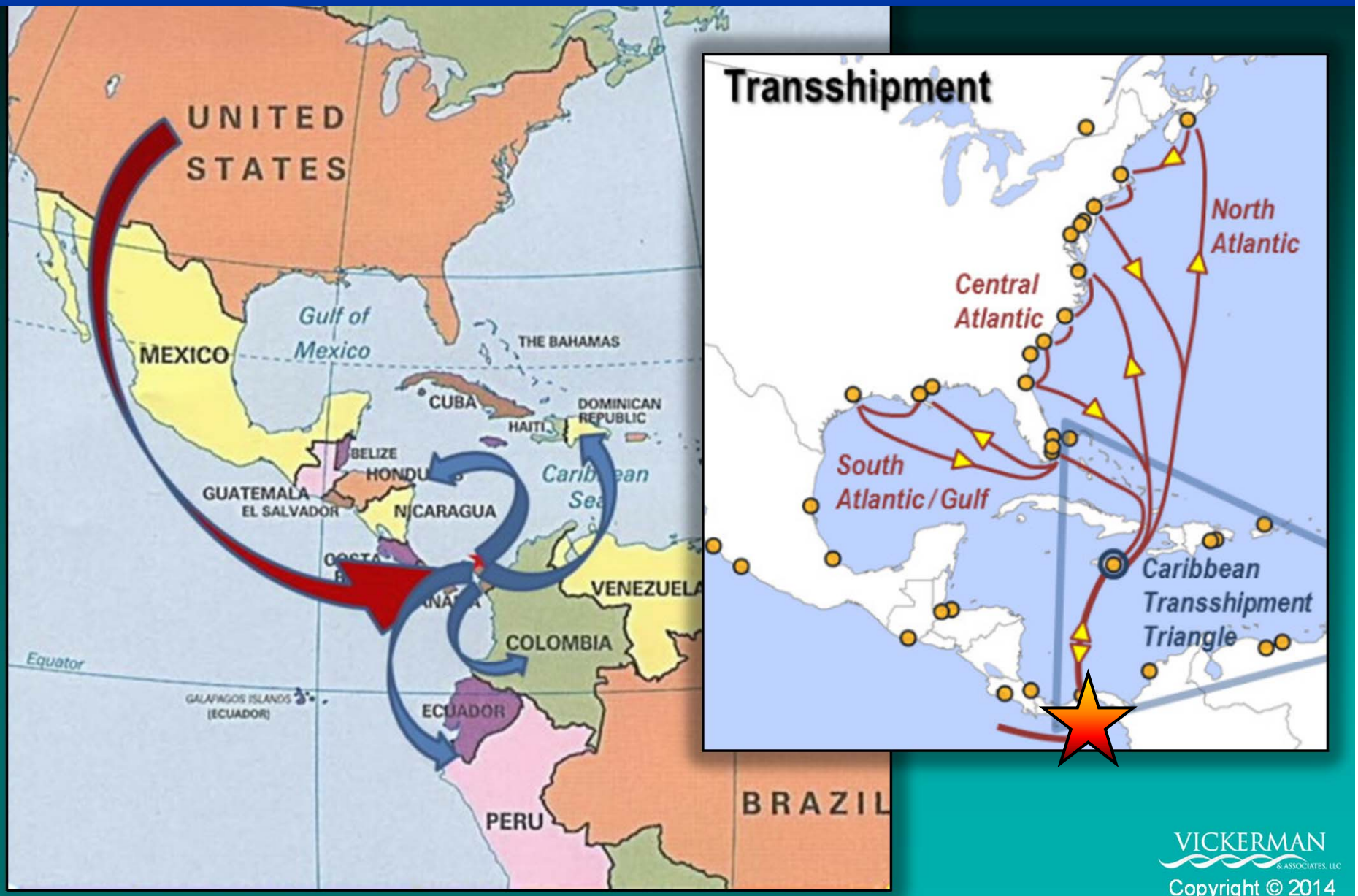
The Panama Canal Expansion Will Move the Caribbean Transhipment Center Point to Panama

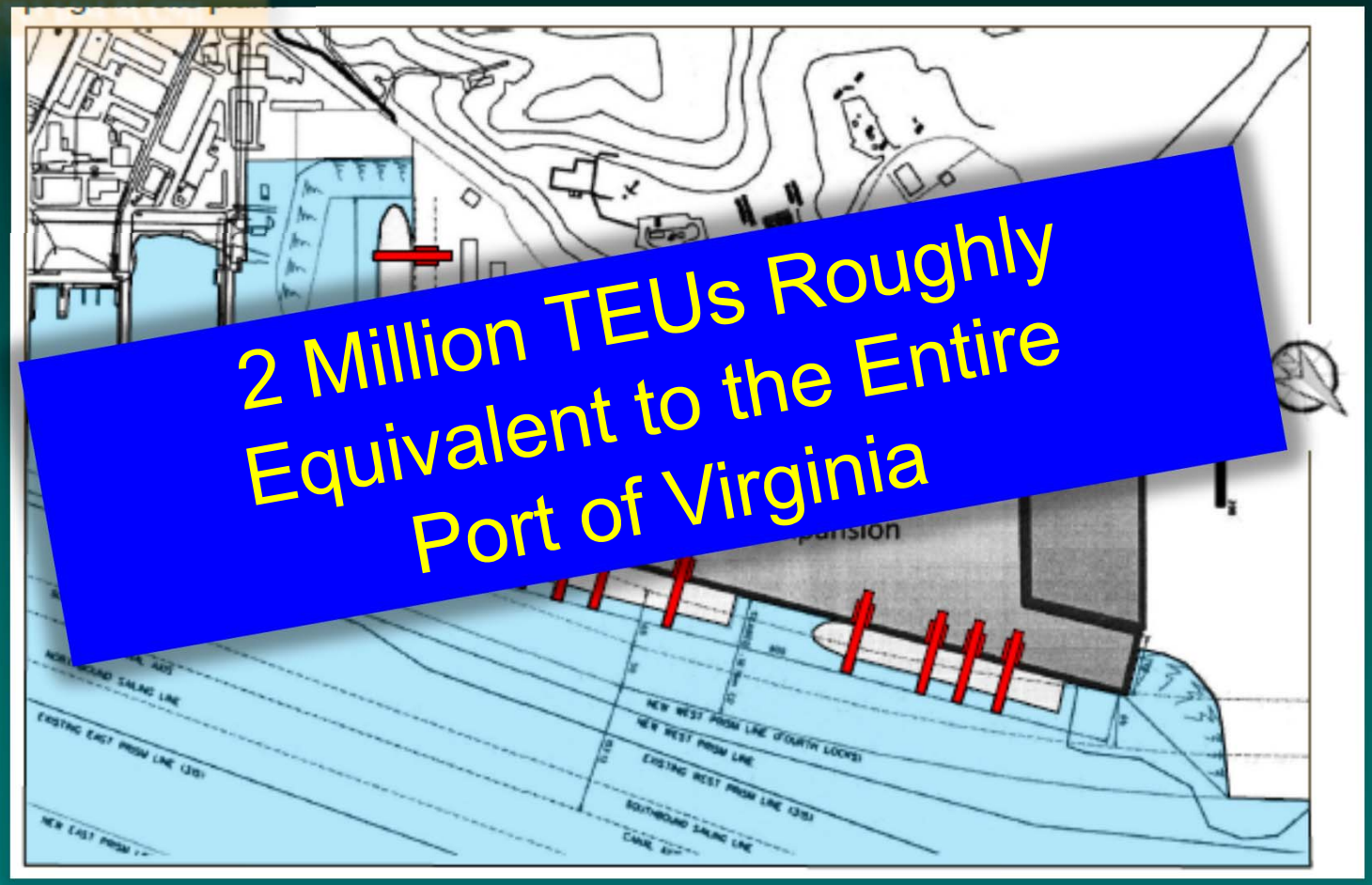


New Panama Canal Pacific Entrance Ports

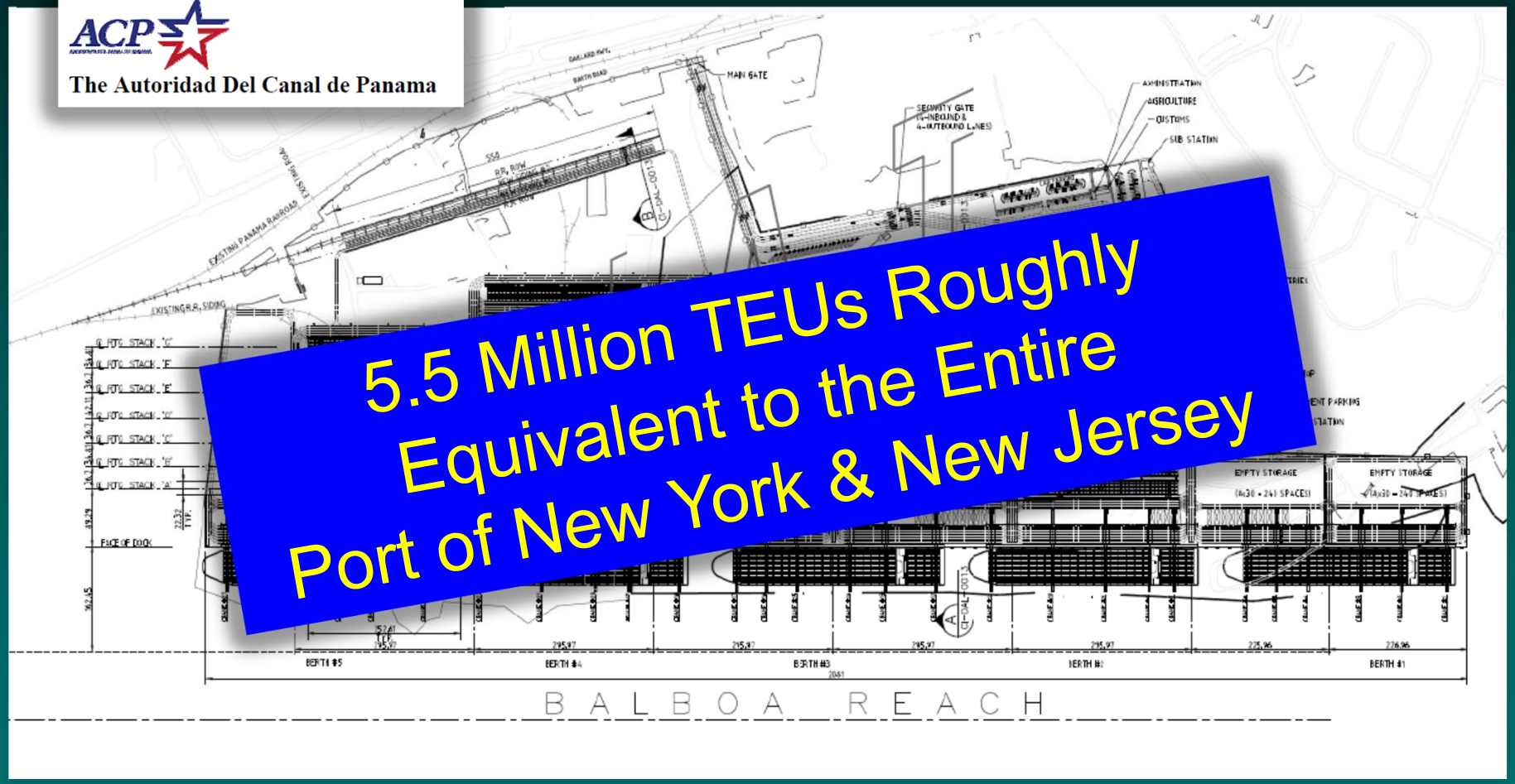
ACP

The Autoridad Del Canal de Panama

PSA Panama International Terminal (PPIT) Western Entrance Conceptual Site Plan, Phase I +II



Corozal Oeste Container New Transhipment Terminal Panama Canal Western Entrance - Phase I & II



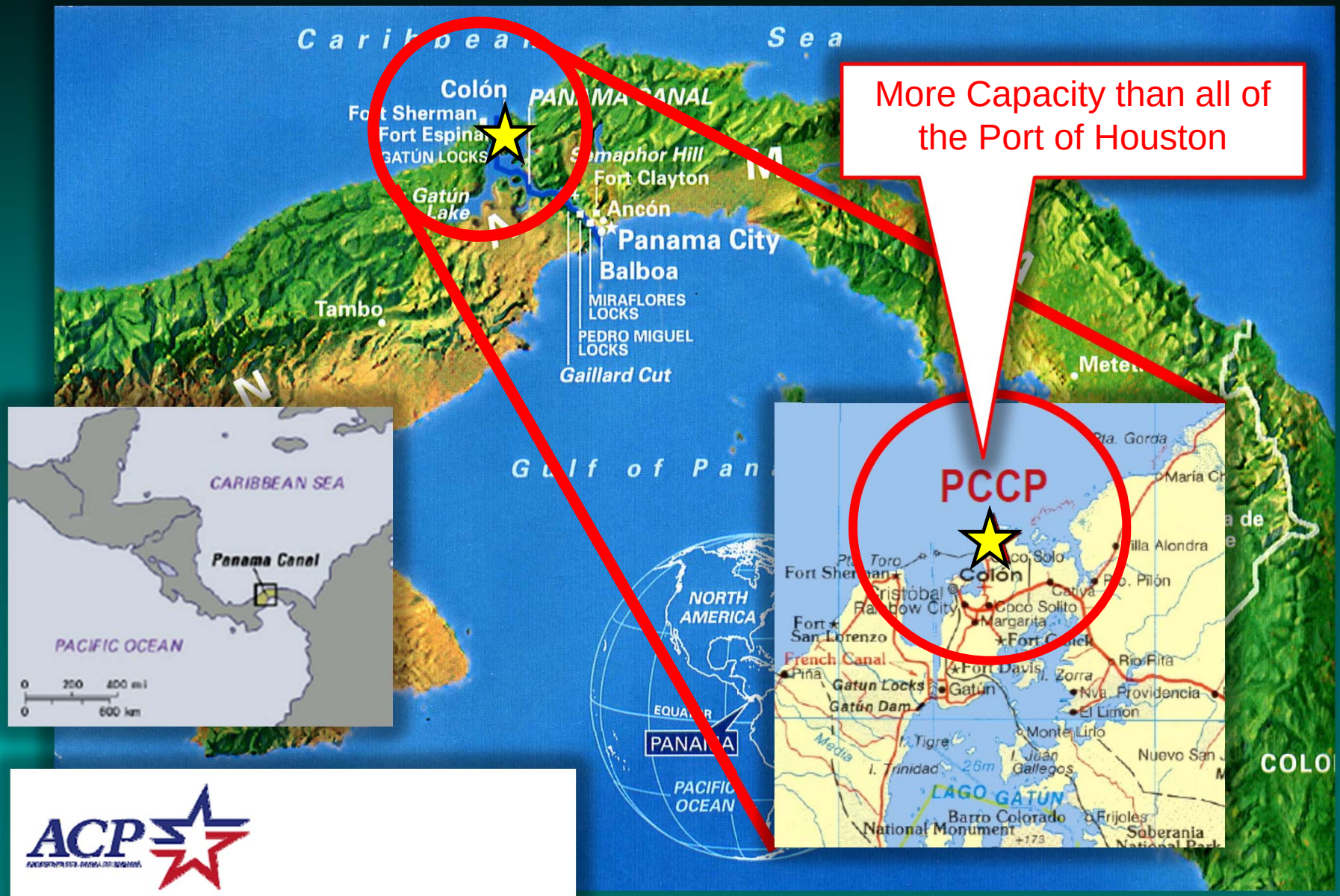
Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013

Corozal Oeste Container
New Transhipment Terminal
Panama Canal Pacific Entrance - Phase I & II

Terminal: 116 hectares (286.6 acres)

Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013

New Panama Canal Atlantic Entrance Port



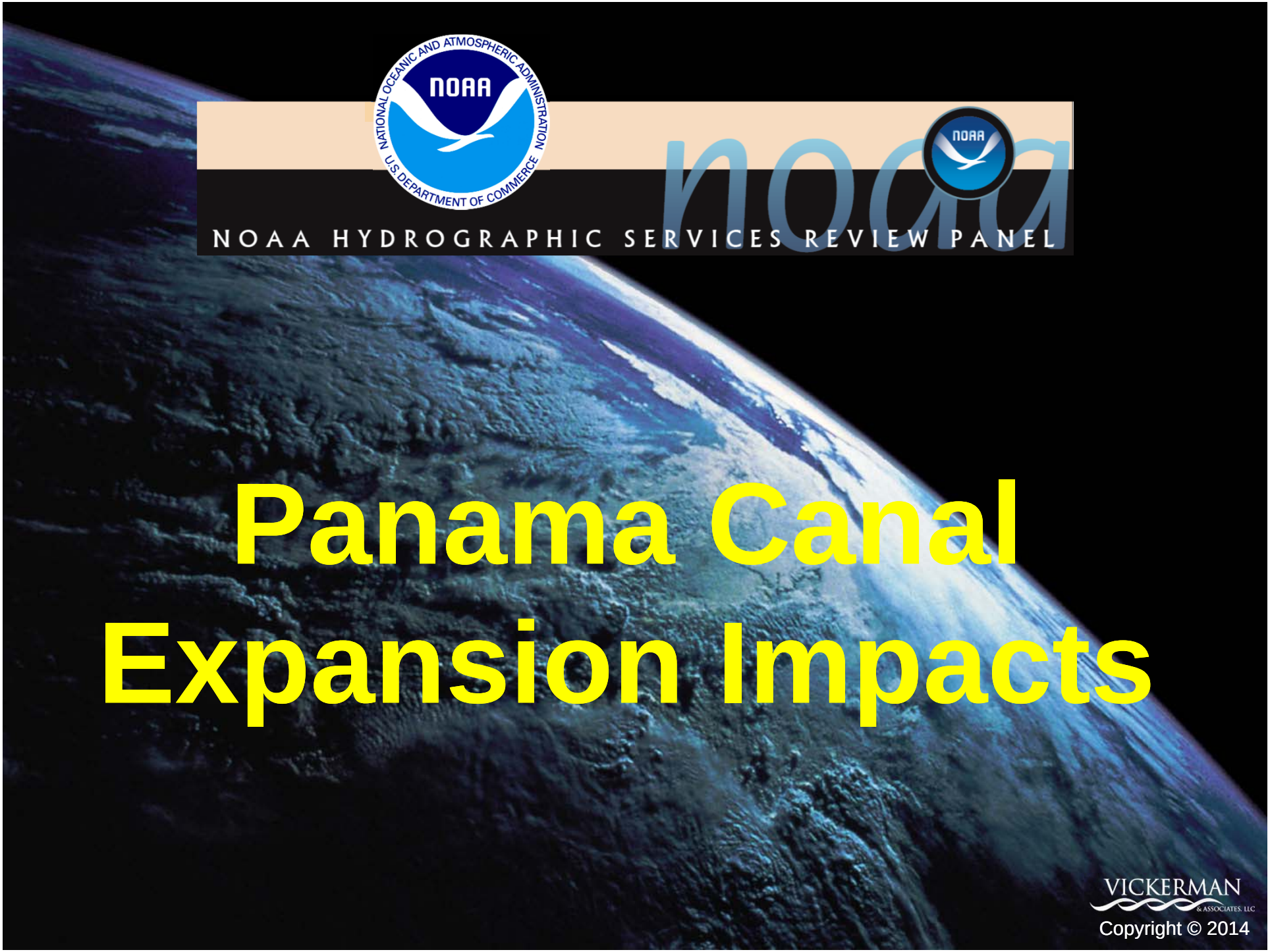
ACP

The Autoridad Del Canal de Panama

Panama Colon Container Port

(New $600 Million Container Port Panama Canal Atlantic Entrance)

The terminal, with an initial capacity of two million TEU, will be constructed by a consortium of Asian developers under the name Panama Colon Container Port LLC (PCCP)



Panama Canal Vessel Deployments Will Determine New US Logistics Patterns

The Distance to New Orleans and Savannah Via the Panama Canal

A <u>Competitive & Robust</u> Landside Access to the Gateway Port's <u>Inland Market</u> will be a Key Success Factor!

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The Primary North American Competitor to the Panama Canal is the Class I Rail Intermodal System

(Potential Increased Service Offerings and System Capacity)

Source: USDOT Maritime Administration (MARAD) 2009

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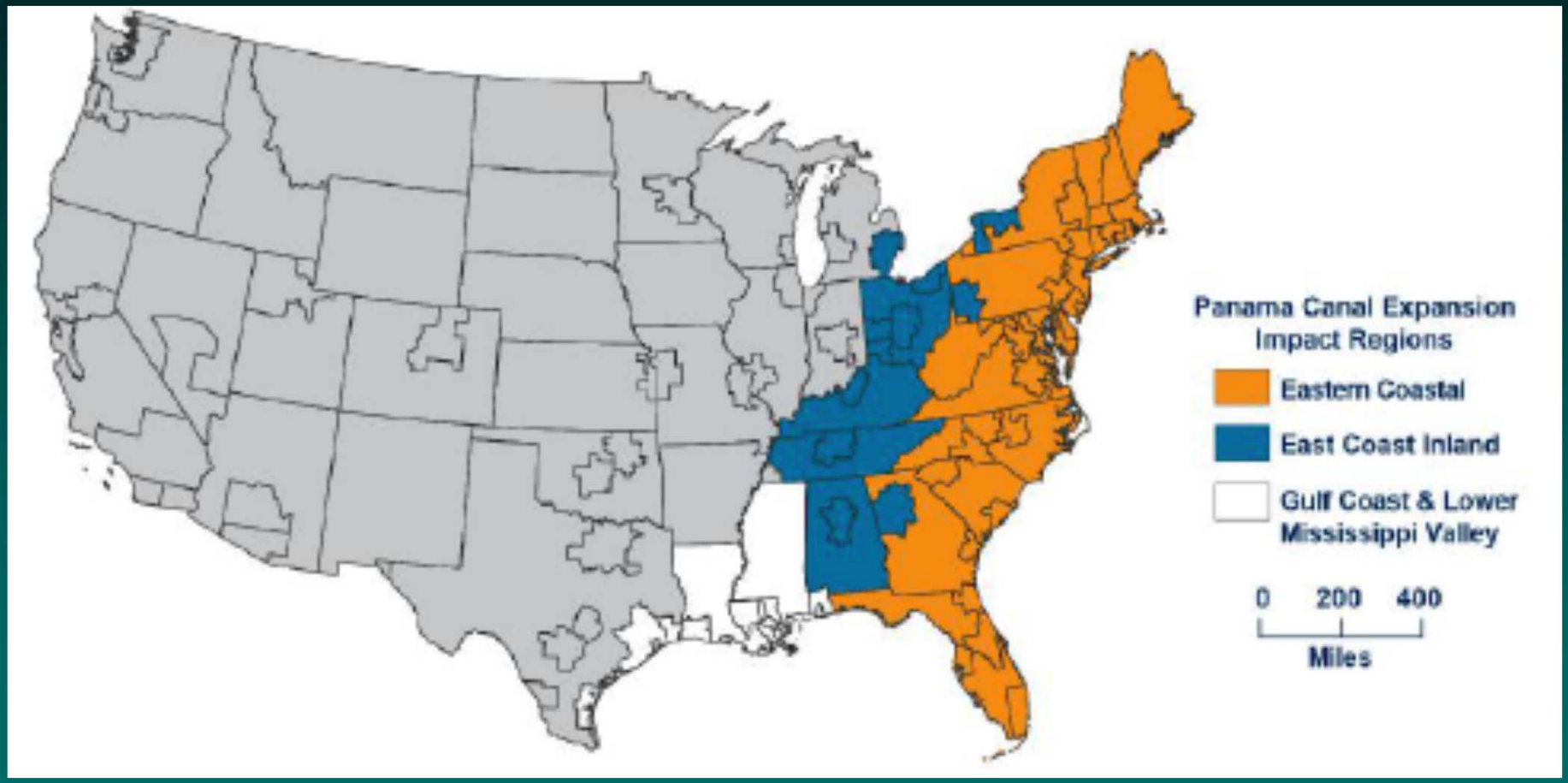
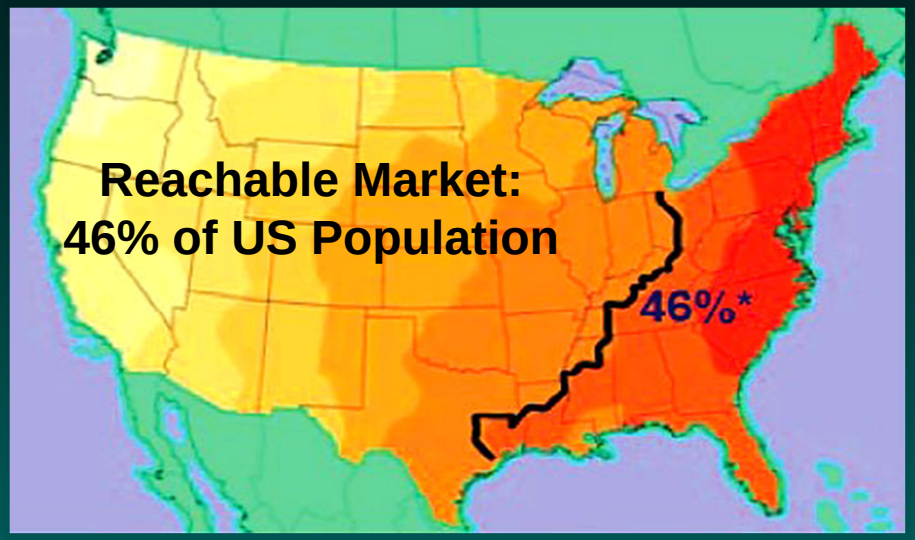
US States Affected By The Panama Canal Expansion – Containerized Cargo

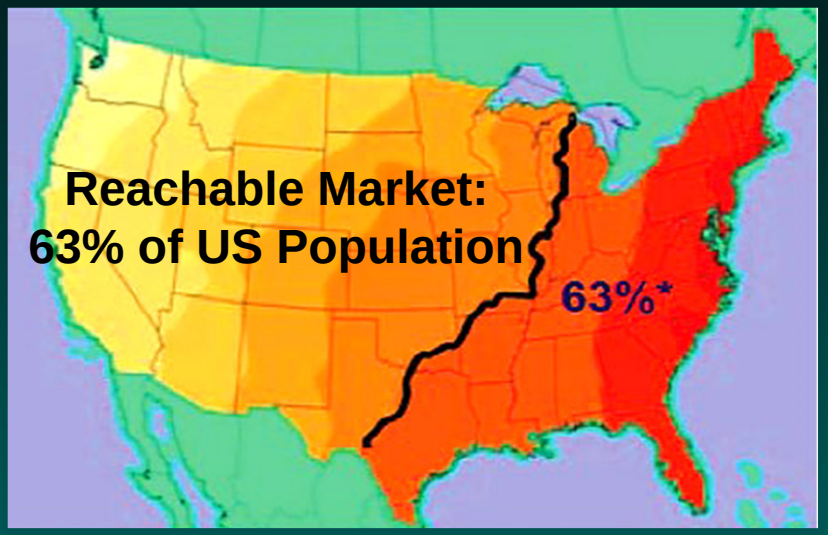


Source: USDOT Panama Canal Expansion Study – November 2013

Dramatic US Market Penetration after 2015

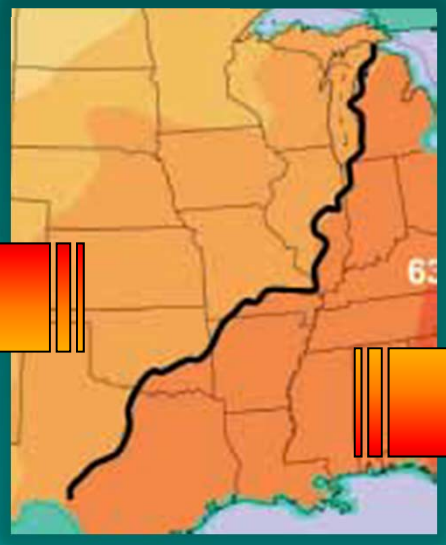
Panama Canal Economies of Scale with permit deeper market penetration into the US





4,000 TEU ship, all-water.

8,000 TEU ship, all-water.



West Coast
Cost Advantage

East Coast
Cost Advantage

Source: PB Consultants - CSX Transportation May 12, 2011 - Director of Strategic Analysis

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Dramatic US Market Penetration after 2015

Panama Canal Economies of Scale with permit deeper market penetration into the US

Source: ACP Expansion Project – Rodolfo Sabonge AAPA January 24, 2013

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