



2015 Eastern Chapter Annual Meeting

October 29, 2015

Suez & Panama Canal Expansion: Impacts & Opportunities on the US East Coast

M. John Vickerman



Williamsburg, Virginia

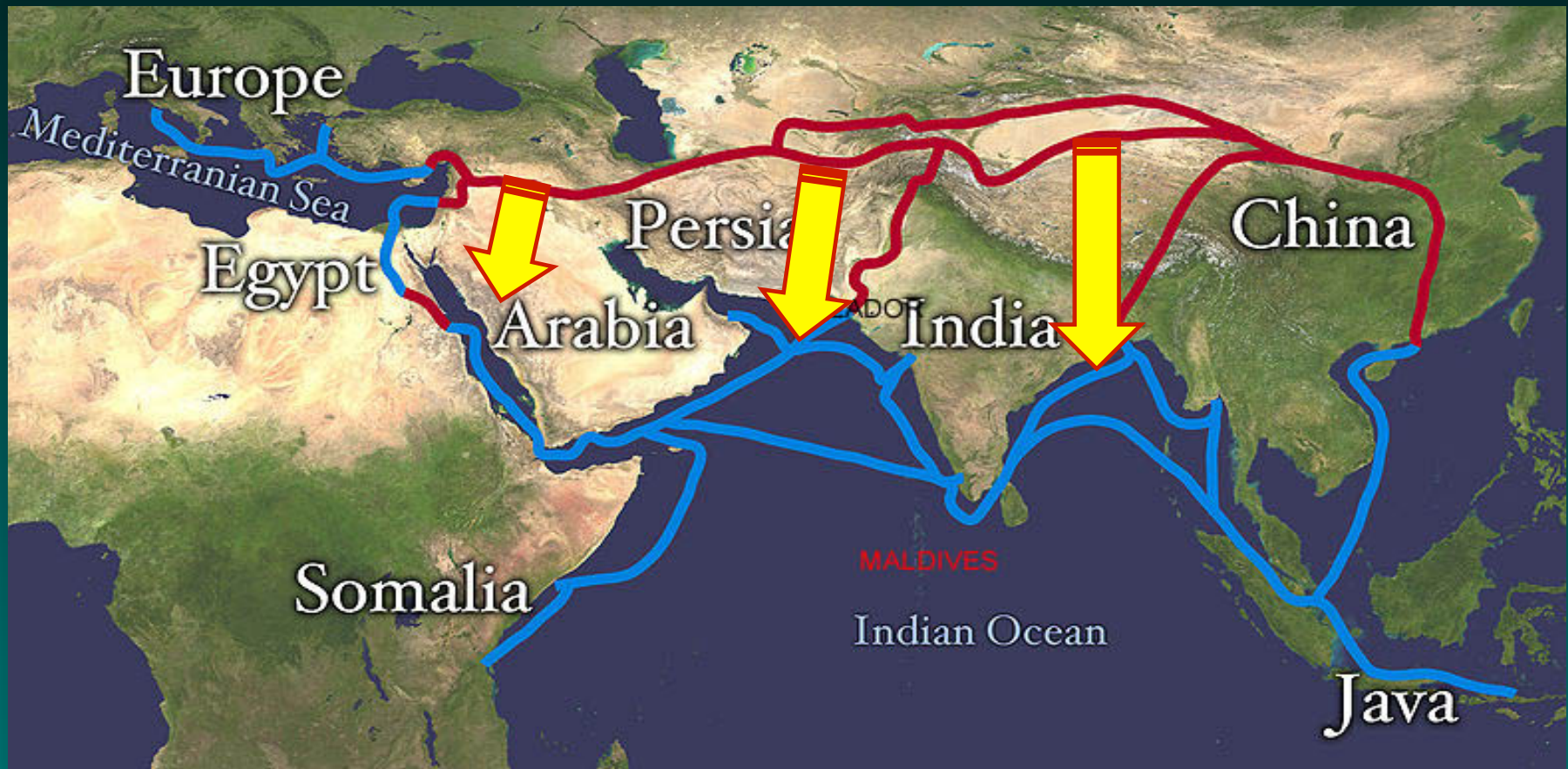


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The Evolution of Today's Global Shipping Lanes



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



The Marine Silk Road was a Precursor to:



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

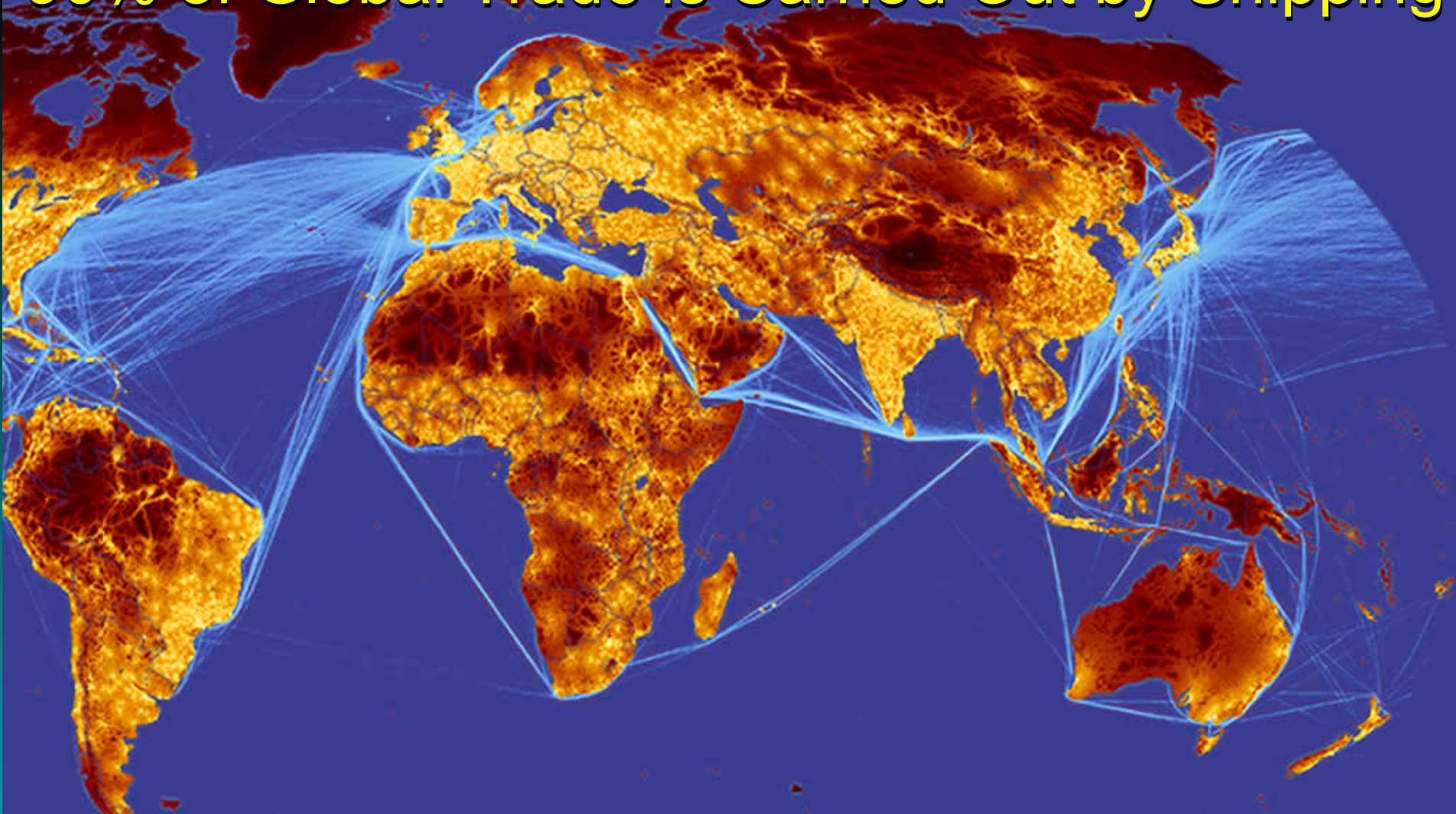
The World's Primary Shipping Routes



The Marine Silk Road



90% of Global Trade is Carried Out by Shipping

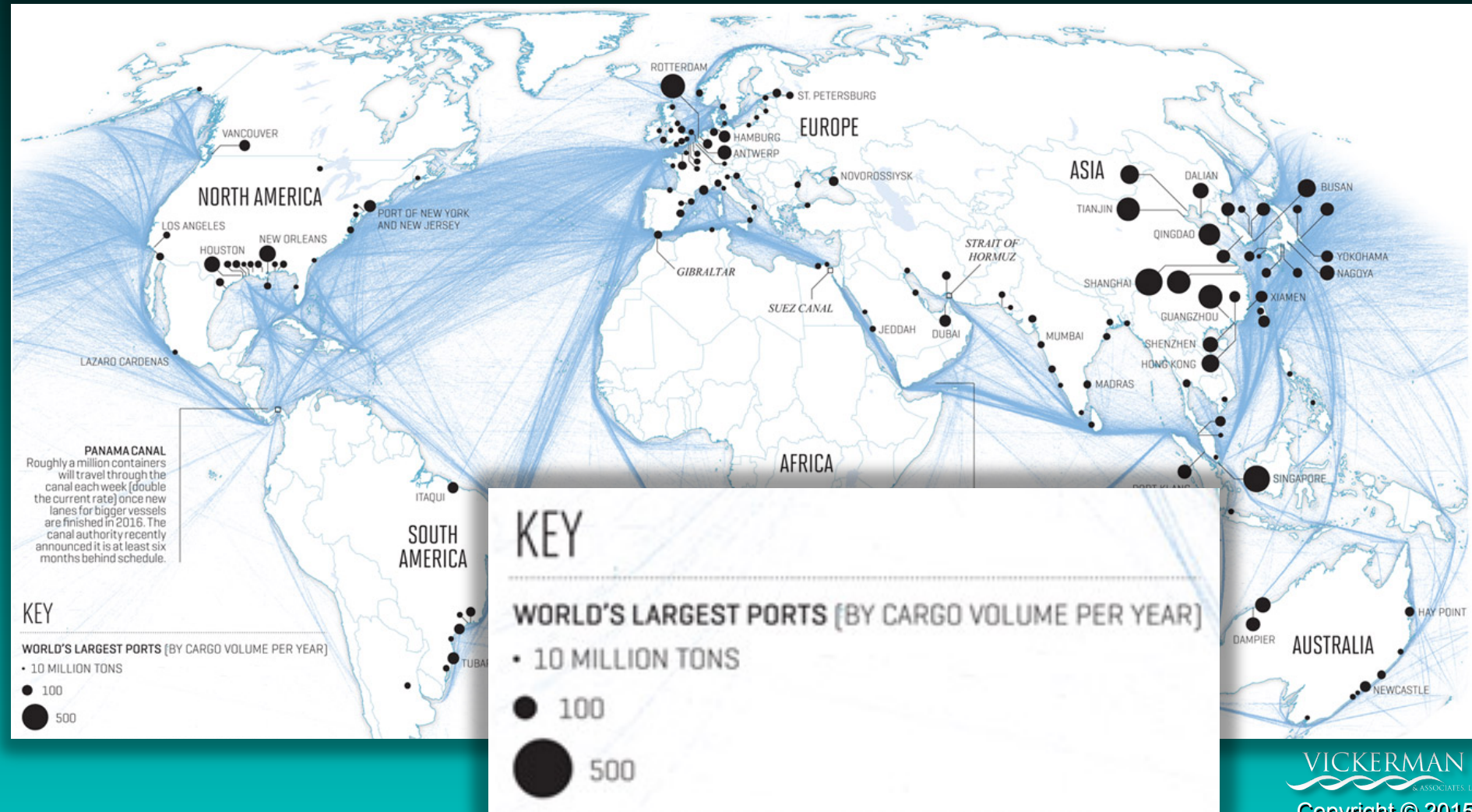


**The Majority of Today's Ocean Trade is
Conducted on the Marine Silk Road**

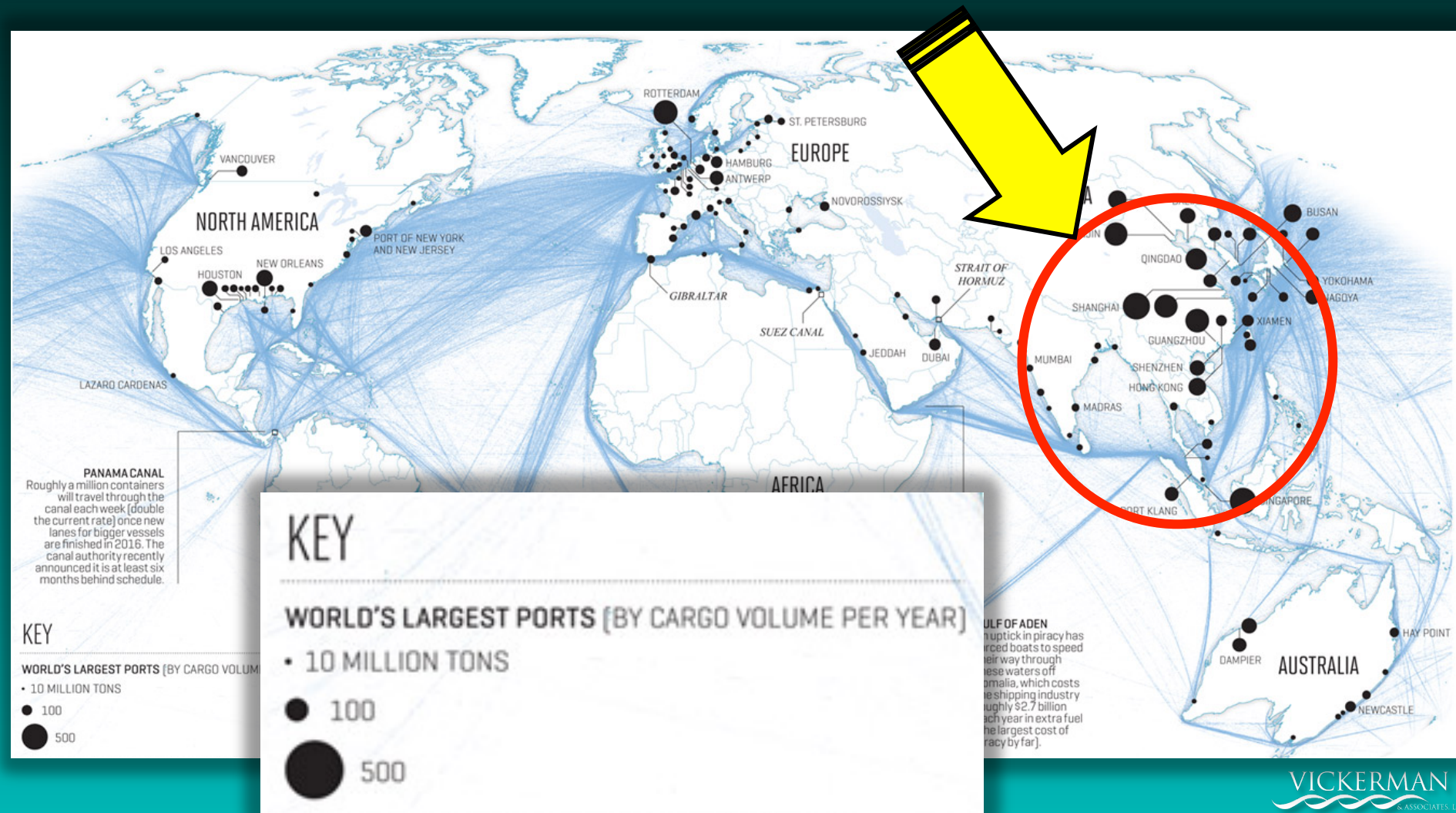
Indian Ocean Electric Blue Shipping Lane Trails From the Marine Silk Road



The World's Largest Ports Are Connected Via The Marine Silk Road *Where are the Biggest Ports?*



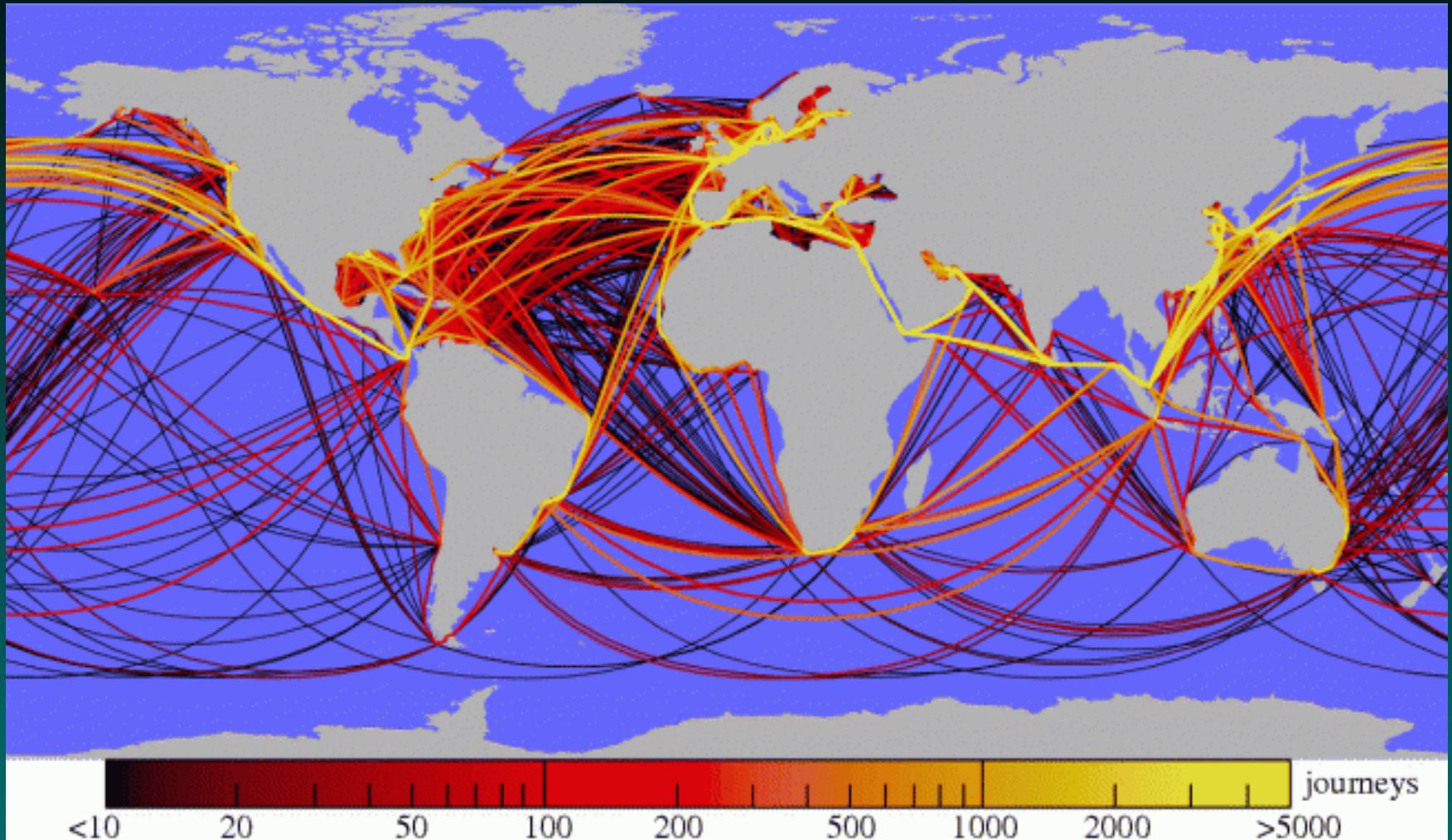
The World's Largest Ports Are Connected Inside TVia The Maritime Silk Road the Circle



Global Shipping Routes Plotted by AIS GPS

Today's Busiest Shipping Routes:

(1) Panama Canal, (2) Suez Canal, (3) Offshore China



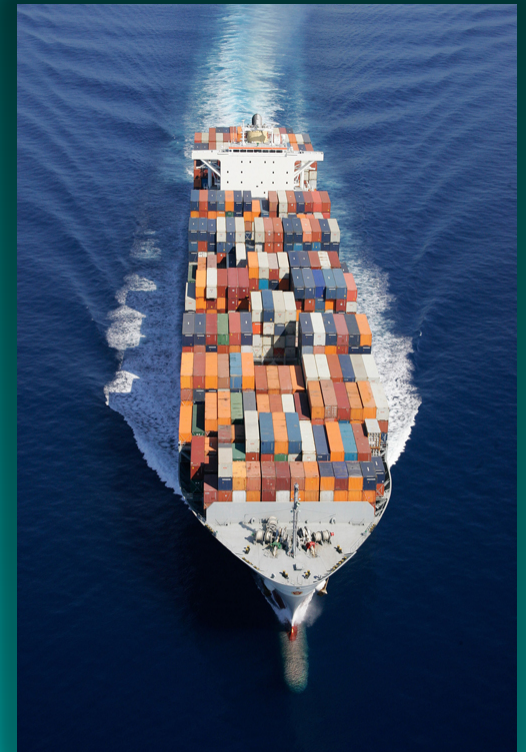
Source: Wired Science January 2010 Journal of the Royal Society: Interface



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International External Industry Pressures Driving Today's Logistics

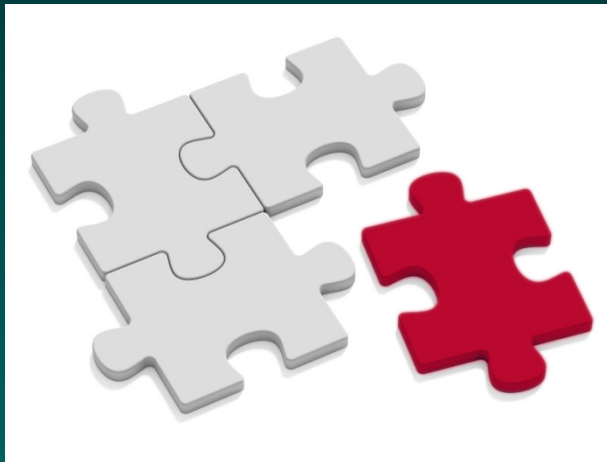
For North America, More than 98% of everything consume, worn, eaten, driven and constructed is brought via ships through the North American port system.





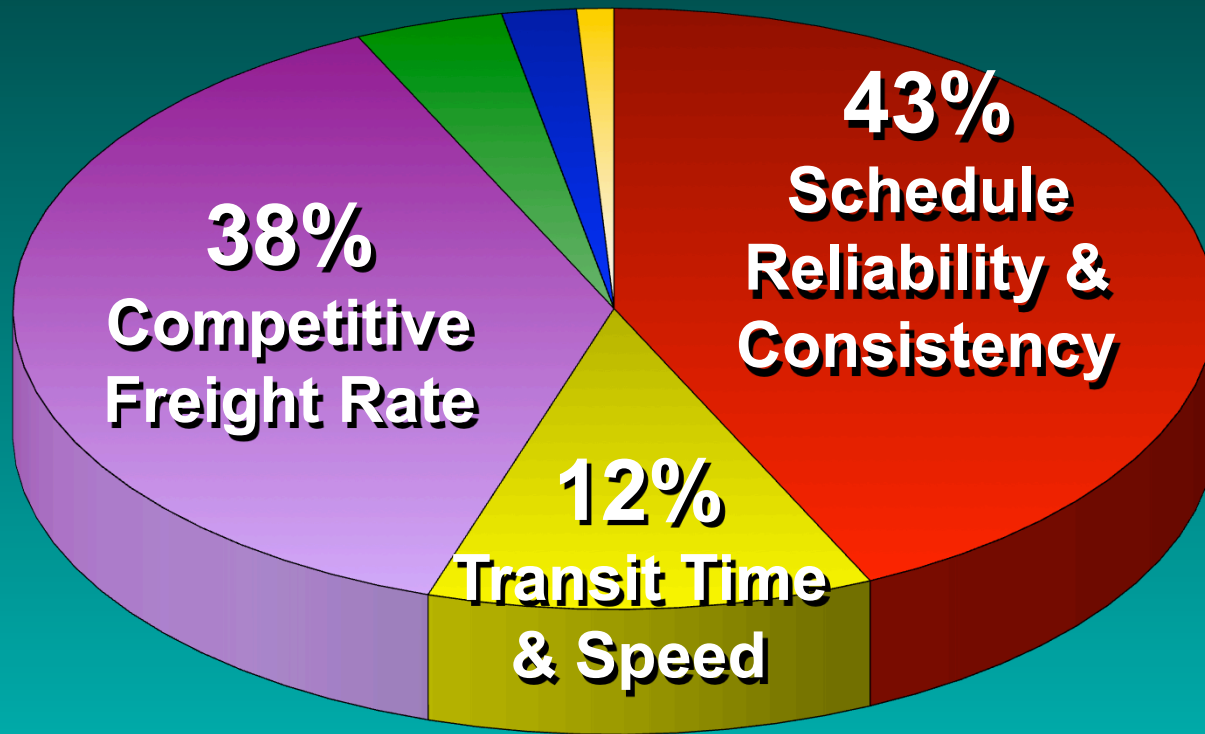
Key Success Factor:

Cargo Will Flow “***Downhill***” to the
“***Lowest Cost - Best Service Levels***”
(Total Logistics Costs From Origin to Destination)



Above All Be MARKET DRIVEN

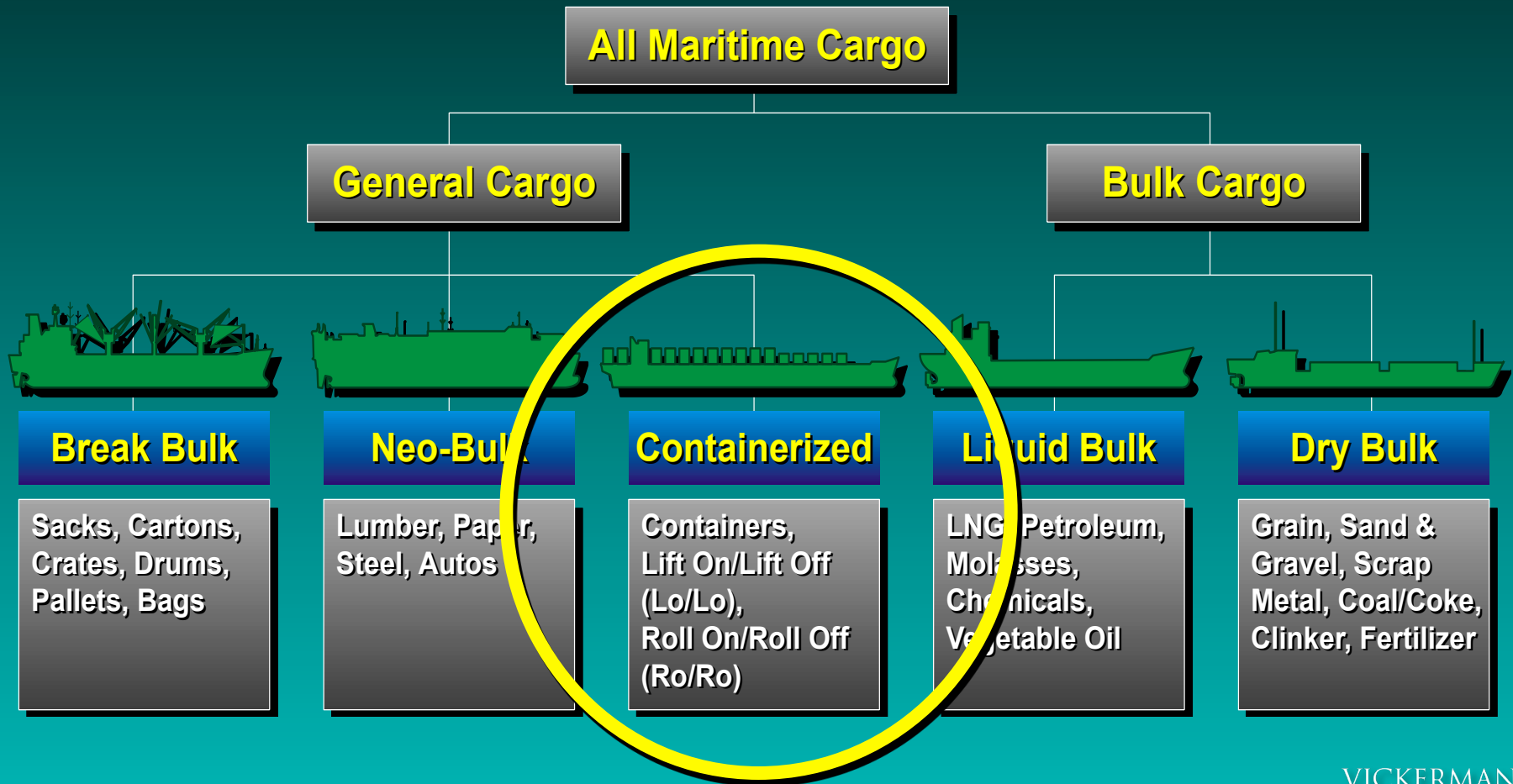
Poll of the Top 1000 “Blue Chip” Multinational Shipper Priorities



Today's Logistics Truth:

***“The customer
wants **more** and
is willing to pay
less for it.”***

Functional Classification of Global Maritime Cargoes

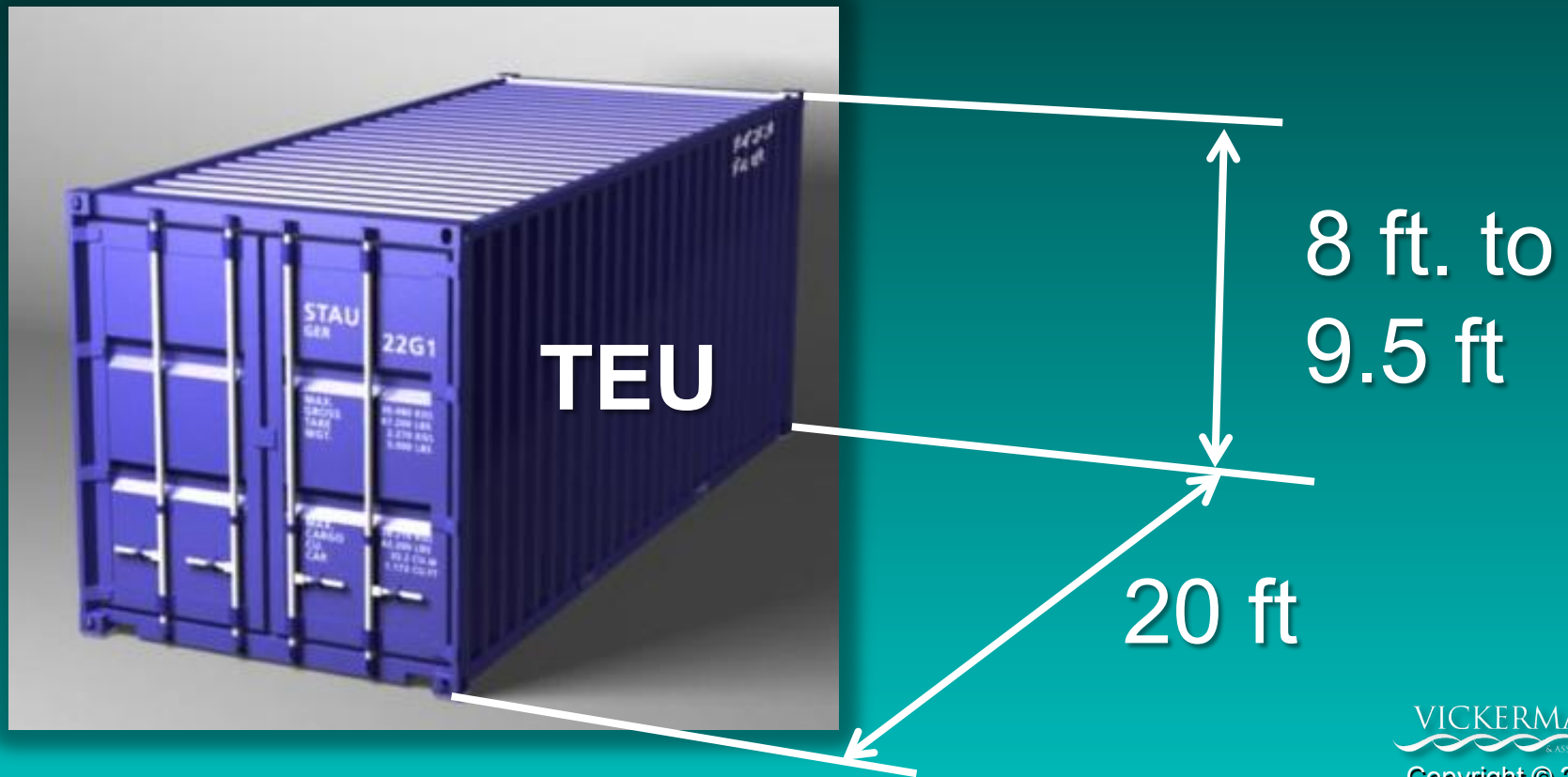


The TEU (Twenty Foot Equivalent Unit)

*“The Port & Container Shipping
Unit of Measure”*

1 TEU = One 20 ft. ISO Container

1 FEU = 2 TEUs = One 40 ft. Container



How Much Can a Single Container Hold?

(Example 40 ft. Container)

Example
Value \$



= 1,890 Cases @ \$25.50/Case = \$48,195



= 315 20" TVs @ \$299/TV = \$94,185



= 10,000 Pairs @ \$30/pair = \$300,000



= 432,000 Packs @ \$4.00/Pack = \$1,728,000

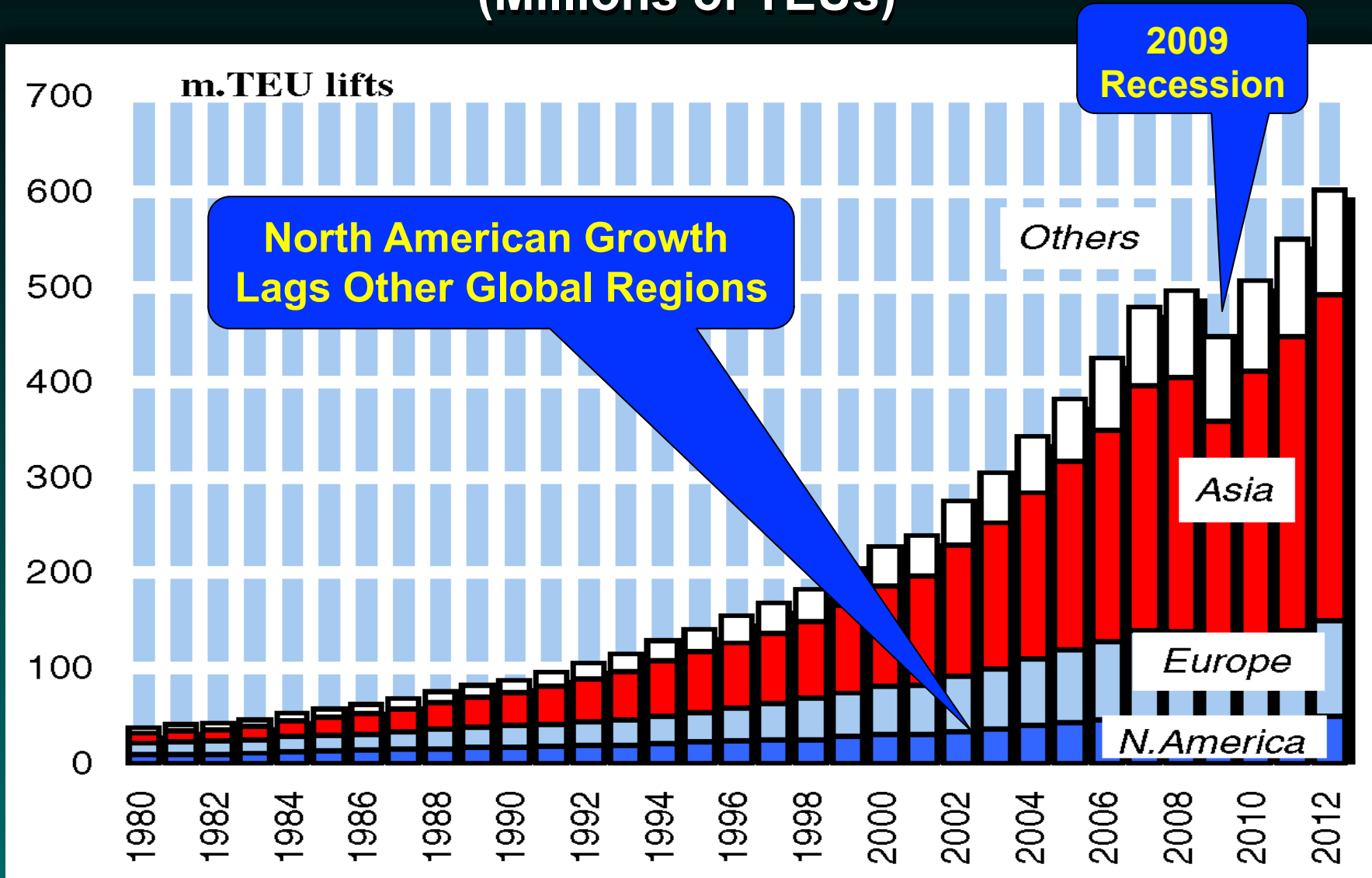


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International Maritime Cargo Demand Trends

Historical Global Container Market Demand

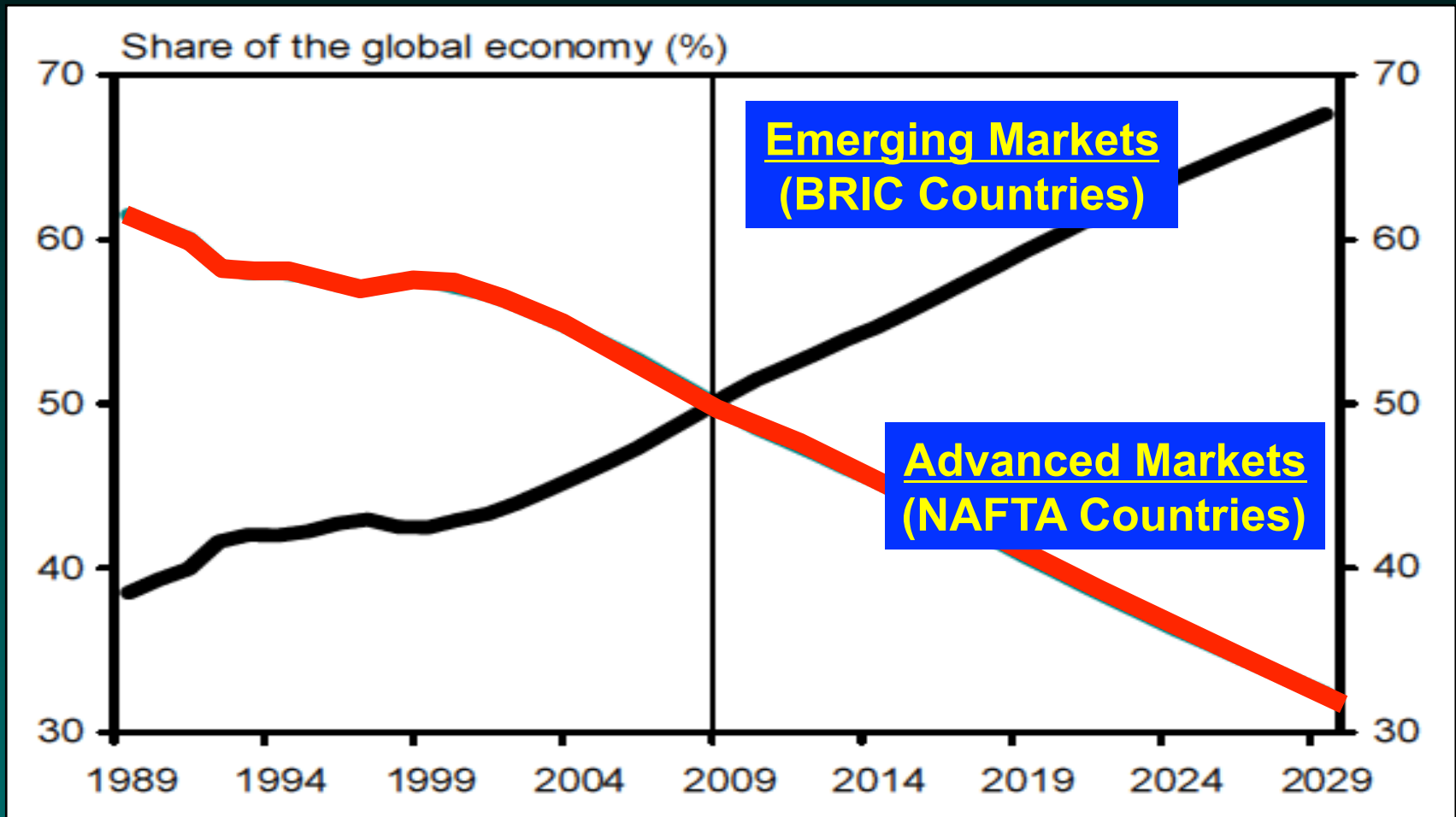
(Millions of TEUs)



Source: Drewry Shipping Consultants

A Turning Point in Global Economic History

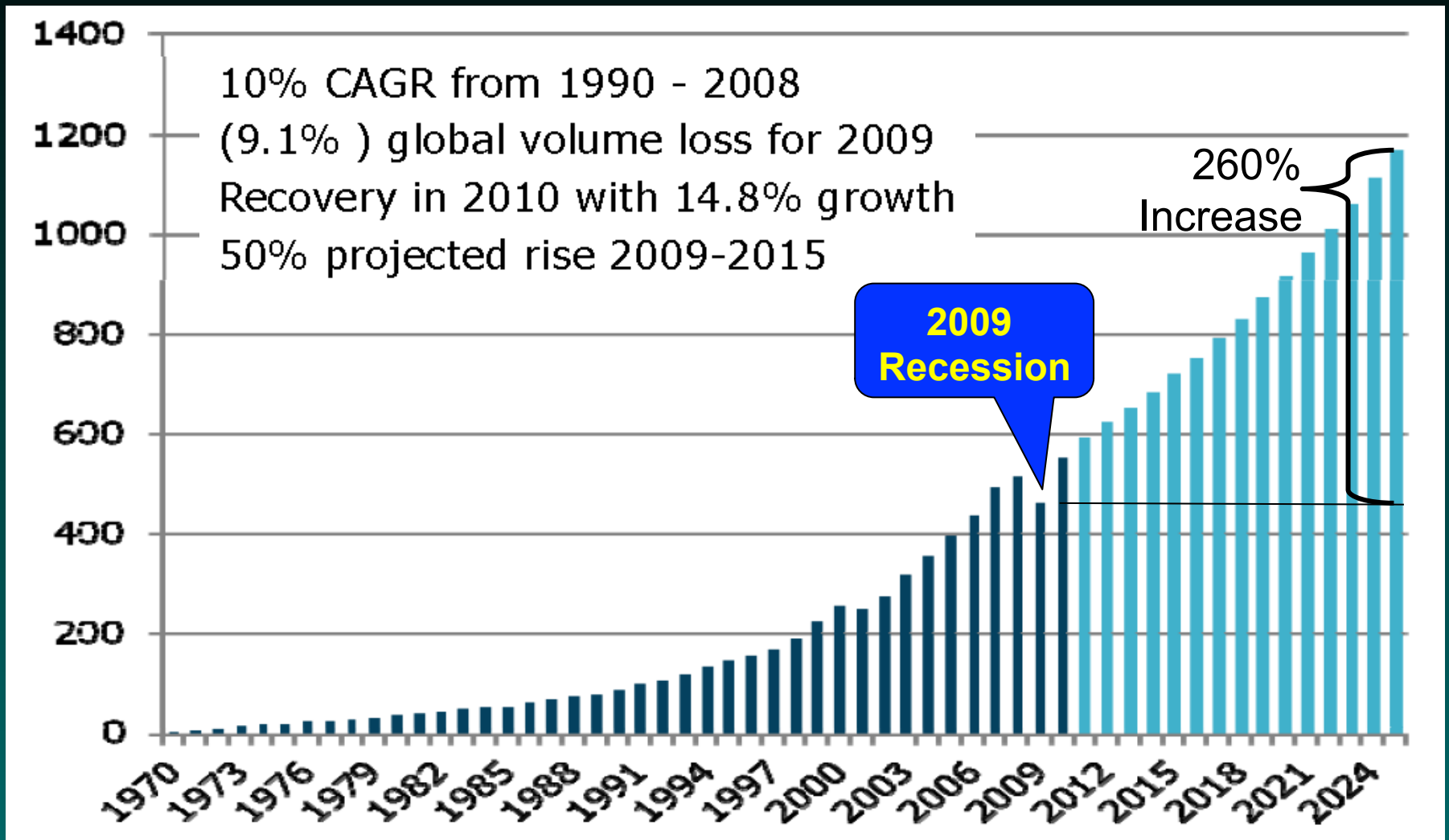
The Advanced Economies Will Decline From 2/3 share of the Global Economy to a 1/3 Global Share. The Global Economy Will See Higher Average Pace of Growth in the Future...



Source: IMF - Forecast by TD Economics, December 2009

2025 World Container Port Market Demand

(Millions of TEUs)



Source: Drewry Shipping Consultants October 2011

South-east Asian

Current Inbound U.S. Cargo Flow

The map illustrates the U.S. Intermodal Rail Flow and the Western Centroid Shift. A large orange arrow curves from the West Coast towards the East Coast, labeled "U.S. Intermodal Rail Flow". A yellow arrow points from the West Coast towards the East Coast, labeled "Western Centroid Shift". A red arrow points from the West Coast towards the East Coast, labeled "Western Centroid Shift". A red arrow points from the West Coast towards the East Coast, labeled "Western Centroid Shift".

Western Centroid Shift

Expanded Asian Panama Canal 2014 Flows

Eastbound: All Water Flow

Eastbound: US Intermodal Rail Flow

Southeast Asian Manufacturing Centroid Shift

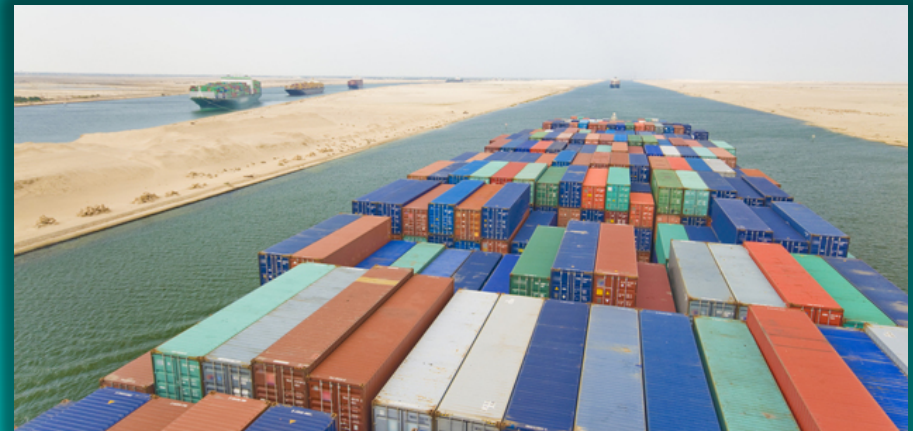
Cu

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**



Suez Canal's \$8.5 Billion Expansion Plan

(A New \$4 Billion 45-mile-long parallel channel and Global Logistics Park)

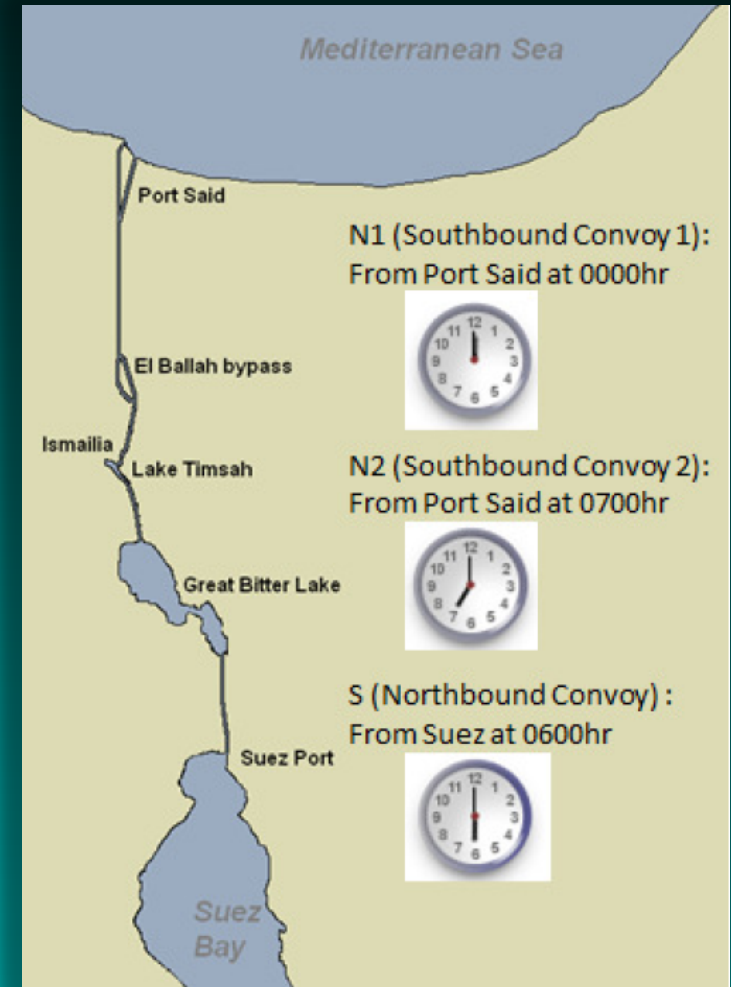


3 Daily Convoys:

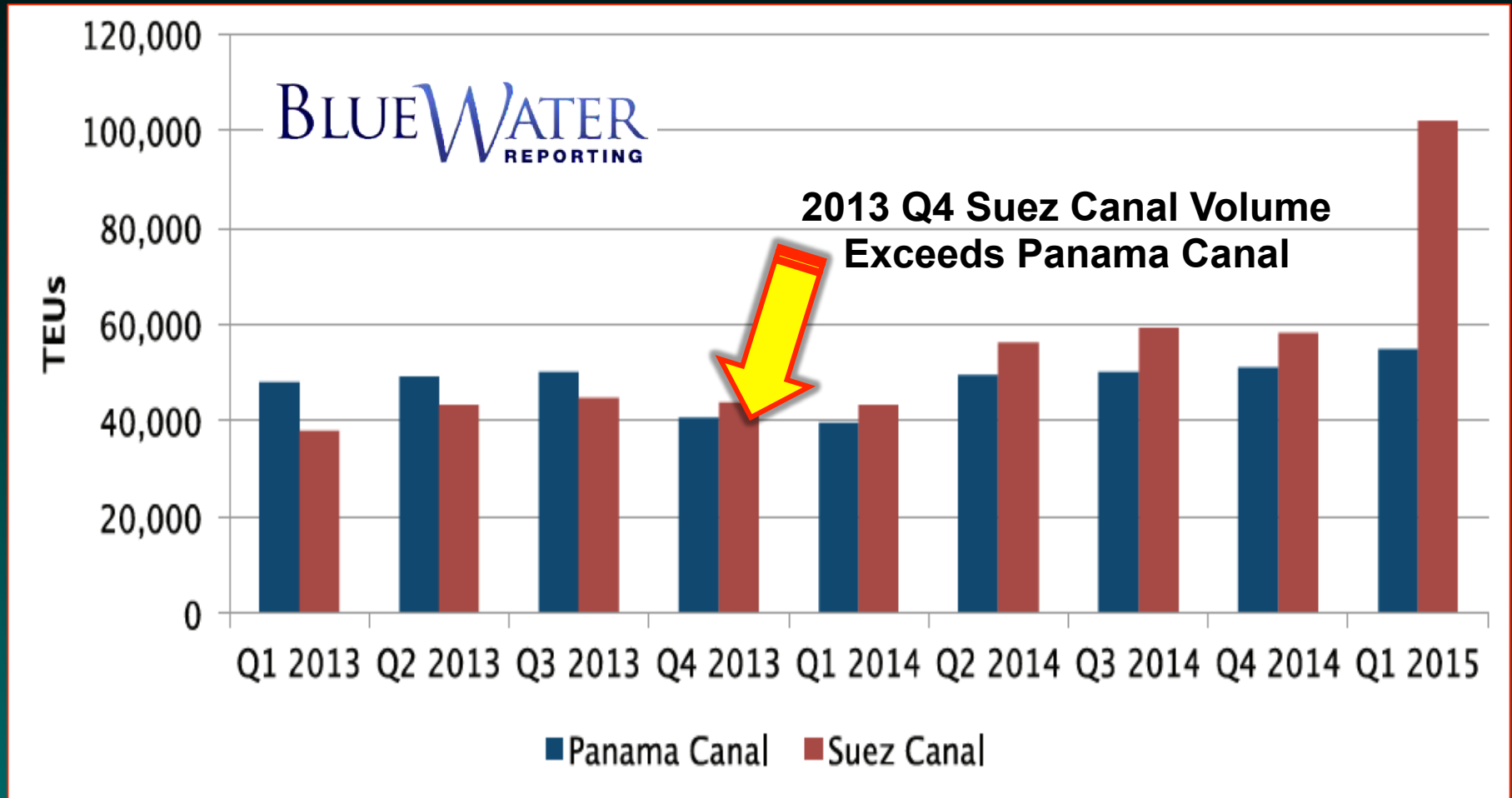


2 Northern Convoys

1 Southern Convoy



Asia-North America Weekly Throughput: *Panama Canal vs. Suez Canal*



Source: American Shipper May 2015



The Suez Canal's \$4 Billion Expansion of the Canal

Completed September 2015

**New 45-mile-long parallel channel cutting
waiting times to transit by 3 hrs. from 11 hrs.**

Egyptian Jet Fighter Escort Selfie

(Taken with the New Expanded Suez Canal in the Background)



Source: Photo Courtesy of MIRASCO, August 2015

Dredging a 180 Million Cubic Meters (35-kilometers-long and 24-meters-deep) Shipping Route in Less than One Year





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The Growing Asian Import Trade Challenge

Container Transshipment World Records

Of the 10 busiest ports in the world,
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

(2014 Volumes = Shanghai: 35.28 million TEU – Singapore: 33.87 million TEU).

China-US: Twin Engines of the World



2015 Population:

US: 325 million

China: 1,400 million
(1/5 World – 19%)

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

Shanghai International Shipping Center

Yangshan Deep Port & Logistics Park

New Port City



New Logistics Park

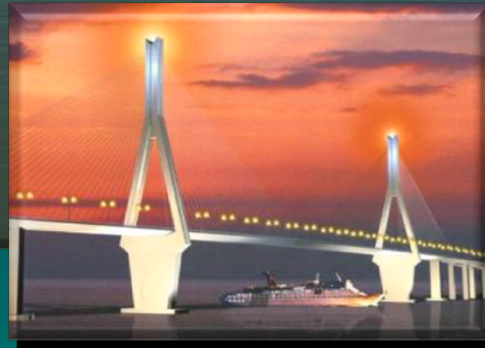
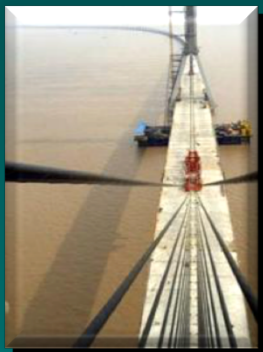


**20 Mile New Port Access
Bridge Constructed in 3 yrs**



54 New Berths

交通部第三航务工程勘察设计院制



Shanghai International Shipping Center

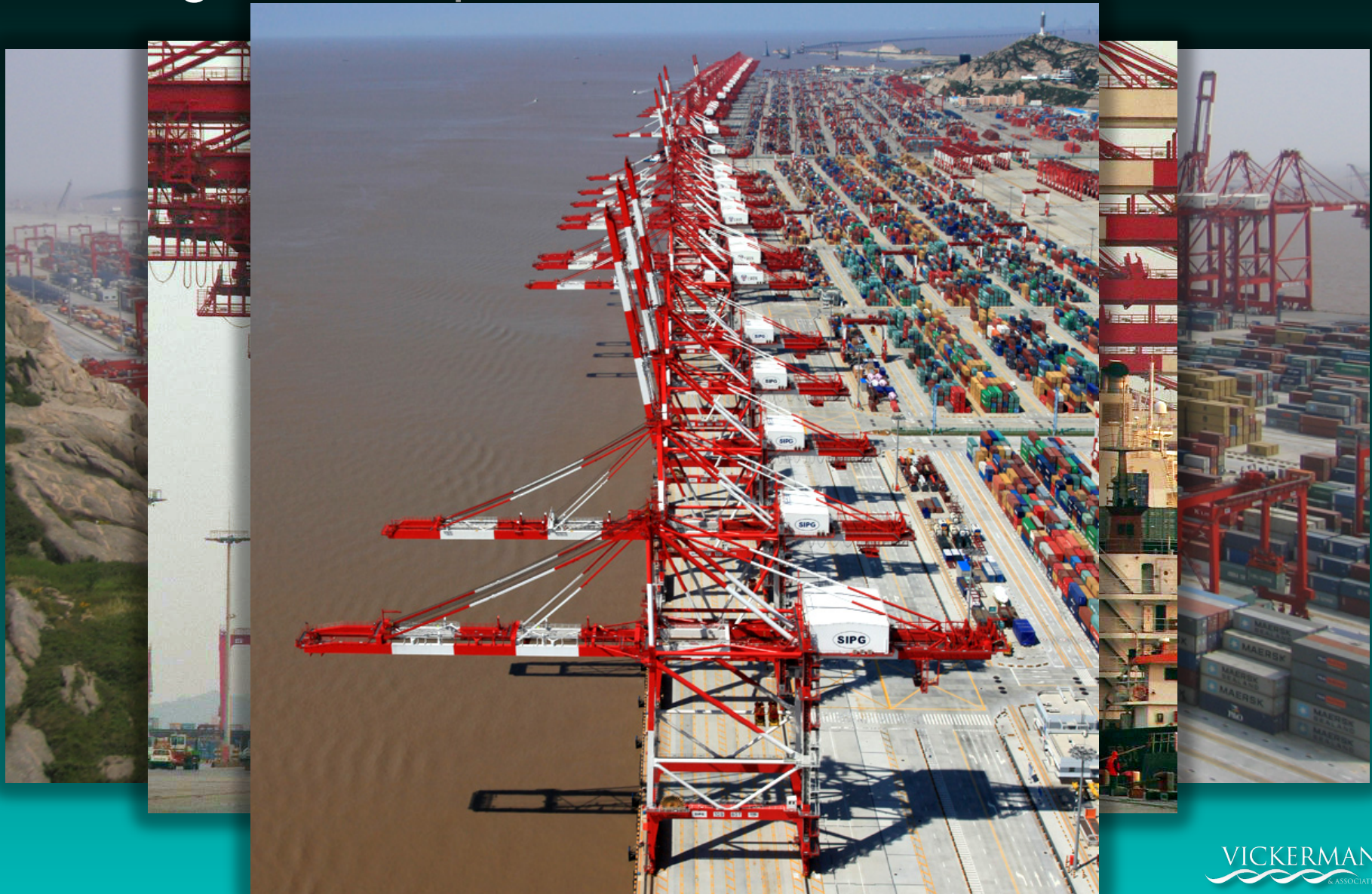
Yangshan Deep Port - 20 Mile Bridge Access

“Second Longest Ocean Bridge in the World”



Shanghai Yangshan Deep-Water Harbour

Yangshan Deep Port – 54 Berths East China Sea



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



April 26, 1956

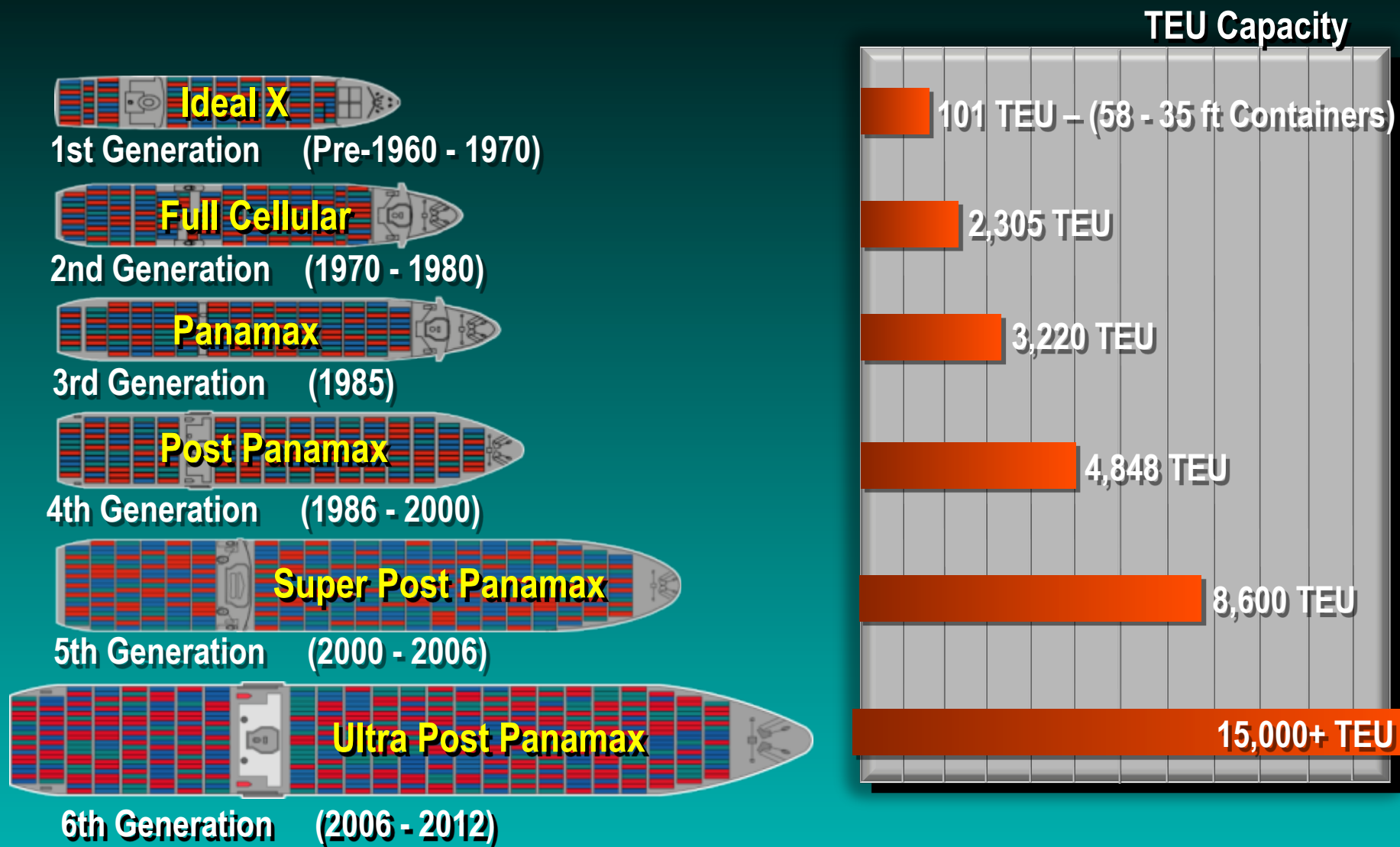
58 Modified 35-foot Truck Containers

The deck of the *Ideal X*
at Port Newark
preparing for the
historical sailing
of the world's first
containership.

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



World Container Ship Evolution



***24% increase in the average container ship size
from 2008 to 2012***

***The Stage is set to Jump again to 22,000 TEU
Mega Container Vessels***



9,000 TEUs 12,000 TEUs

15,000 TEUs

18,000 TEUs

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

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



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





MAERSK
LINE, LIMITED

February 2011: A.P. Moller-Maersk Orders 30 – 18,000 TEU Container Vessels “*Largest in the World*”



23 Containers Wide – 9 Tiers Above the Hatch

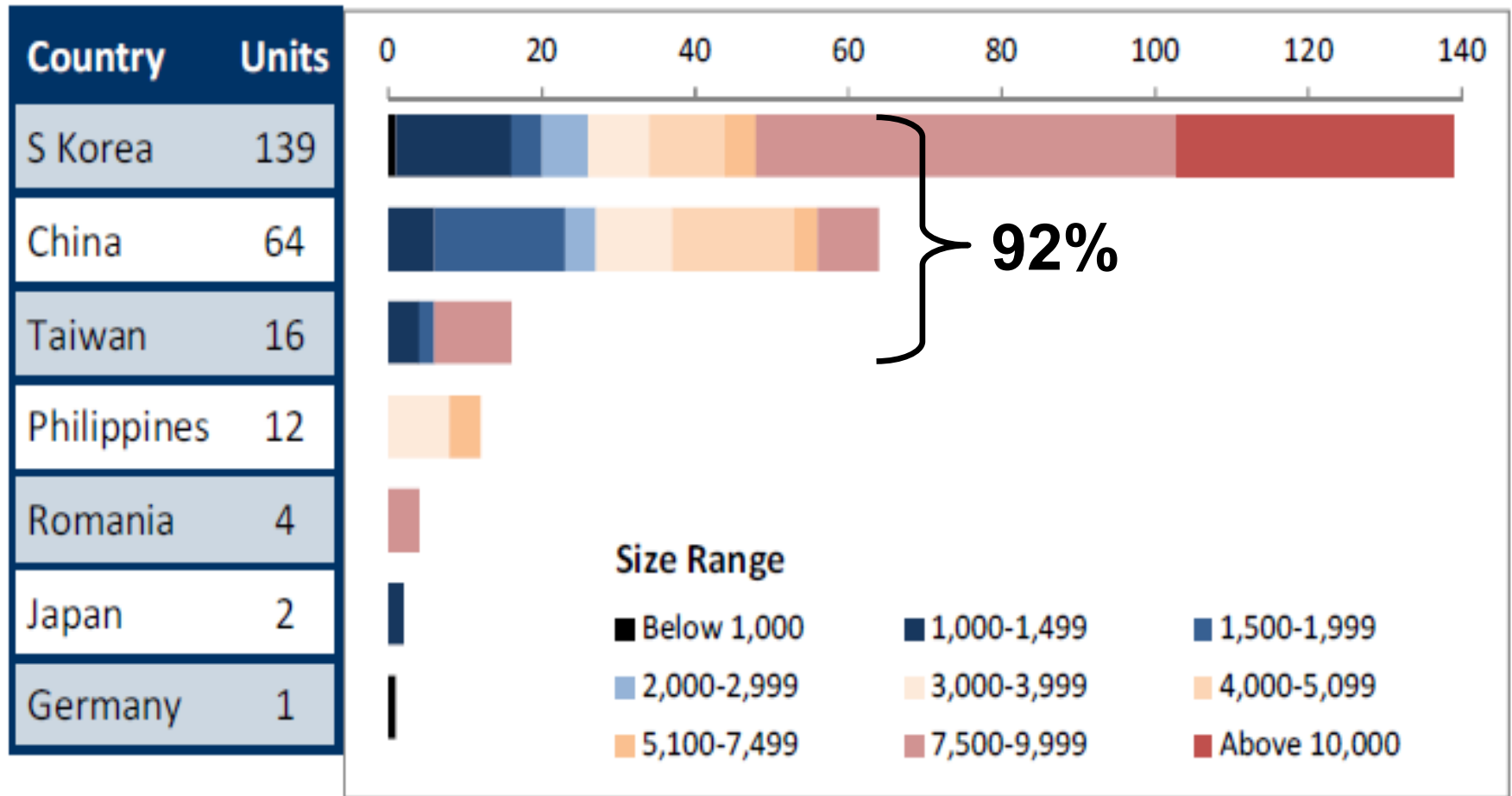
2018: Ultra-Large 20.000 TEUs Container Ships

2015: Maersk Planning Orders up to
10 New 20,000 TEU Ships (\$1.5 Billion Order),
Evergreen, Seaspan and United Arab Shipping Company (UASC)
are also looking at 20,000 TEUs



Containership Orders – Country of Build

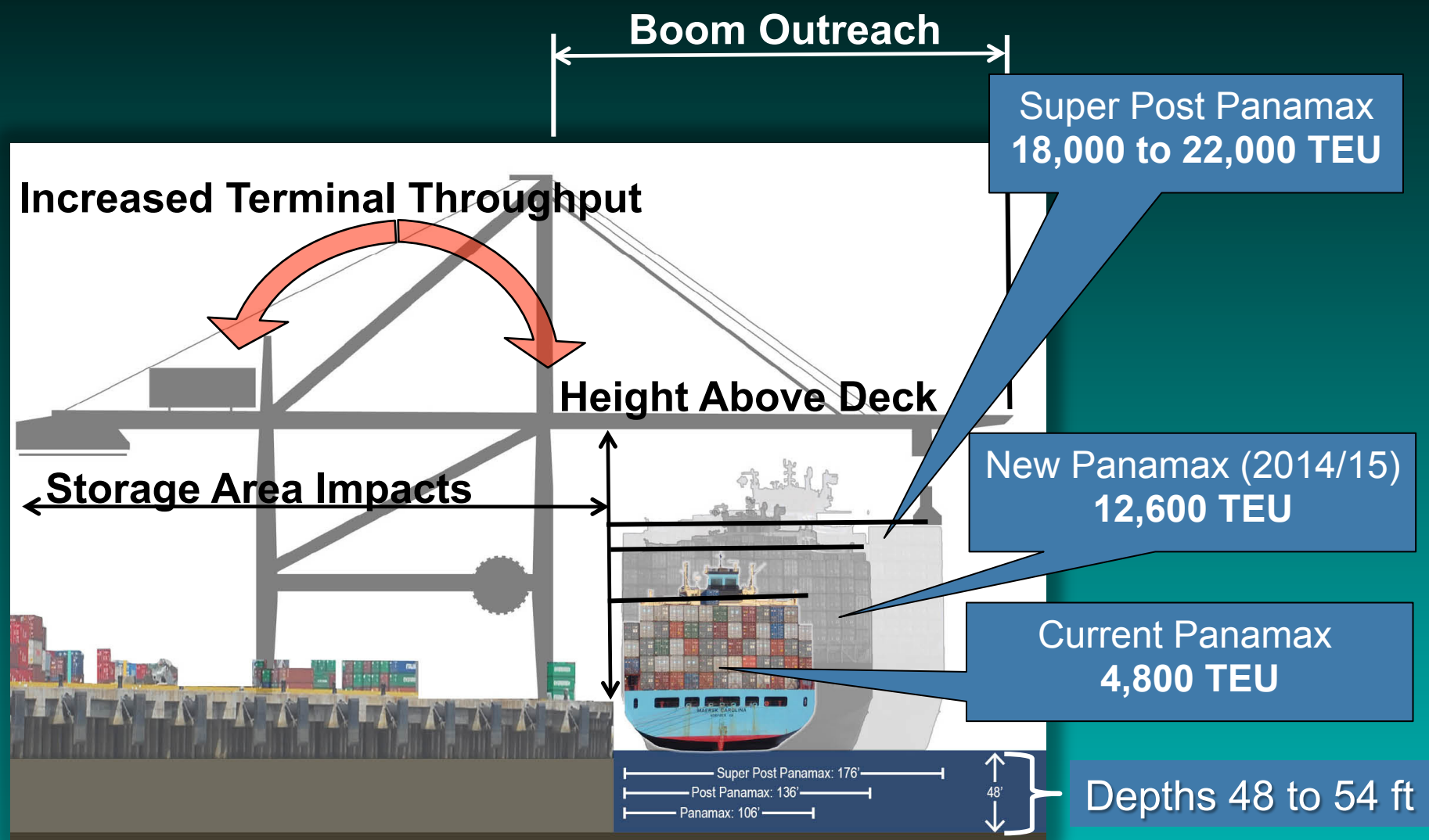
(Orders Since January 2010)



Source: Alphaliner Newsletter Volume 2011 Issue 21

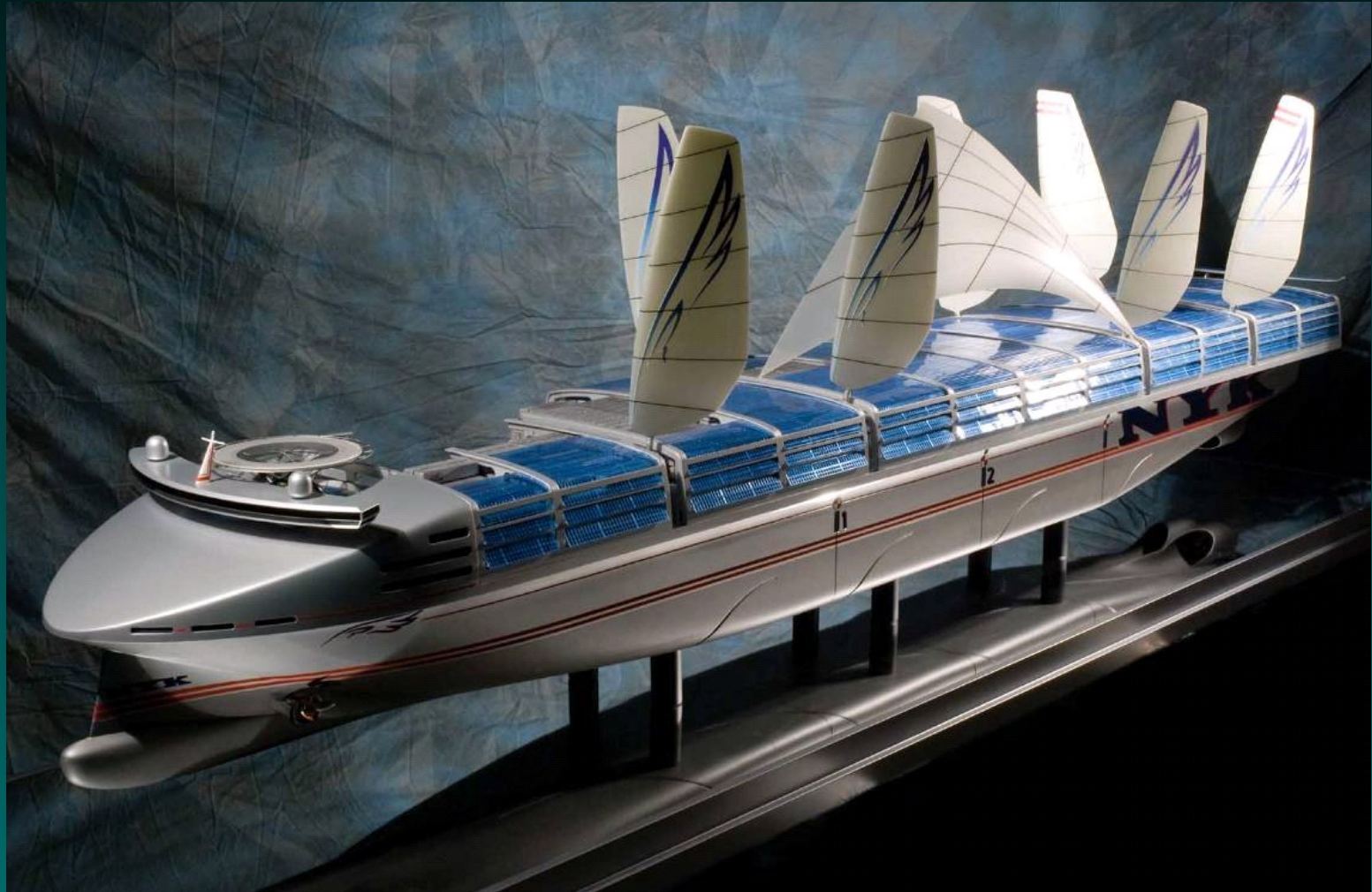
Vessel Size Expansion - Terminal Impacts

(Port Terminal Infrastructure & Equipment Geometry Impacts)



Source: Georgia Ports Authority and Vickerman & Associates

Future Container Vessel: NYK Super Eco Ship



Future Container Vessel: NYK Super Eco Ship





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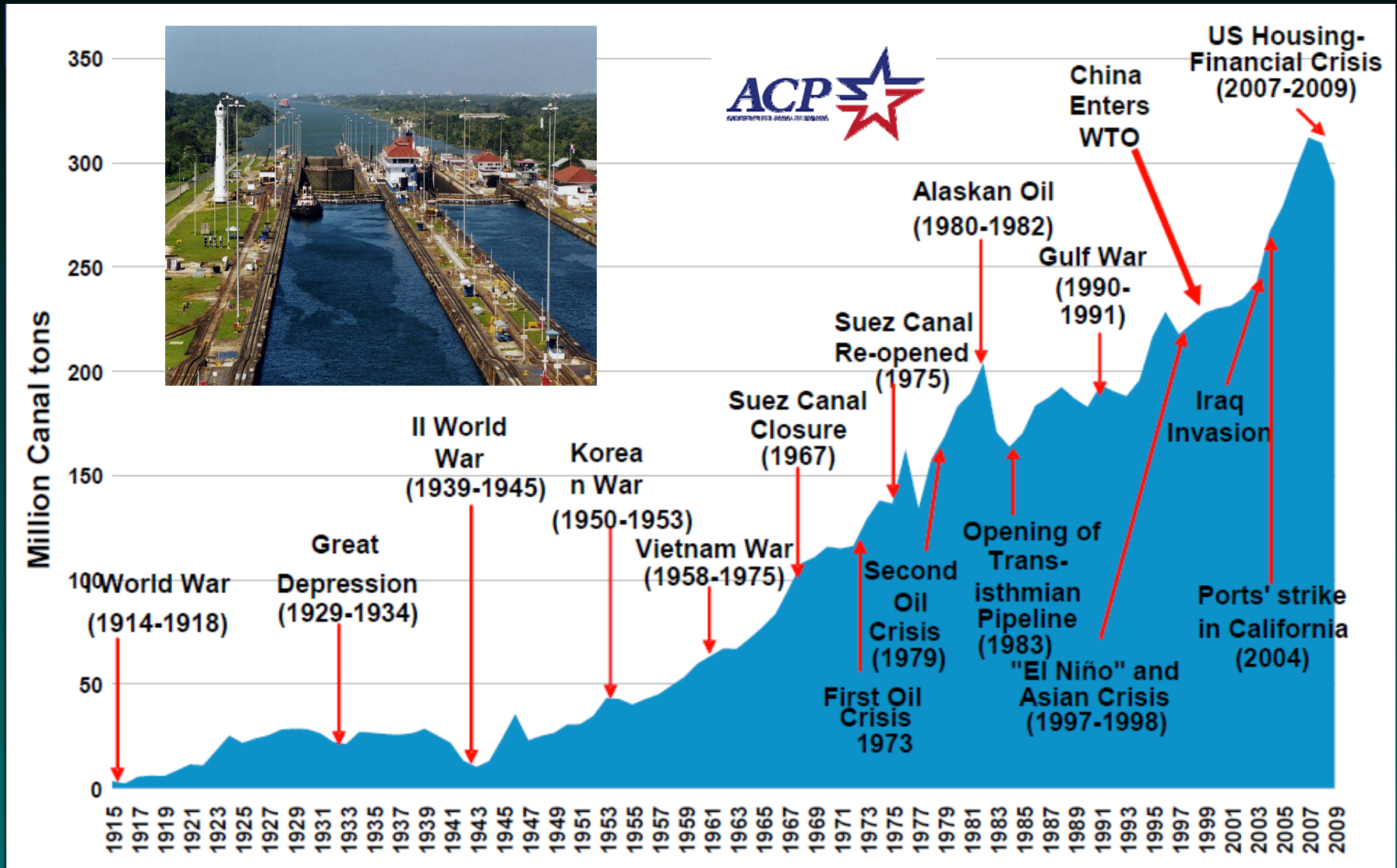
Panama Canal Expansion: New Capacity

Panama Canal Route



The Autoridad Del Canal de Panama

Panama Canal Historical Tonnage Traffic



Source: ACP Data

The Panama Canal Circa 1914



Panama Canal Today



The Autoridad Del Canal de Panama



Expansion of the Panama Canal: Circa 2015

Depth needed for ships
39.5 feet

110 feet

Greater
than 181 feet

Depth needed
for larger ships
50.49 feet

0 25 mi
0 25 km

Gatun Lake

Panama Canal

PANAMA

Panama City

Gulf of Panama

Proposed locks

The canal, 35 yards above sea level, uses a series of parallel locks to lift ships to Gatun Lake for the 50-mile cruise across.





The Autoridad Del Canal de Panama

Post 2016 Panama Canal



Panama Canal Third Lane Expansion Circa 2016



A \$5.25 Billion Investment in a 3rd Set of Locks Equating to 16% of Panama's National GDP



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



Crude Oil - 0% to 42%



LNG - 10% to 90%

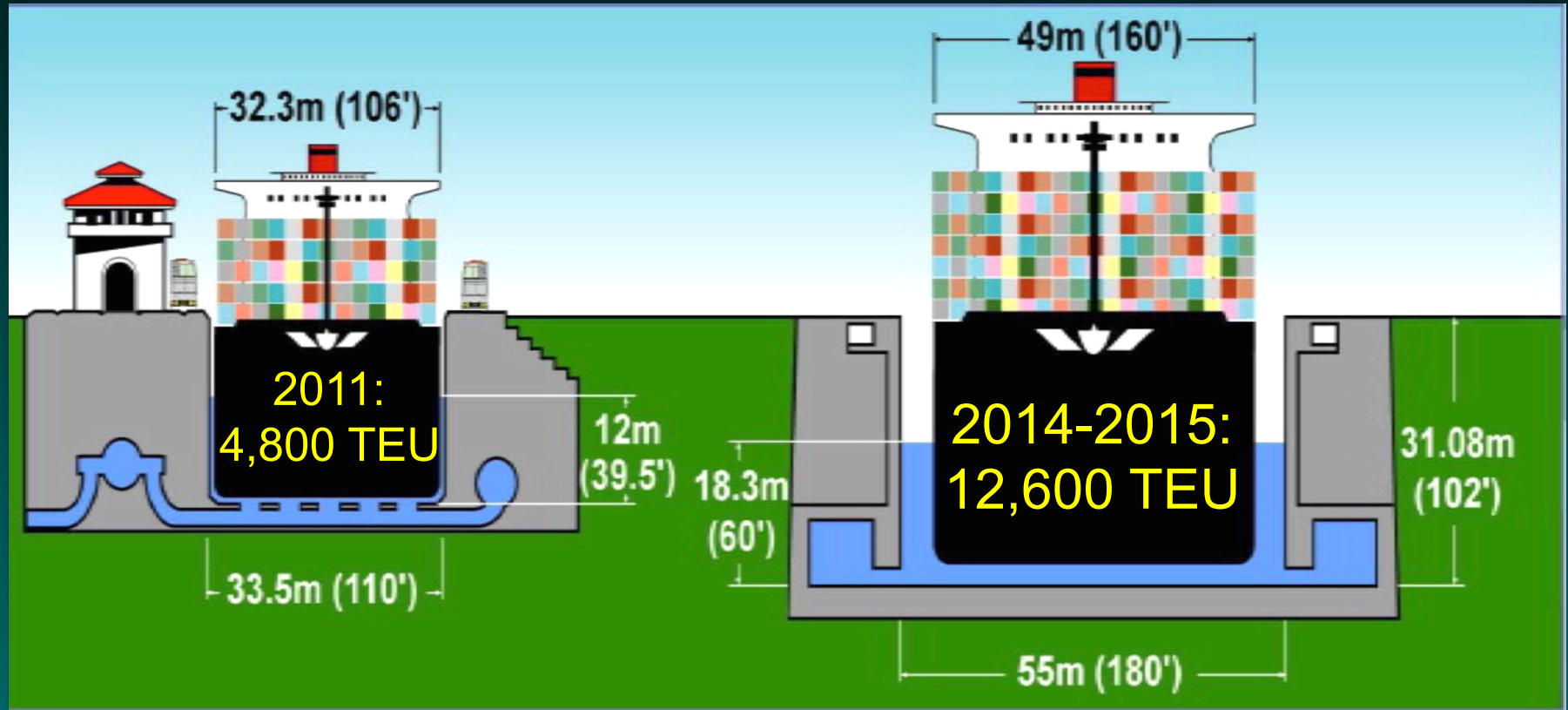


Dry Bulk - 55% to 80%



The Autoridad Del Canal de Panama

Panama Canal Third Lane Expansion Capabilities



Source: ACP Expansion Project



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Panama Canal Expansion Alternatives

Nicaragua's \$40 Billion Contract with Chinese HKND to Dig a Rival to the Panama Canal



Alternative “Dry Canal” Proposals to Counteract Anticipated Canal Fees/Costs





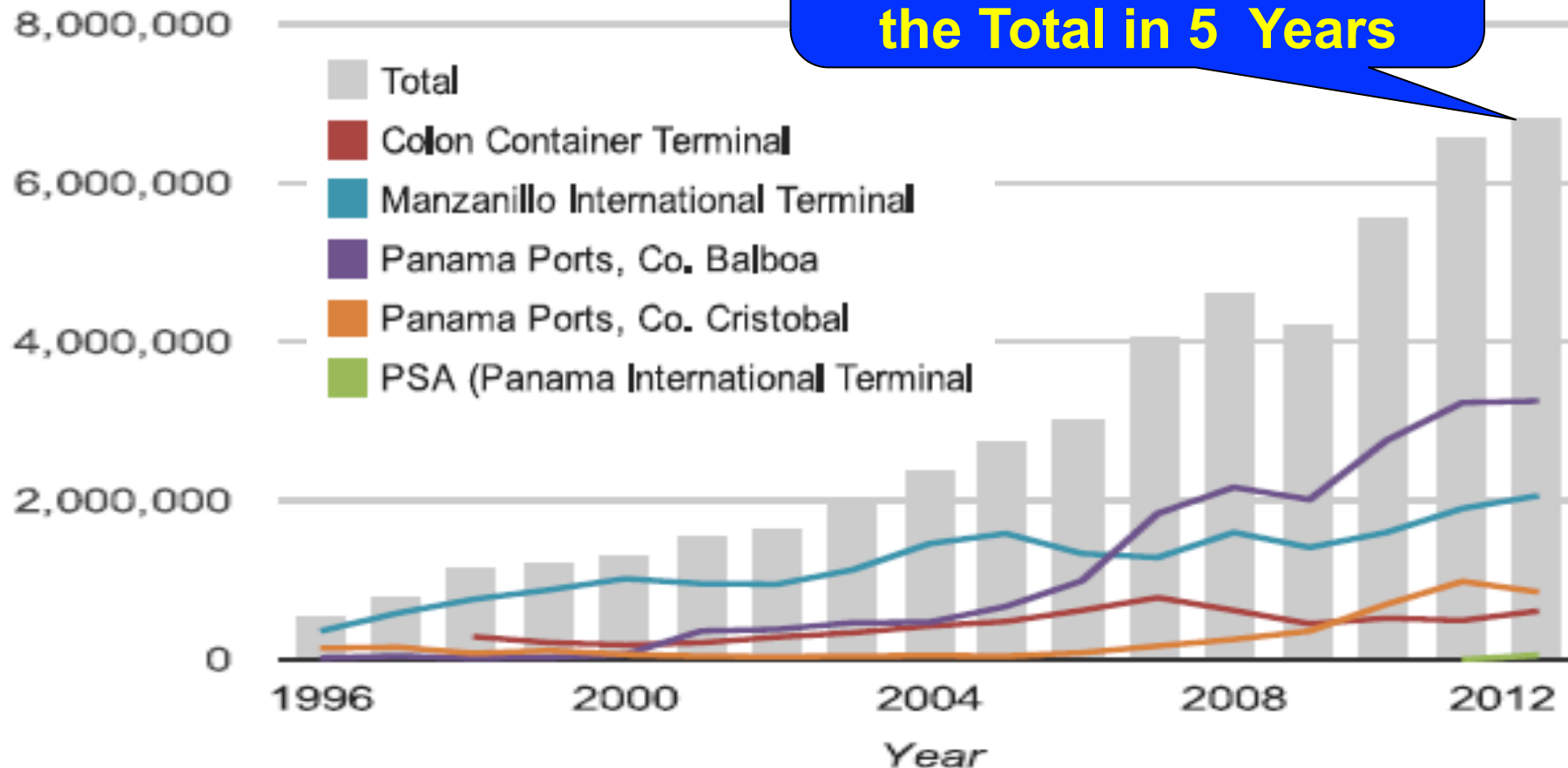
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Emerging New Caribbean Transshipment Center

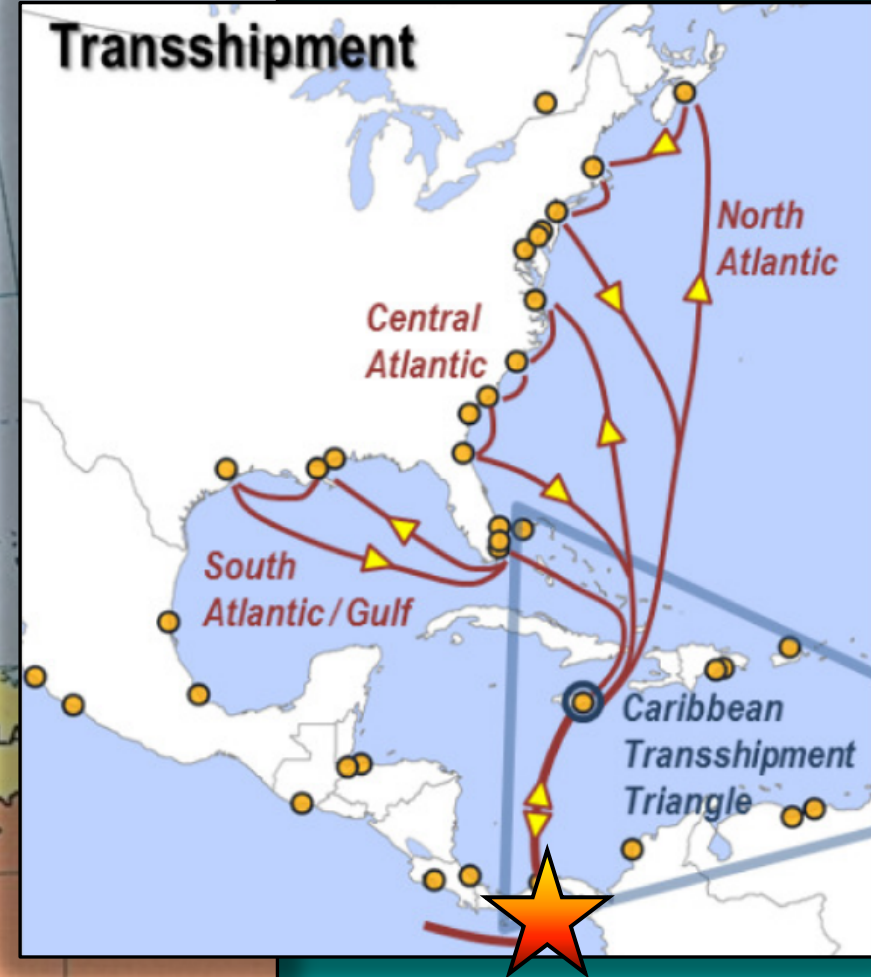
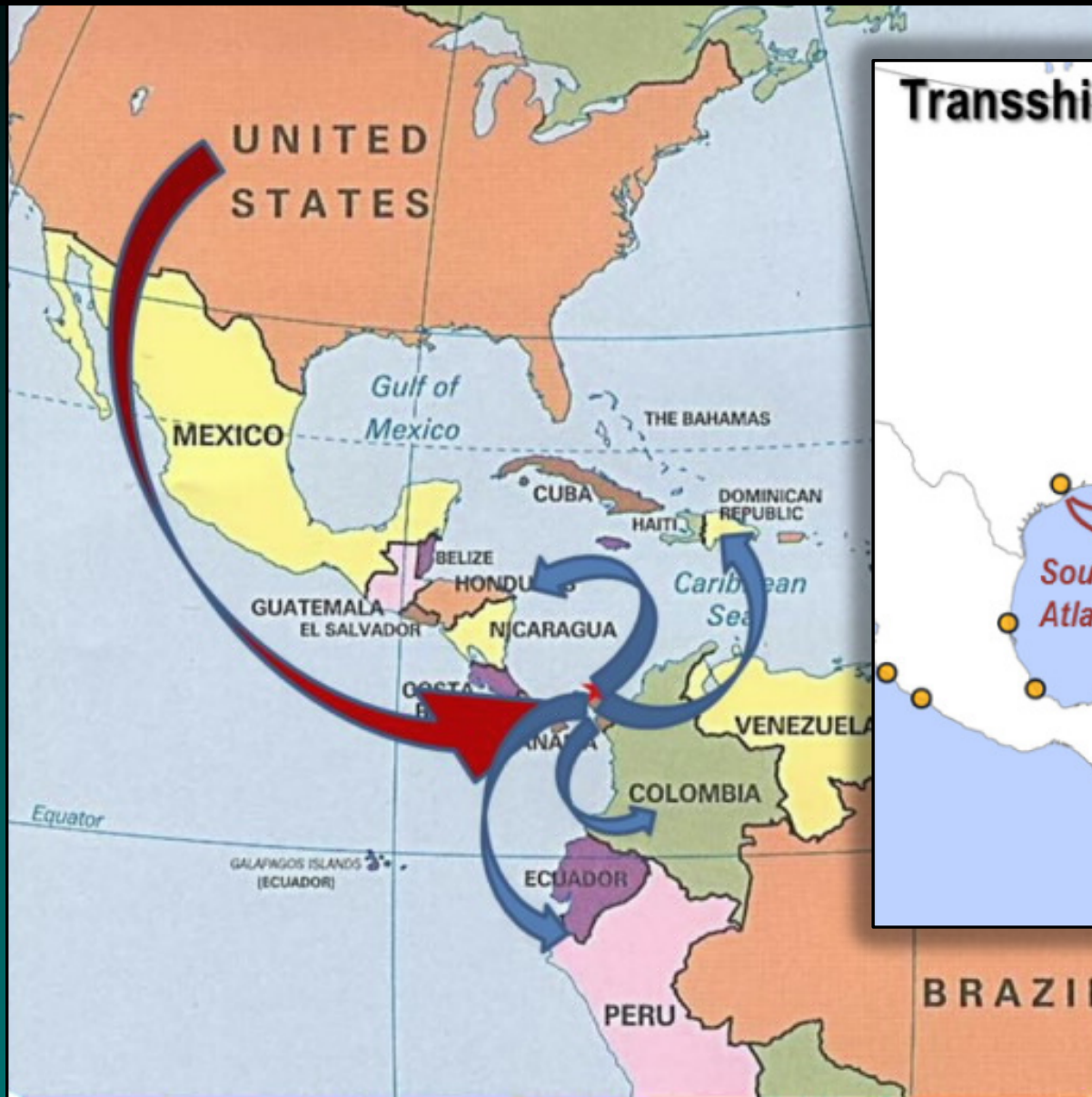
Panama Ports Annual Transshipment Growth

“The Singapore of Latin America”

**Proposed New Port
Projects Would Double
the Total in 5 Years**



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



New Panama Canal Pacific Entrance Ports

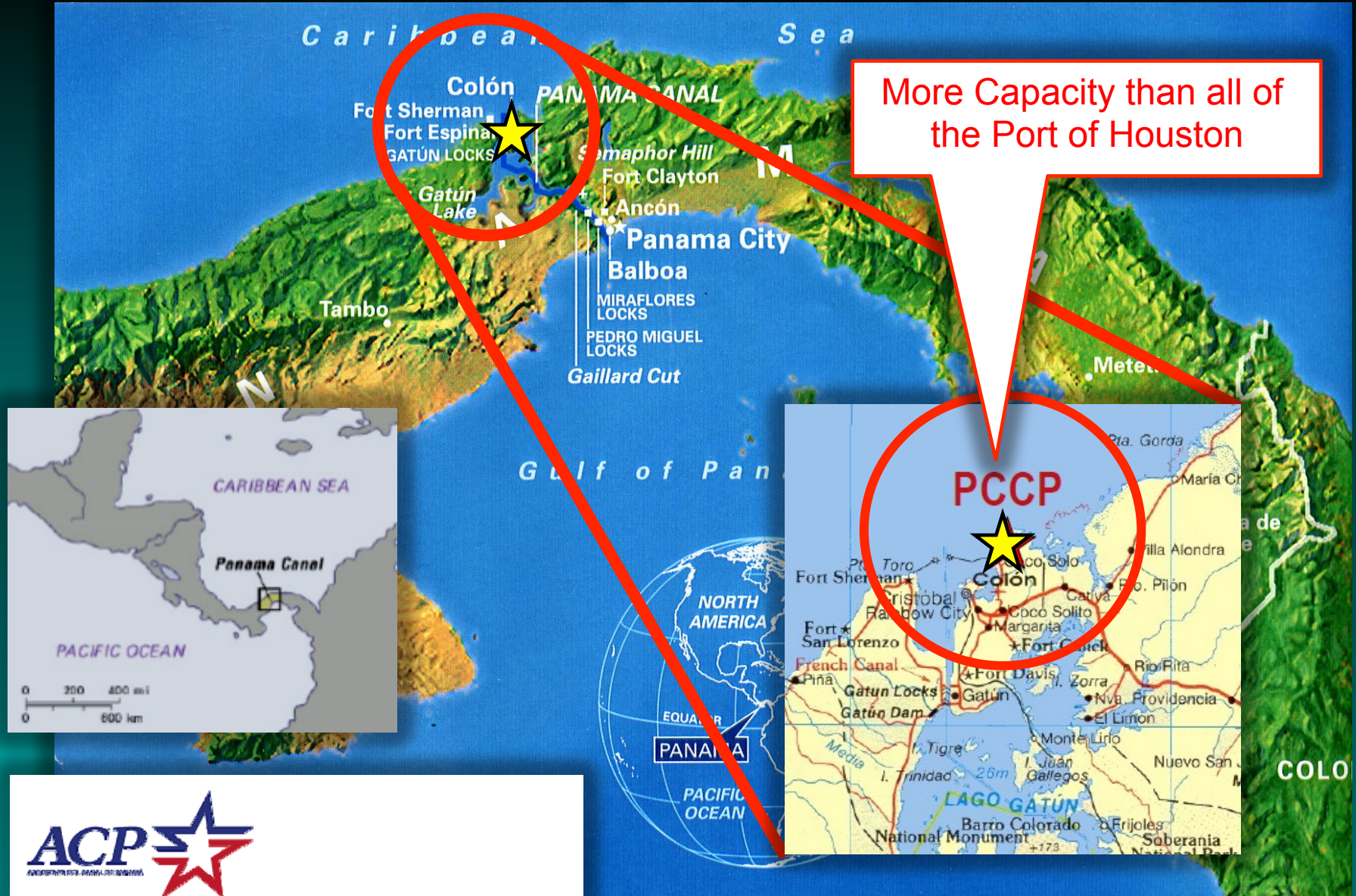


More Capacity than all of
the Port of Los Angeles



The Autoridad Del Canal de Panama

New Panama Canal Atlantic Entrance Port



The Autoridad Del Canal de Panama



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America's New Energy Self Sufficiency

Shale Gas: A Game Changer for US Competitiveness



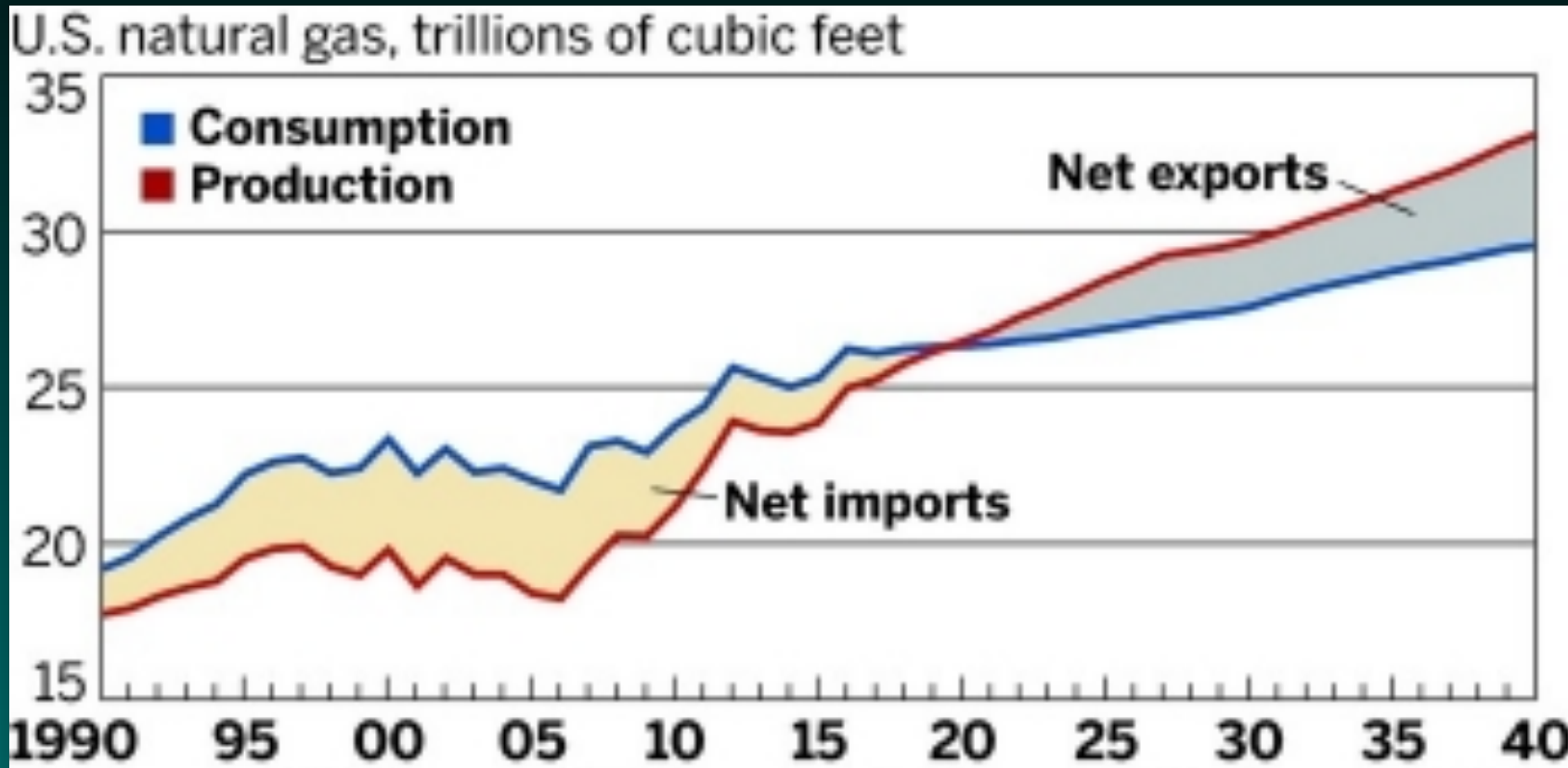
US oil production recently hit a 20-year high and could **surpass Saudi Arabia's output by 2019.**

The US has a 100-year supply of natural gas, & will be **the world's largest natural gas producer by end of 2015.**



Independent Statistics & Analysis
U.S. Energy Information
Administration

US Natural Gas Production (Trillions of Cubic Feet)



By 2020, U.S. is Projected to Be a Net Exporter of Natural Gas

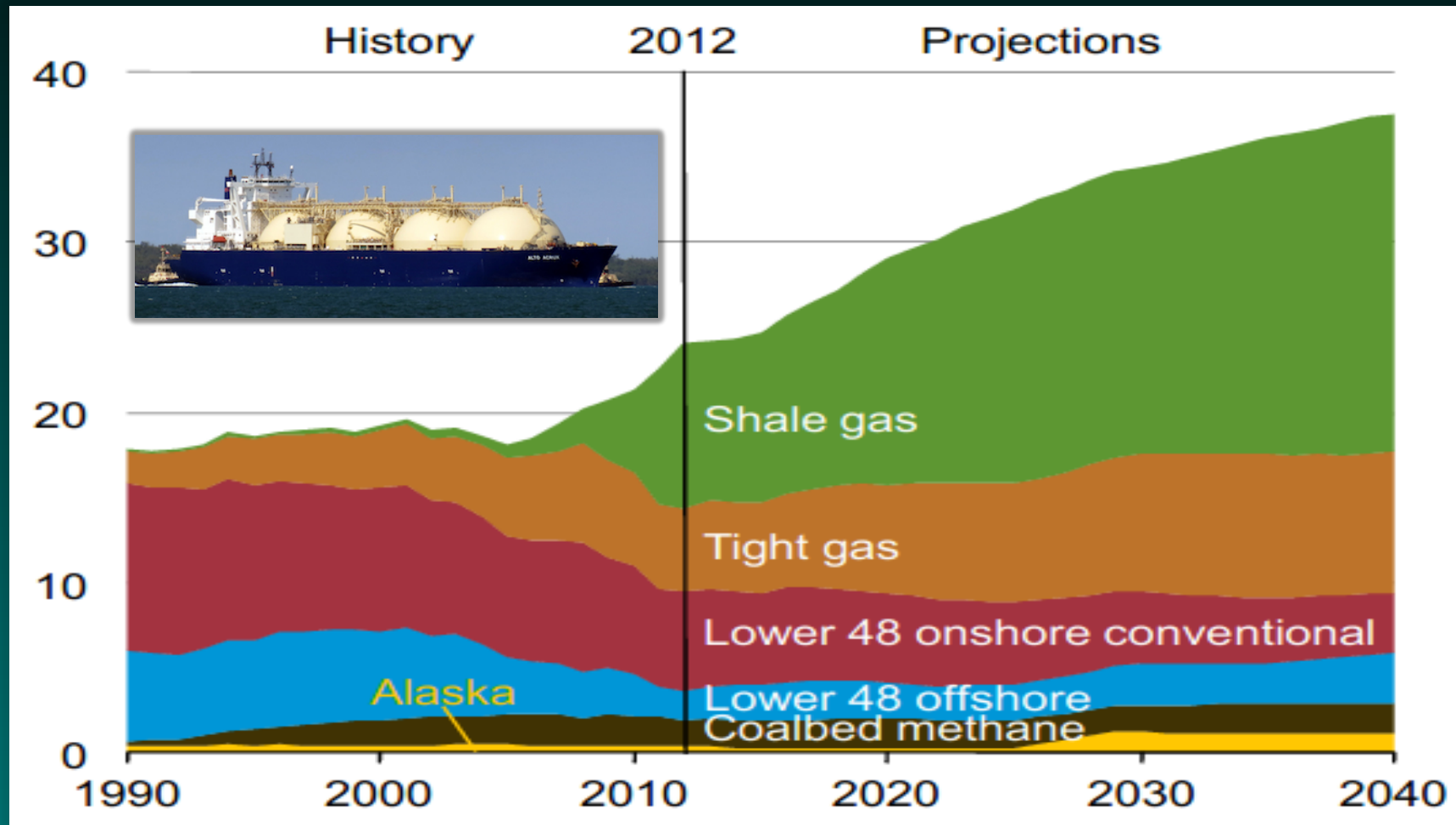
Source: Derived from US Energy Information Administration: EIAAE 02014



Independent Statistics & Analysis
U.S. Energy Information
Administration

US Natural Gas Production by Source

(Trillion Cubic Feet)



Source: Derived from US Energy Information Administration: EIAAE 02014



Independent Statistics & Analysis
U.S. Energy Information
Administration

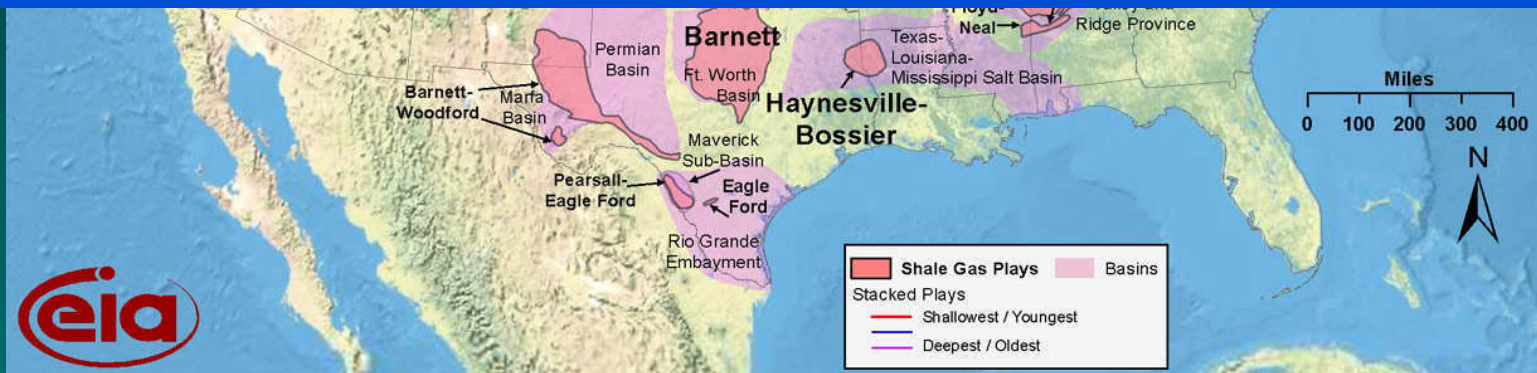
US Shale Gas Basins in North America

Shale Gas Plays, Lower 48 States

Montana
Thrust
Belt

Williston
Basin

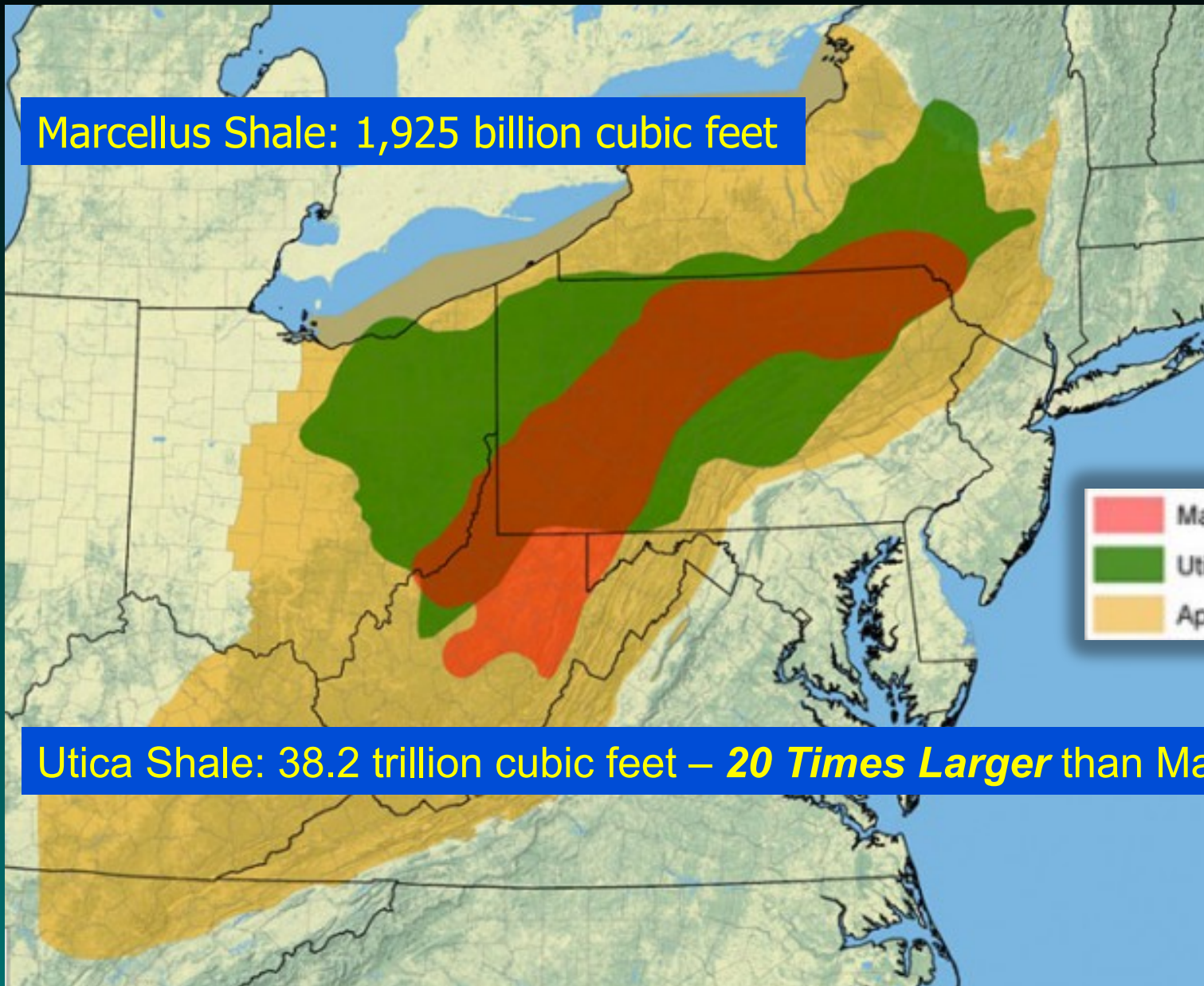
***There is Enough Recoverable Domestic
Natural Gas to Meet America's Needs
for at Least 100 years at Current
Consumption Rates.***



Source: Derived from US Energy Information Administration: EIAAE 02014

Marcellus/Utica/Appalachian Shale Basins

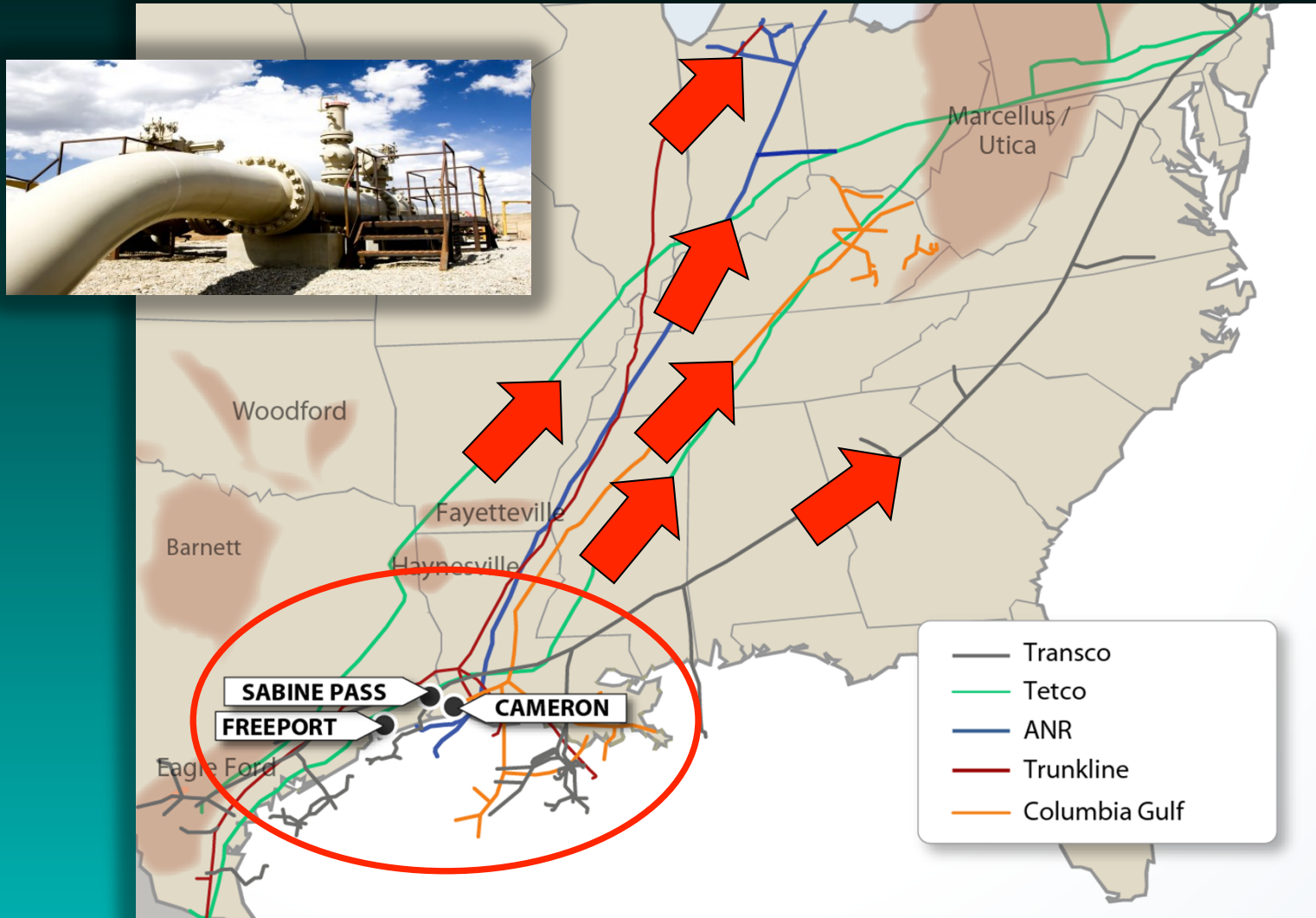
Marcellus Shale: 1,925 billion cubic feet



Utica Shale: 38.2 trillion cubic feet – **20 Times Larger** than Marcellus

US LNG Exporters Target Marcellus Shale as Feed Gas

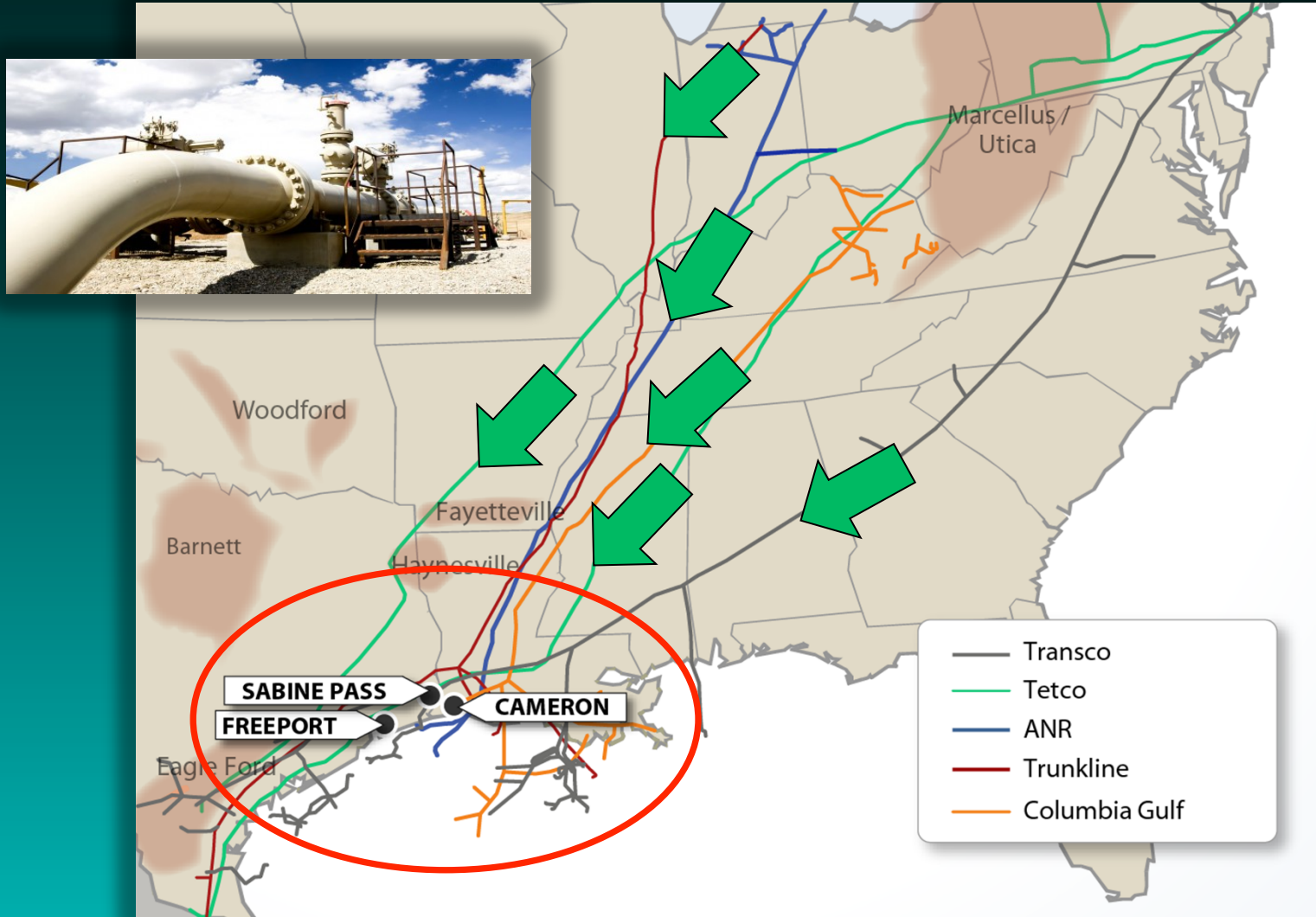
(Liquefaction Participants are Now in the Market for Dedicated Pipeline Supply to Match Their Exporting Needs)



Source: Poten & Partners' in July 2014 LNG in World Markets Research Report

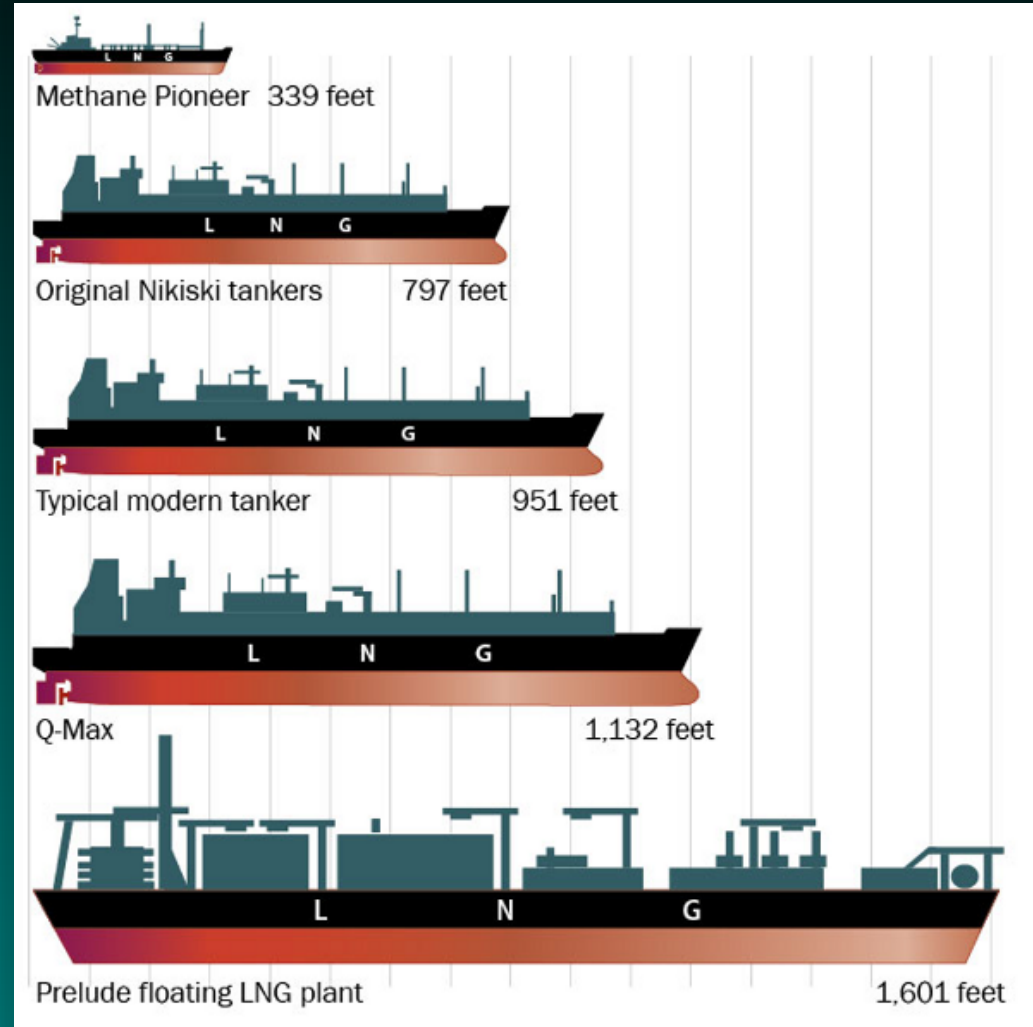
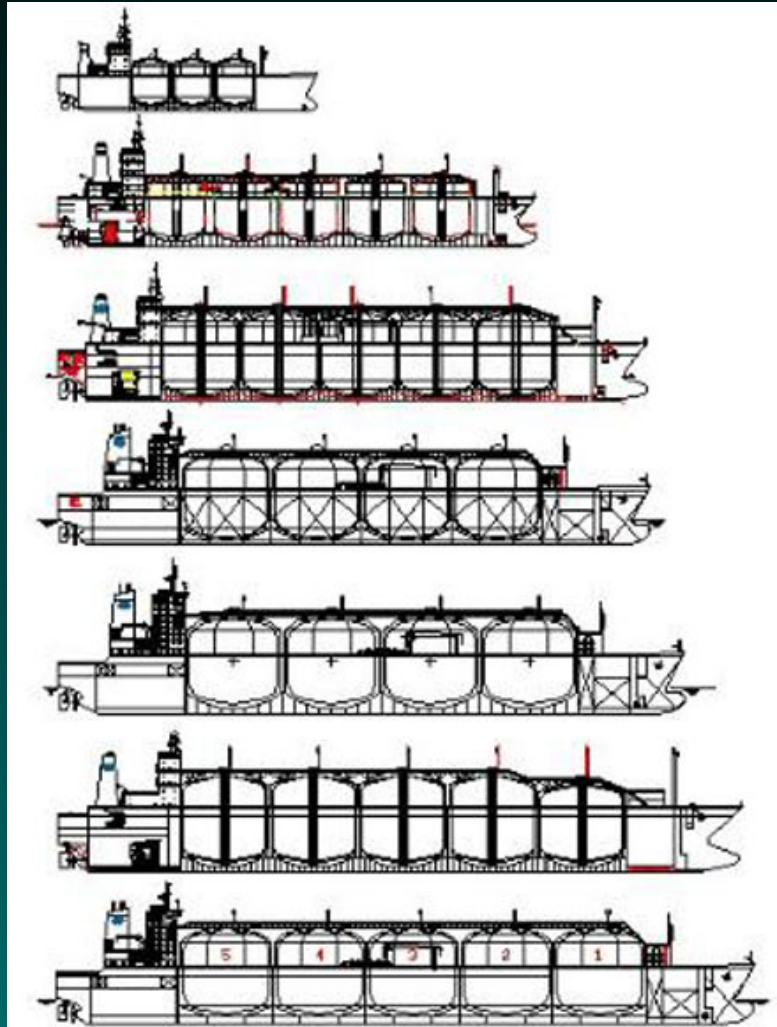
US LNG Exporters Target Marcellus Shale as Feed Gas

(Liquefaction Participants are Now in the Market for Dedicated Pipeline Supply to Match Their Exporting Needs)



Source: Poten & Partners' in July 2014 LNG in World Markets Research Report

LNG Tanker Vessel Size Evolution



Maximum Draft for Any LNG Ship is 12 Meters for LNG Loading and Regasification Terminals



Panamax LNG Vessel Dimensions

Length:	345 m (1,132 ft.)
Beam:	53.8 m (177 ft.)
Height	34.7 m (114 ft.)
Draft	12 m (39 ft.)
Capacity	266,000 cubic meters 9,400,000 cu ft.

The first Q-Max LNG carrier, **Mozah**,
was built in November 2007.

Largest Gas Ocean Carrier: Q-Max LNG

Q-Max (Qatar Max)

Gross Tonnage: 164,000 t

Summer DWT: 129,000 t





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***New Era of LNG Vessels
is on the Horizon:
Will LNG be the Fuel of the
Future for Shipping ?***



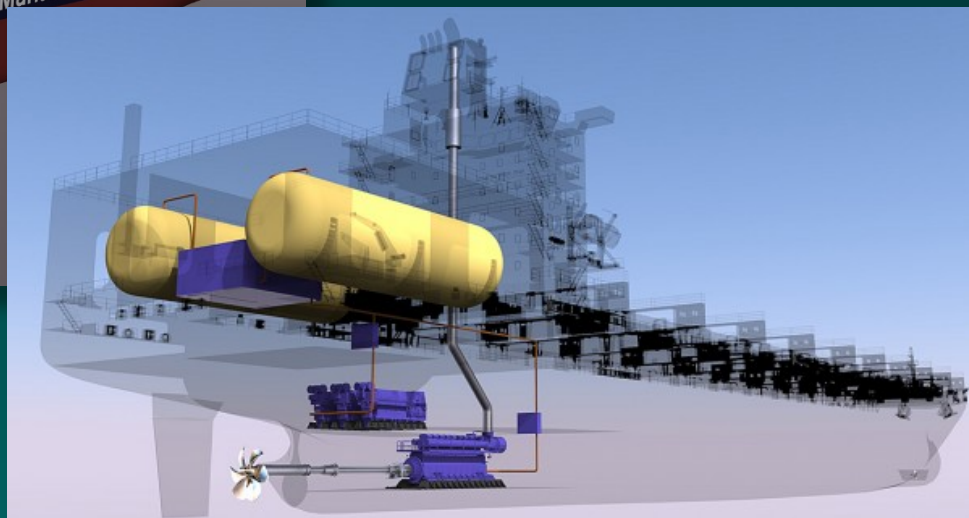
TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World



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



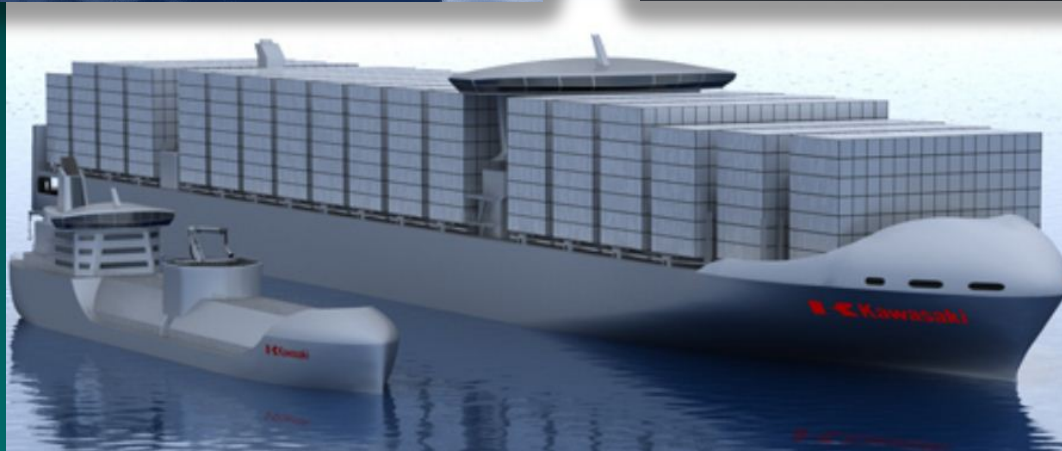
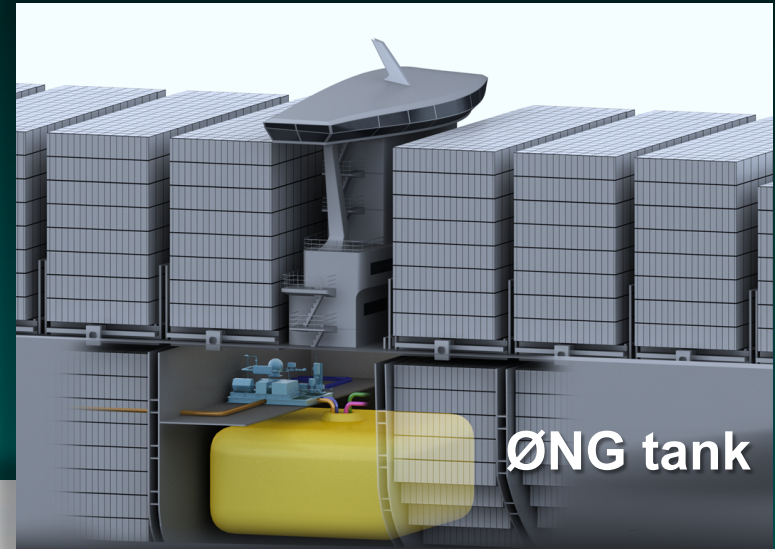
TOTE Orders Two New LNG Powered Container Ships & Two RO/RO Conversions: Largest LNG Powered Ships in the World



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.

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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Emerging Trade Opportunities for the US Heartland

"Emerging Big Ideas"



**navigating the future
of the Lower Mississippi
River Delta**

“Changing Course”:

A COMPETITION for a Project of National Significance



A 50-100 year, \$15 billion plan that lays out a bold, ambitious, and essential vision for Mid-America's future.



VAN
ALEN
INSTITUTE

Led by the Environmental Defense Fund (EDF) & the Van Alen Institute and Funded by:



Rockefeller Foundation

Innovation for the Next 100 Years



**GREATER NEW ORLEANS
FOUNDATION**

For a vibrant region.




THE KRESGE FOUNDATION

The
**WALTON FAMILY
FOUNDATION**



A New Mississippi Delta For The World



“Changing Course” has brought together teams of the world’s best engineers, scientists, planners and designers to show the **“art of the possible”** in creating a self-sustaining delta ecosystem.

“Changing Course”

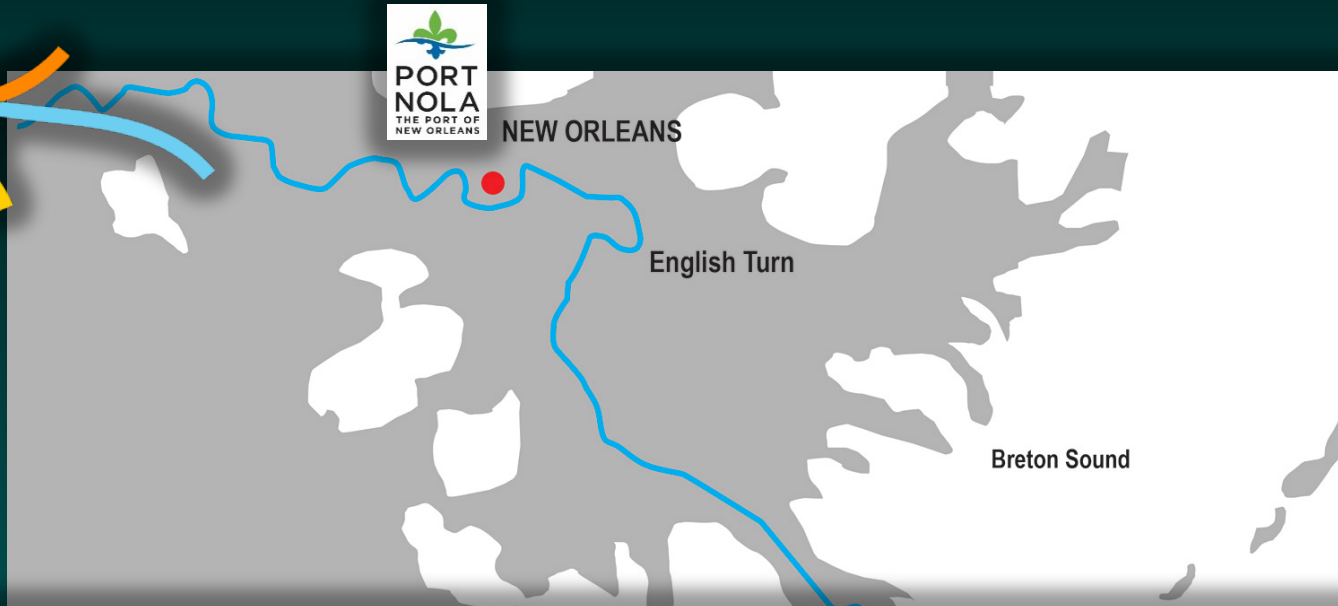
Lower Mississippi River Basin Eco System



**The Mississippi River Delta Region is:
40 % of the US Marshland
30% of the US Seafood Consumption**

The Lower Mississippi River Today

Over the last century, nearly 1,900 square miles of Louisiana's coastal wetlands have vanished



“Every hour, a football field - sized swath of land drowns in the Gulf’s advancing tides”...
If nothing is done the Delta will continue to lose
19.3 square miles a year

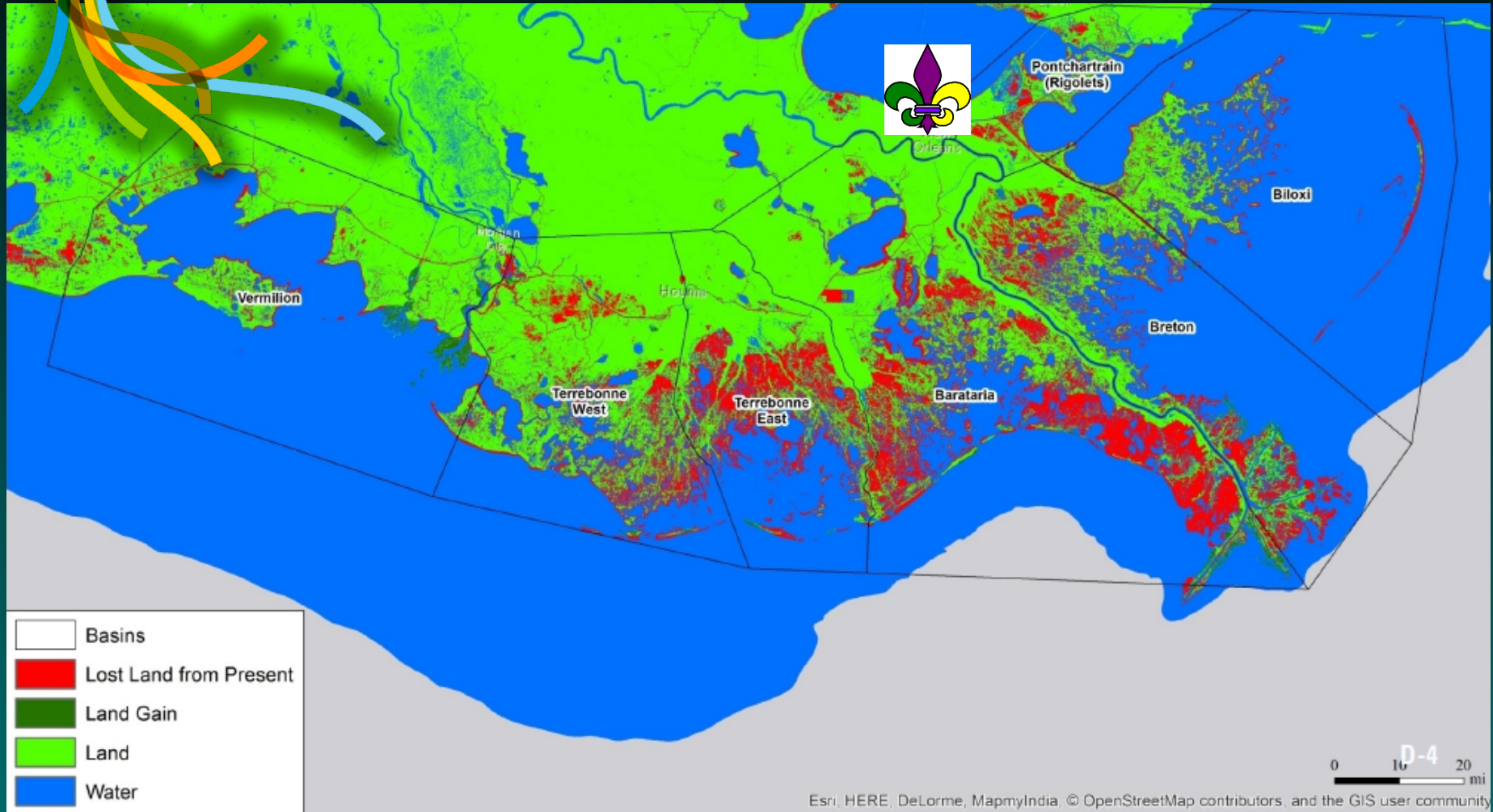


New Orleans is at River Mile 100

(from Mile Zero at Head of Passes)

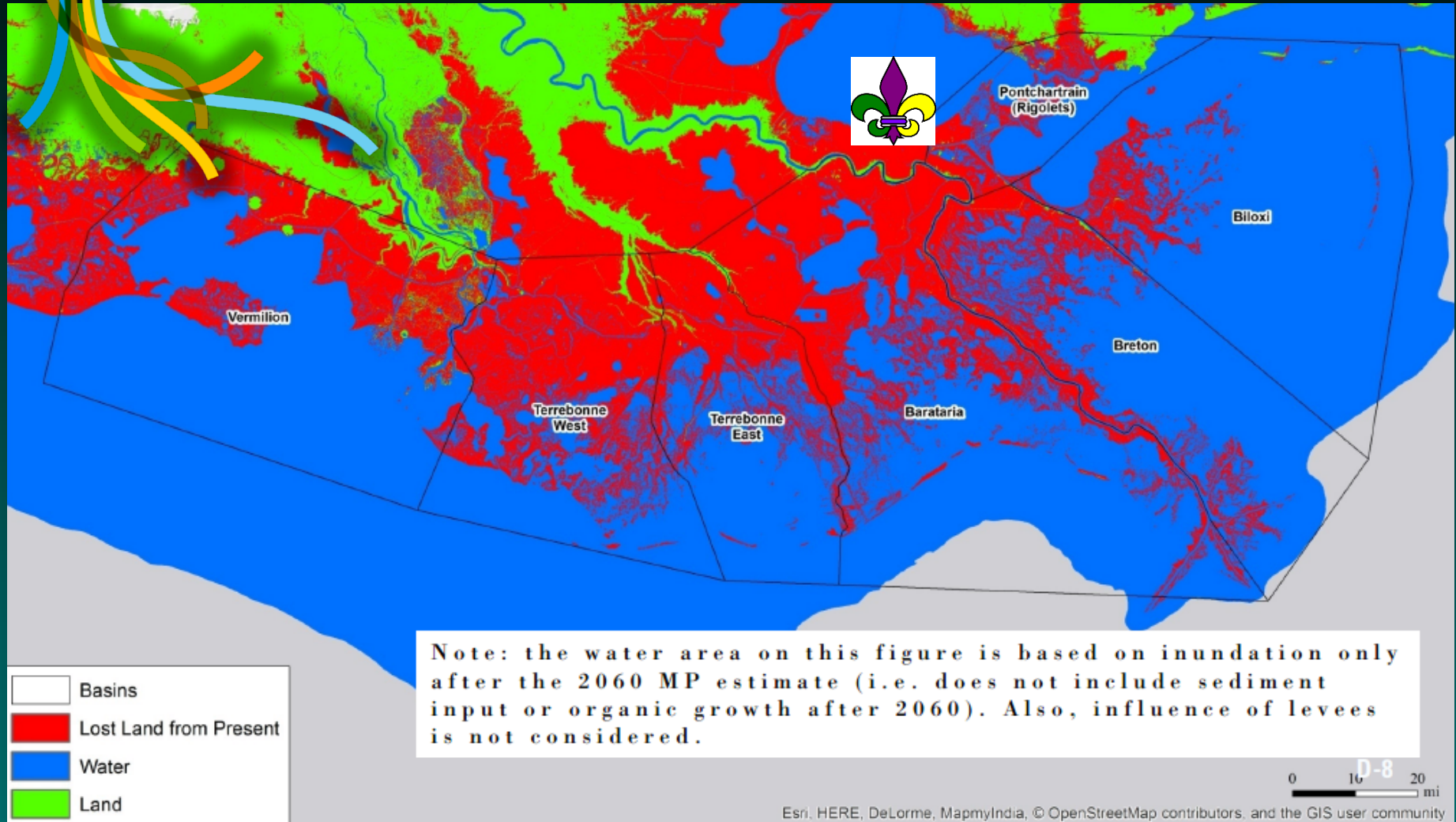


Loss of Land From 1932 to 2015



2115 Land Losses

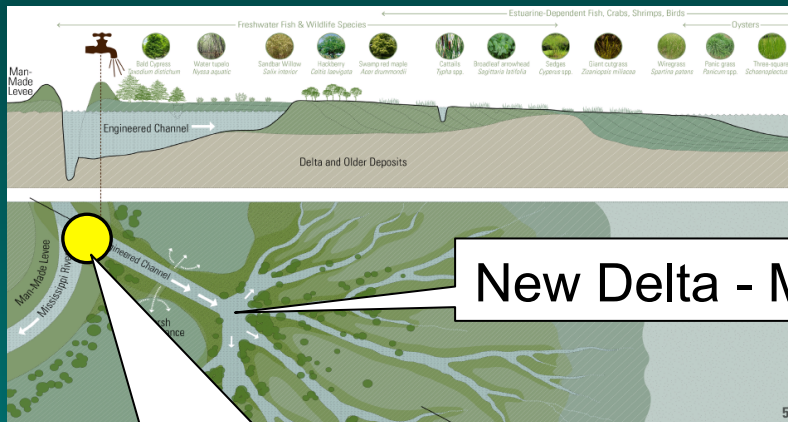
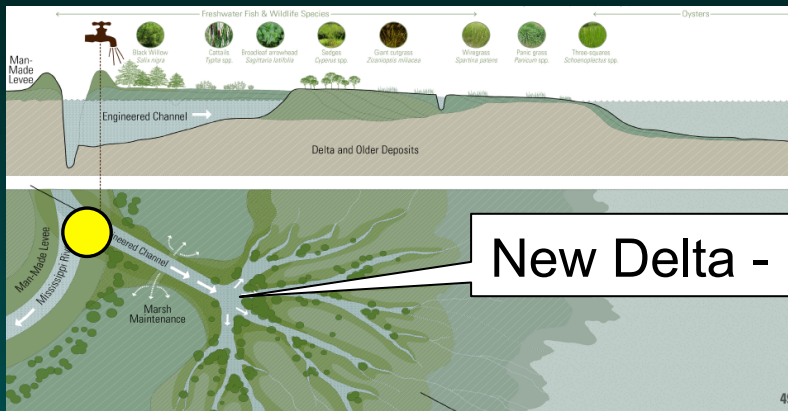
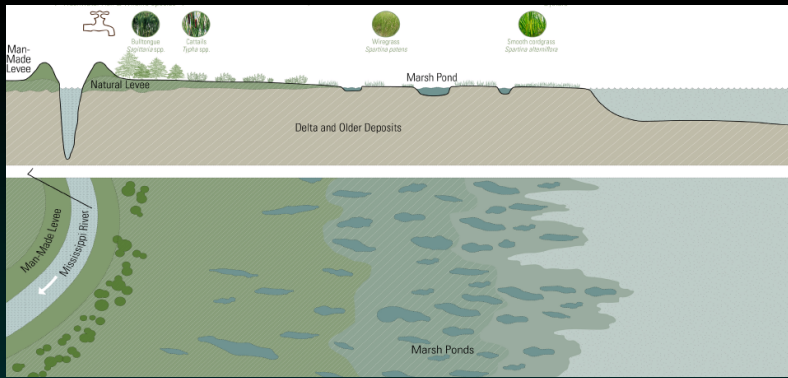
(Sea Level Rise + Land Subsidence = 1.5 meters)



Restoring America's Delta



Without action, by **2100** Louisiana will have
lost virtually **all** of its coastal wetlands.



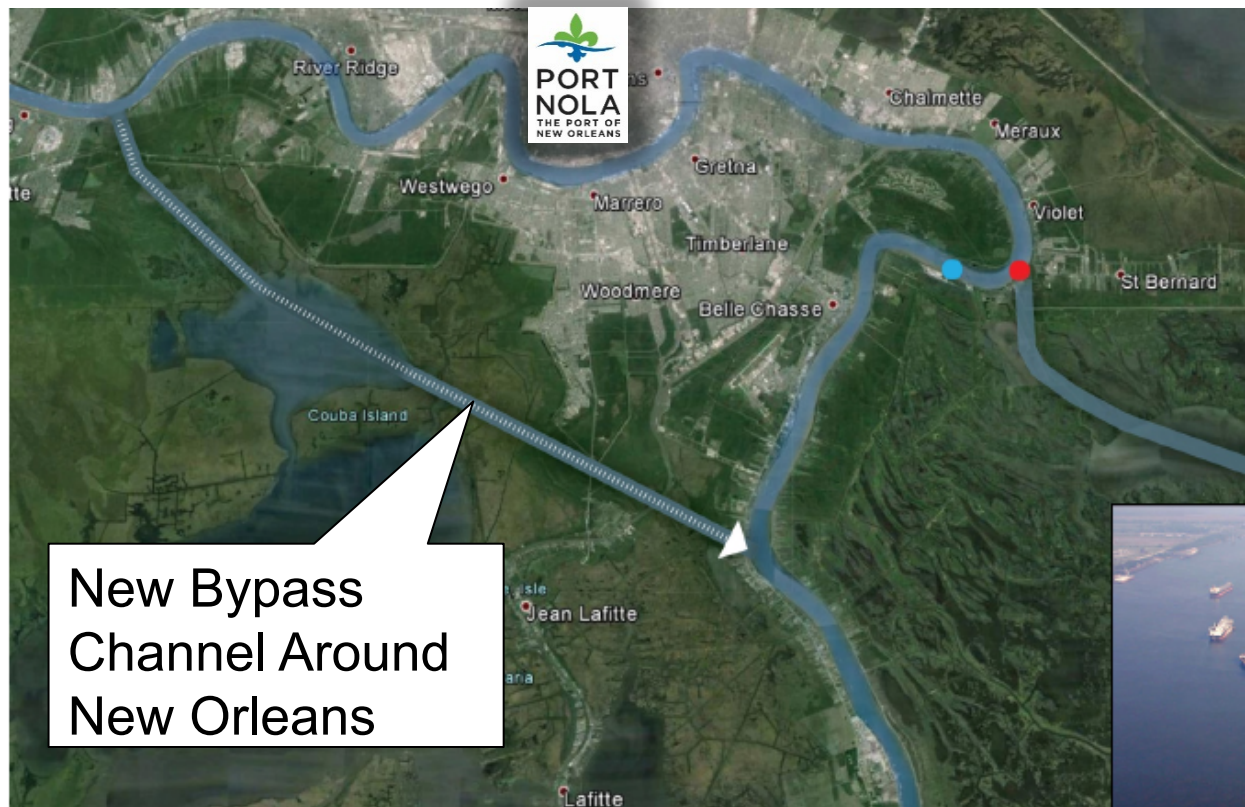
Controlled Gate



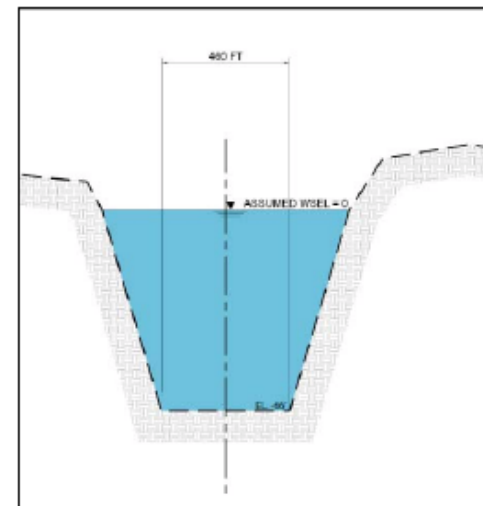


Navigation Engineering Solutions

New Orleans Bypass Channel
Reducing Distance to Baton Rouge by 30 Miles &
Eliminates Congestion in the Port of New Orleans

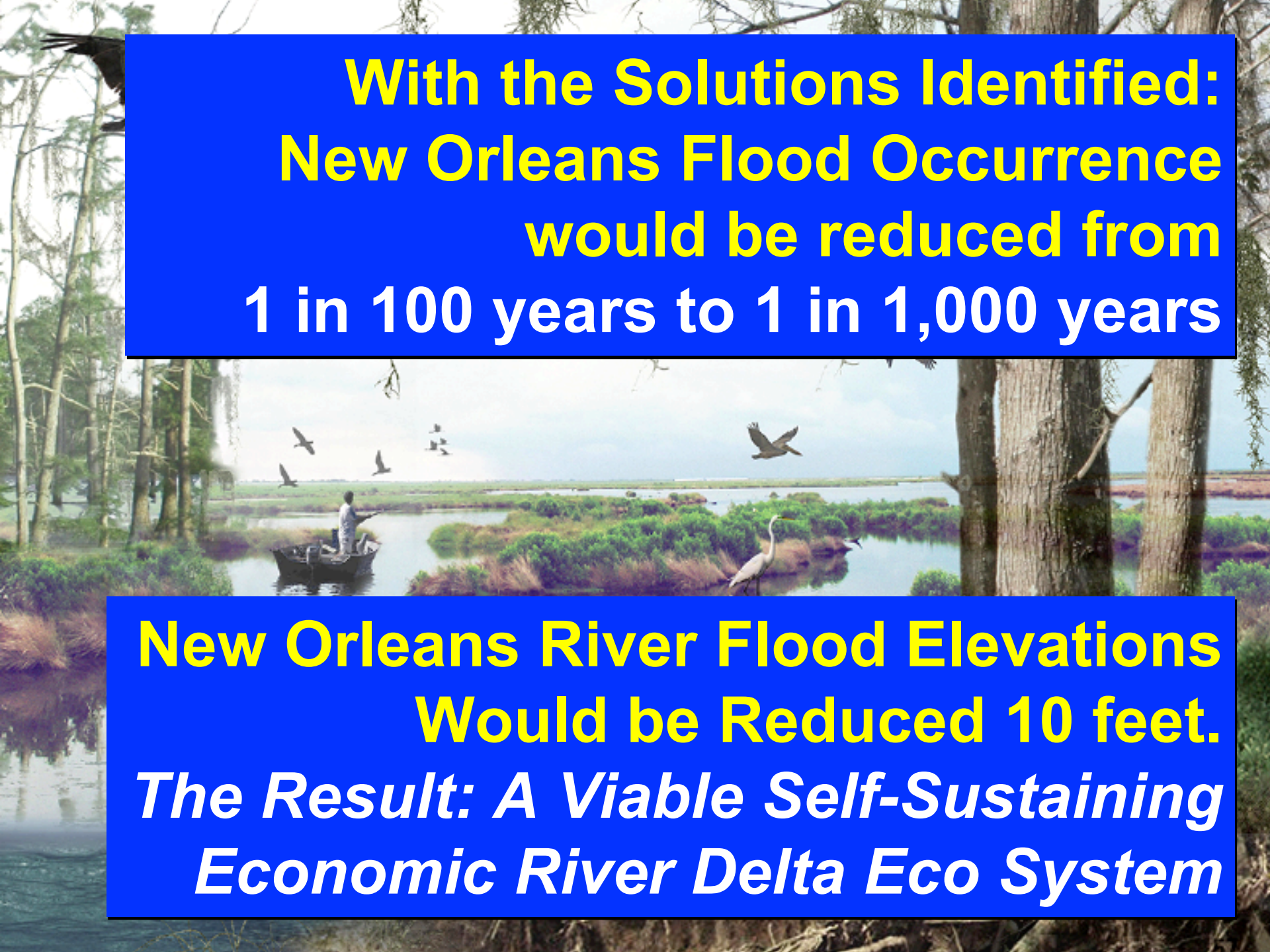


**New Bypass
Channel Around
New Orleans**



Distributary and vessel channel



A scenic view of a river delta, likely the Mississippi River Delta. In the foreground, a person stands in a small boat on the water. The background features a wide expanse of water, lush green vegetation, and several birds in flight. Tall trees frame the scene on both sides.

**With the Solutions Identified:
New Orleans Flood Occurrence
would be reduced from
1 in 100 years to 1 in 1,000 years**

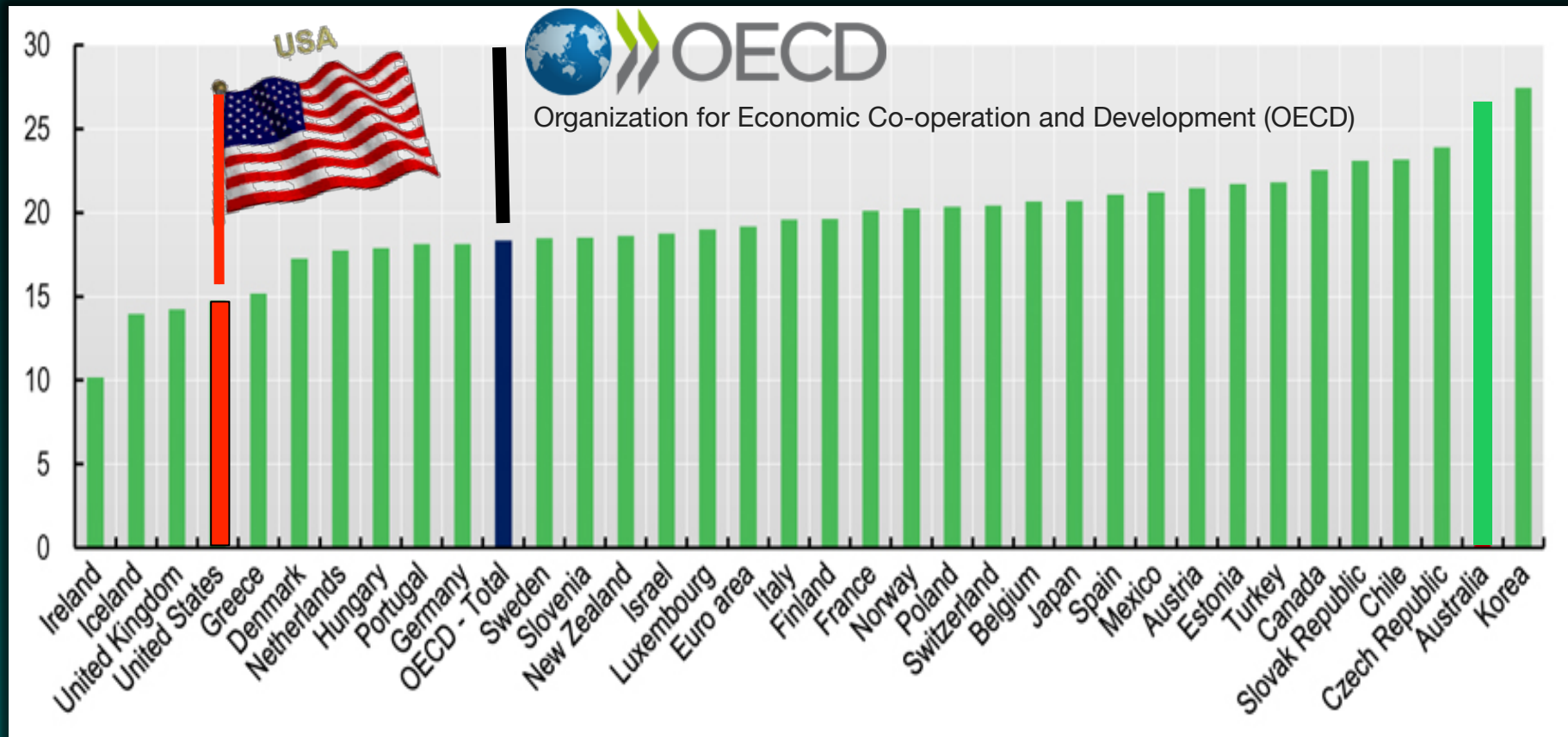
**New Orleans River Flood Elevations
Would be Reduced 10 feet.
*The Result: A Viable Self-Sustaining
Economic River Delta Eco System***

Recommended Navigational
Improvements On the Lower Mississippi
will “*Shorten the Distance to Open Ocean*”
for All River Ports by *More Than 75 Miles*



2011 International Gross Fixed Capital Formation as a Percent of GDP

(US is 32nd in the World - Below OECD Nations)





2015 Eastern Chapter Annual Meeting

Thank You

