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Alliance of the Ports of Canada, the Caribbean, Latin America and the United States

Commissioners Seminar
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Technologies, Economics, and Changes in Selected US Ocean Cargo Flows

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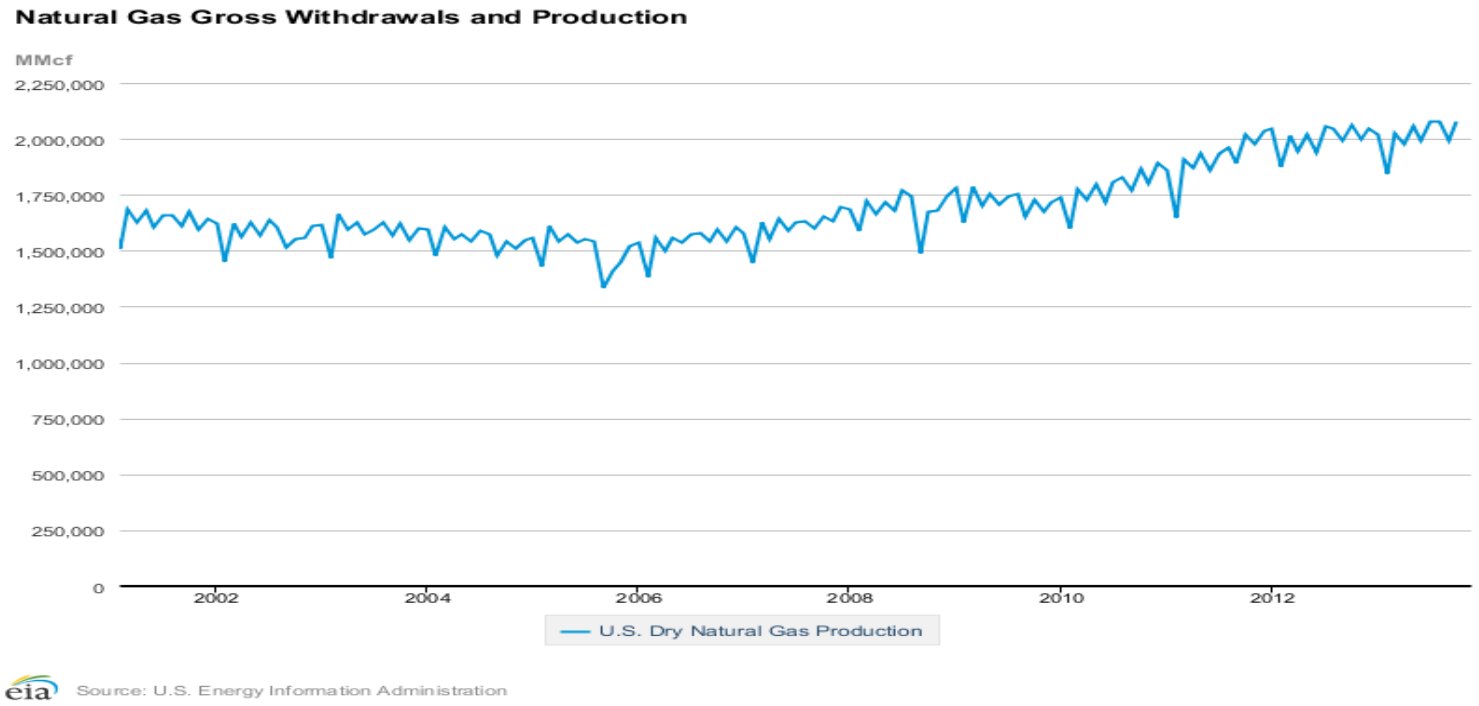
Outline of Discussion

- **Impacts of hydraulic fracturing technology on ocean cargo flows of energy products from/to US**
  - **LNG exports**
  - **Coal exports**
  - **Crude oil imports/exports**
  - **Petroleum products exports**
- Impacts of implementation of MARPOL Annex VI sulfur emission regulations on containership deployment patterns for North American liner services
- Impacts of large containerships and industry concentration on service levels for selected North American container traffic flows

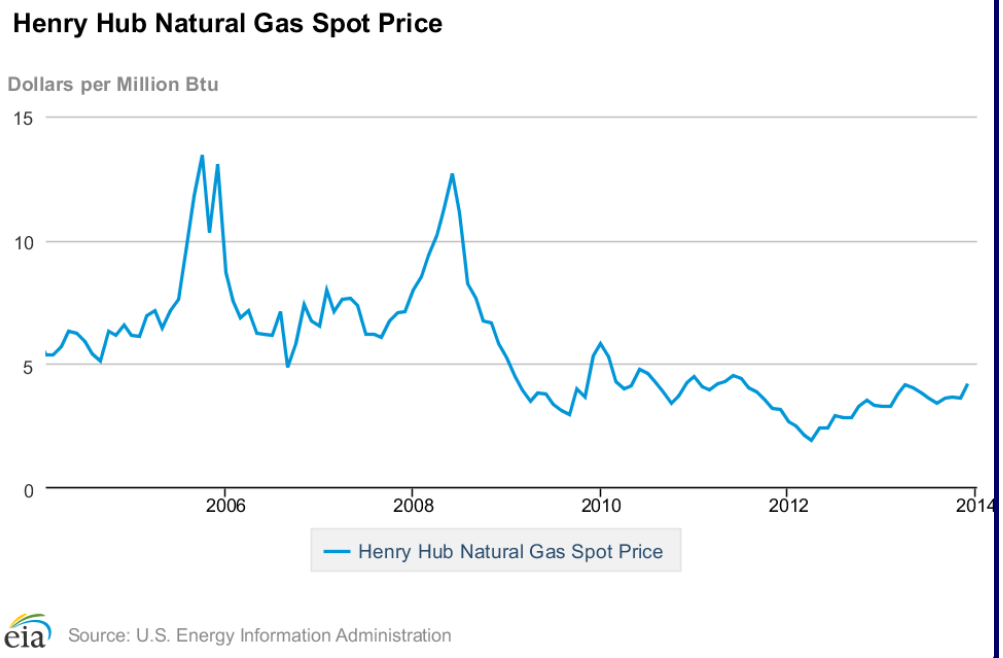
Fracking and Gas Production

- Hydraulic fracturing took off in 2005, and domestic natural gas production -- which had been declining since 2001 -- began to grow rapidly
- Between 2006 and 2013, US natural gas production increased by over one-third



Shale Gas and US Energy Exports

- The shale gas production surge created a natural gas supply glut and has pushed domestic prices down
- These low prices are having two important impacts on transportation of energy products in or from the US, and on corollary port infrastructure:
  - Increased pressure to develop LNG exports
  - Increased pressure to expand coal exports



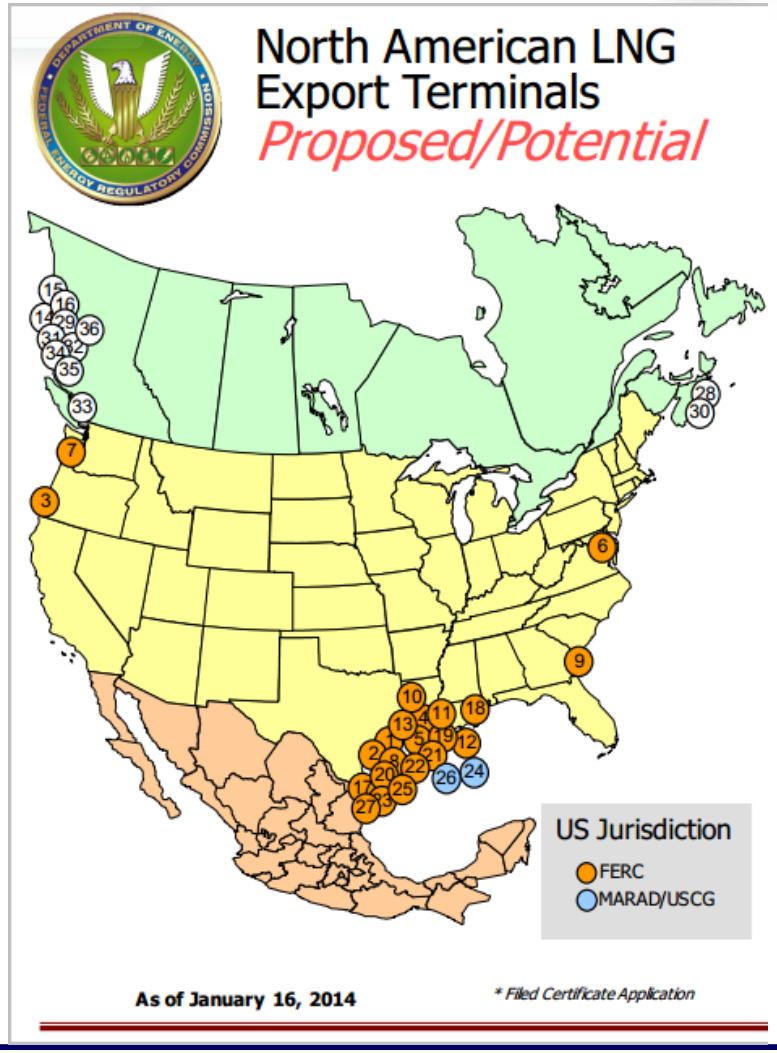
Demand for US LNG Exports

- Strong demand has materialized for LNG liquefaction facilities in the US to export the product to Asia and Europe, where natural gas prices are 2-4 times more than domestic rates

Demand for US LNG Export Terminals

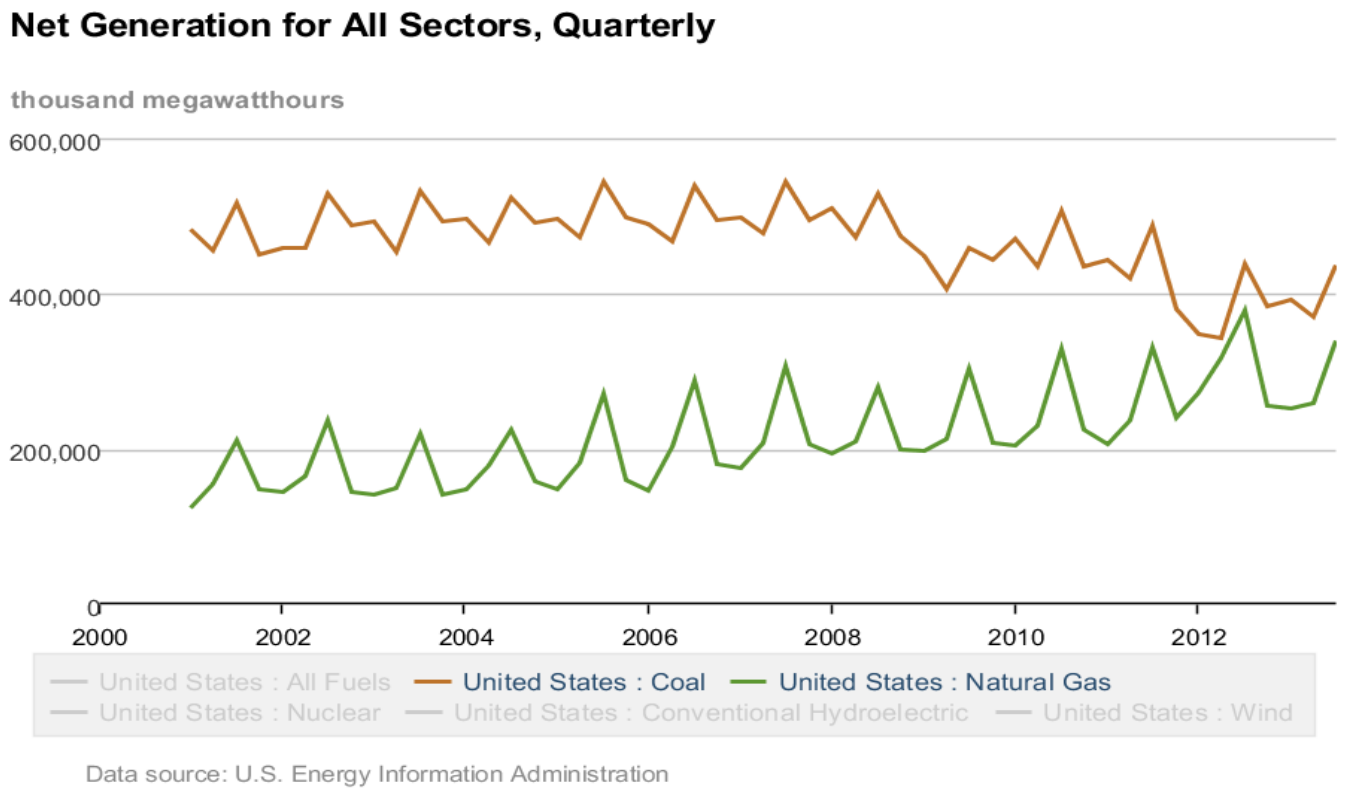
- A few dozen LNG export terminals have been proposed for construction at different US ports, but only four have been approved by FERC:
  - Cove Point – MD
  - Sabine Pass – TX
  - Freeport – TX
  - Lake Charles – LA
- These four are good locations for exports to Europe, but less ideal for exports to Asia
- However, several LNG export terminals have been proposed for development in BC and the US PNW to facilitate the shipment of natural gas from Alberta to Asia

Source: FERC Office of Energy Projects



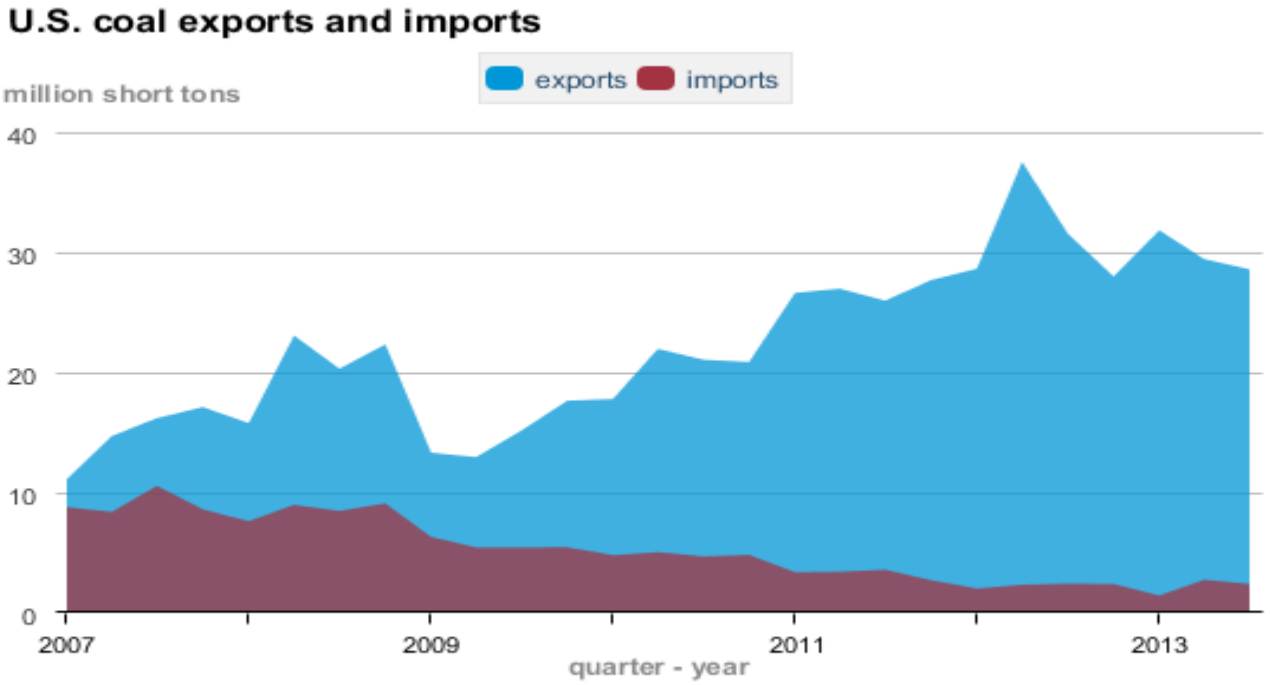
Shale Gas and Domestic Coal Consumption

- Low NG prices since 2009 have induced US electricity providers to increase their use of natural gas, while reducing their burning of coal



Shale Gas and US Coal Exports

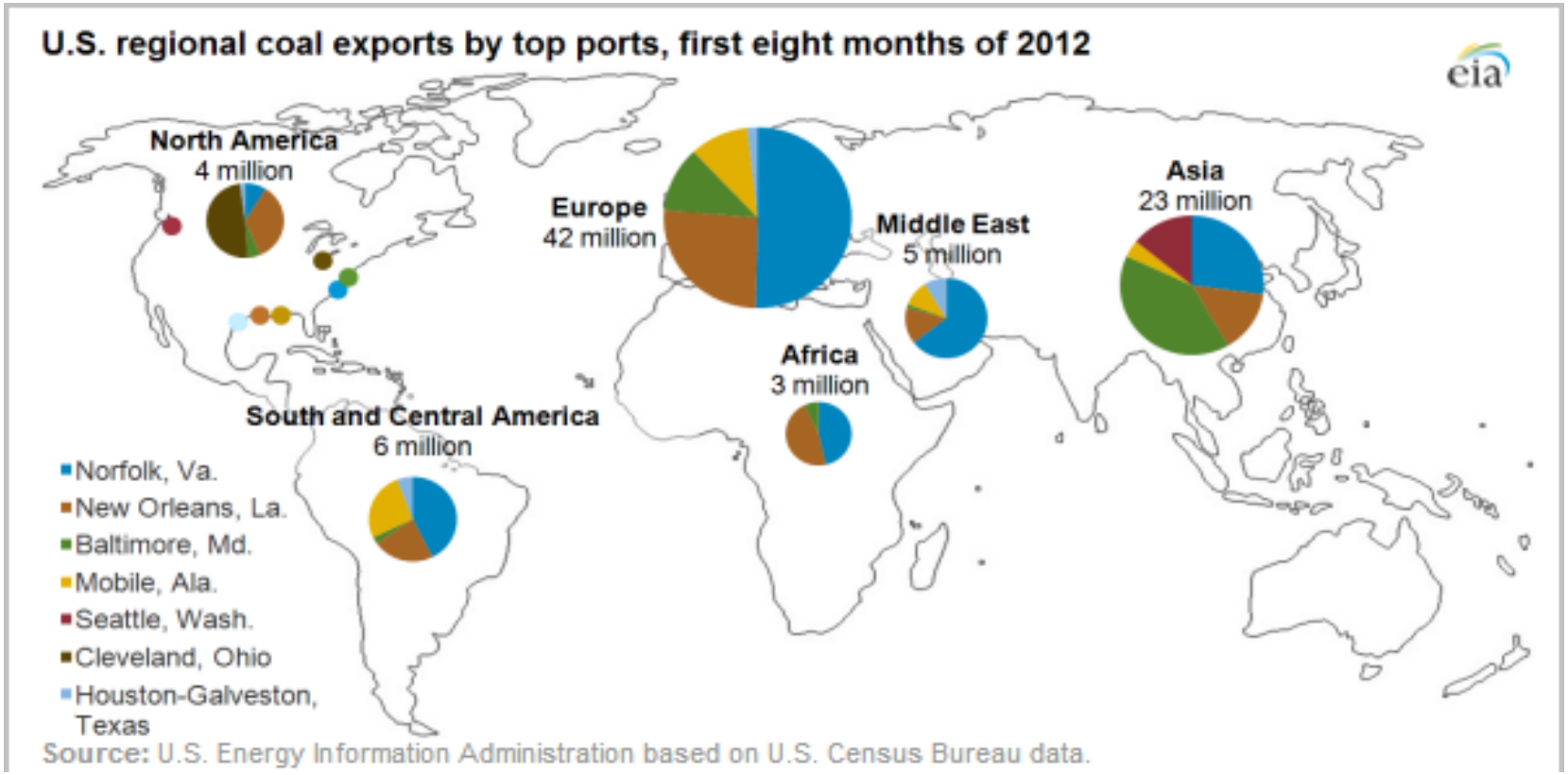
- As a consequence of declining domestic demand for coal, due to NG substitution by utilities, US coal producers have more than doubled their exports since 2009 to over 125 million tons in 2012



eia Source: U.S. Energy Information Administration: "Quarterly Coal Report."

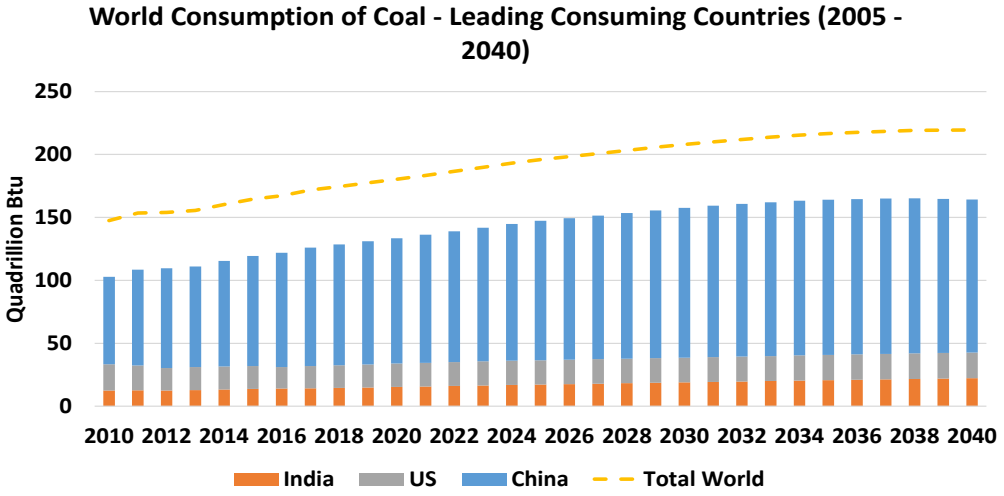
Markets for US Coal Exports

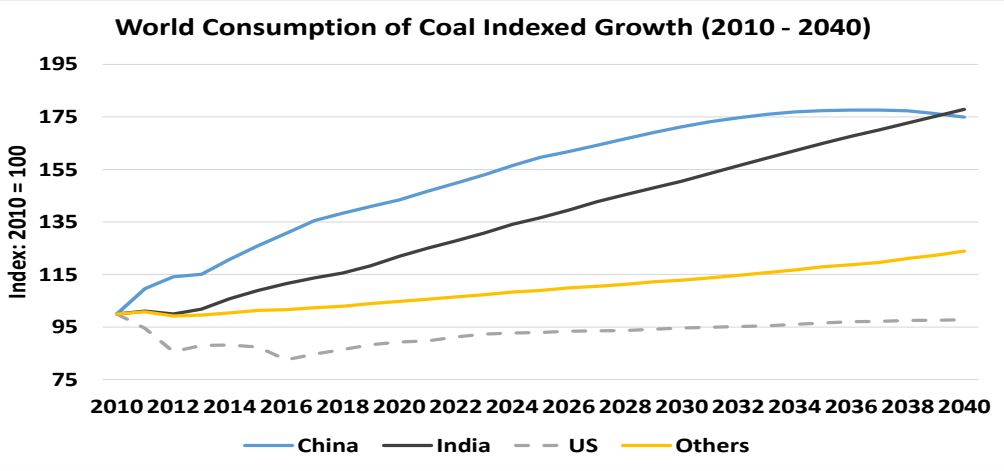
- Europe is the largest importing region for US coal exports, taking over 50% of the country's overseas shipments in 2012, with lower costs than Russian natural gas



Markets for US Coal Exports

- However, demand for coal is projected to rise most rapidly in Asia, particularly in China and India
- As US consumption of coal trends down, per EIA forecasts, the pressure to increase exports will be magnified

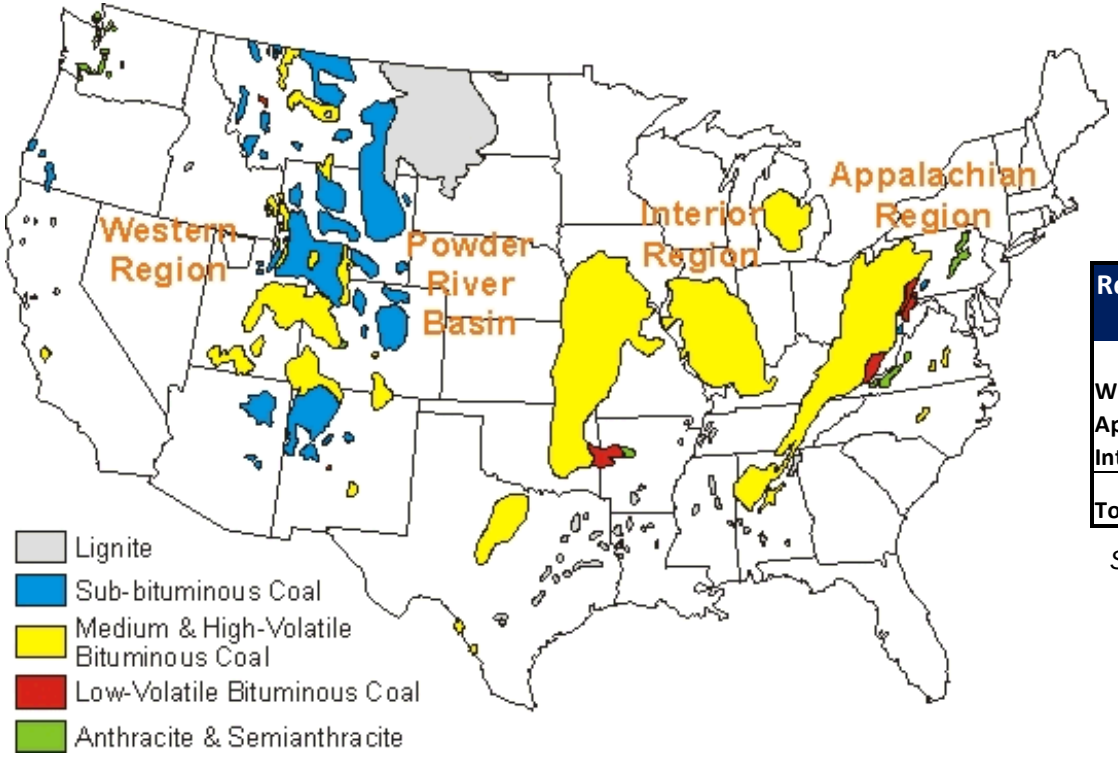




Source: EIA, 2013

Demand for US Coal Export Terminals

- Given that the majority of US coal production is now in the Western Region, additional export terminal capacity is needed on the West Coast, to enable the country to be a more competitive supplier to coal buyers in East Asia



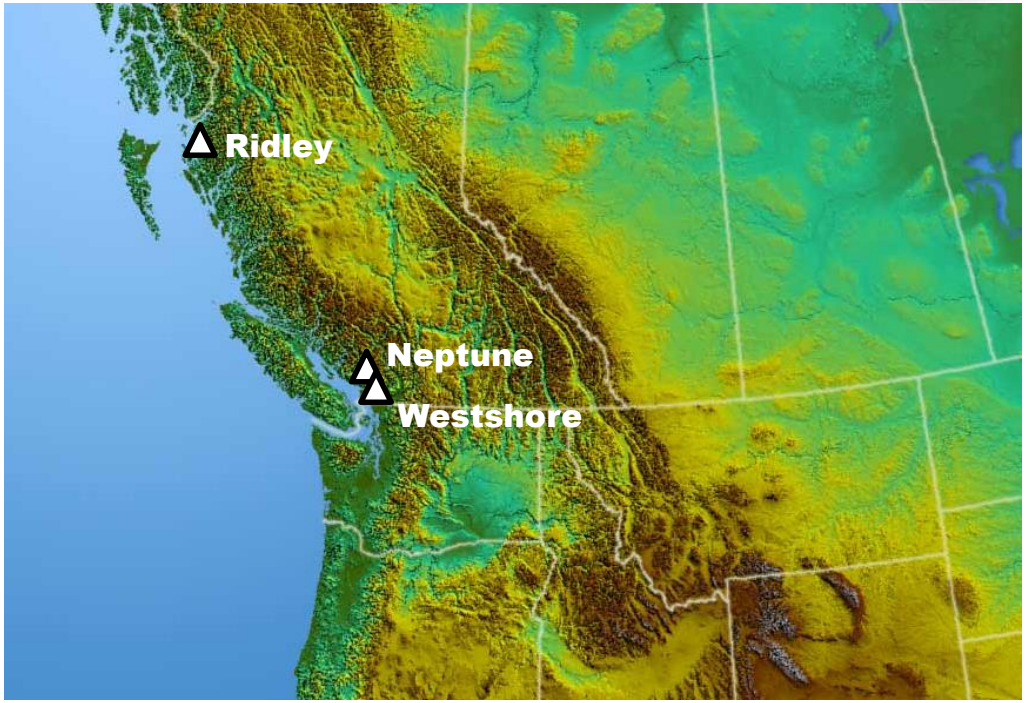
Region	2013 Output (Mtons)	US Share
Western	532	54%
Appalachian	286	29%
Interior	166	17%
Total USA	984	

Source: EIA. 2014

Source: Kentucky Coal Education Project

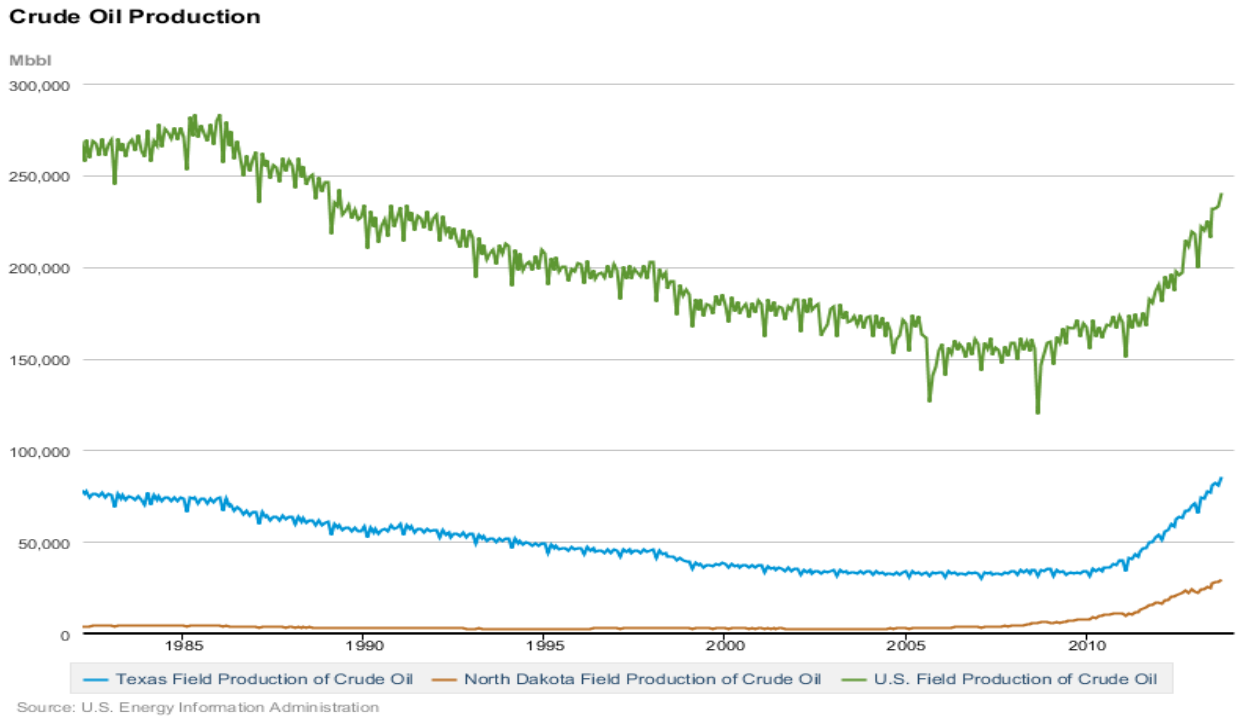
Demand for US Coal Export Terminals

- At present, there are no coal export terminals in Washington or Oregon, and very limited facilities in the Californian ports of Richmond, Stockton, and Long Beach
- In desperation, PRB producers are routing coal shipments into three BC terminals: Ridley (Prince Rupert), Neptune (North Vancouver), and Westshore (Ladner)
- Three new coal export terminals are being proposed in the PNW – in Bellingham (WA), in Longview (WA), in Port Westward (OR)
- All three projects face stiff local opposition



Fracking and Oil Production

- The same hydraulic fracturing technology used to produce shale gas has caused domestic oil production to surge since 2008, with the two largest shale plays in North Dakota and Texas



- This jump in production activity has further stimulated increased imports of piping materials through the country's main steel-handling ports, especially Houston and New Orleans

Bakken Shale Oil Transportation

- Insufficient pipeline infrastructure is in place to move North Dakota's shale oil to domestic refineries with capacity to process the crude output, so the majority of production is moving in unit trains of tank cars, mainly to the Gulf Coast

- This lack of pipeline capacity causes the price of Bakken crude to be less than West Texas crude by about $5-25 per barrel

Bakken Shale Oil Exports via West Coast Ports

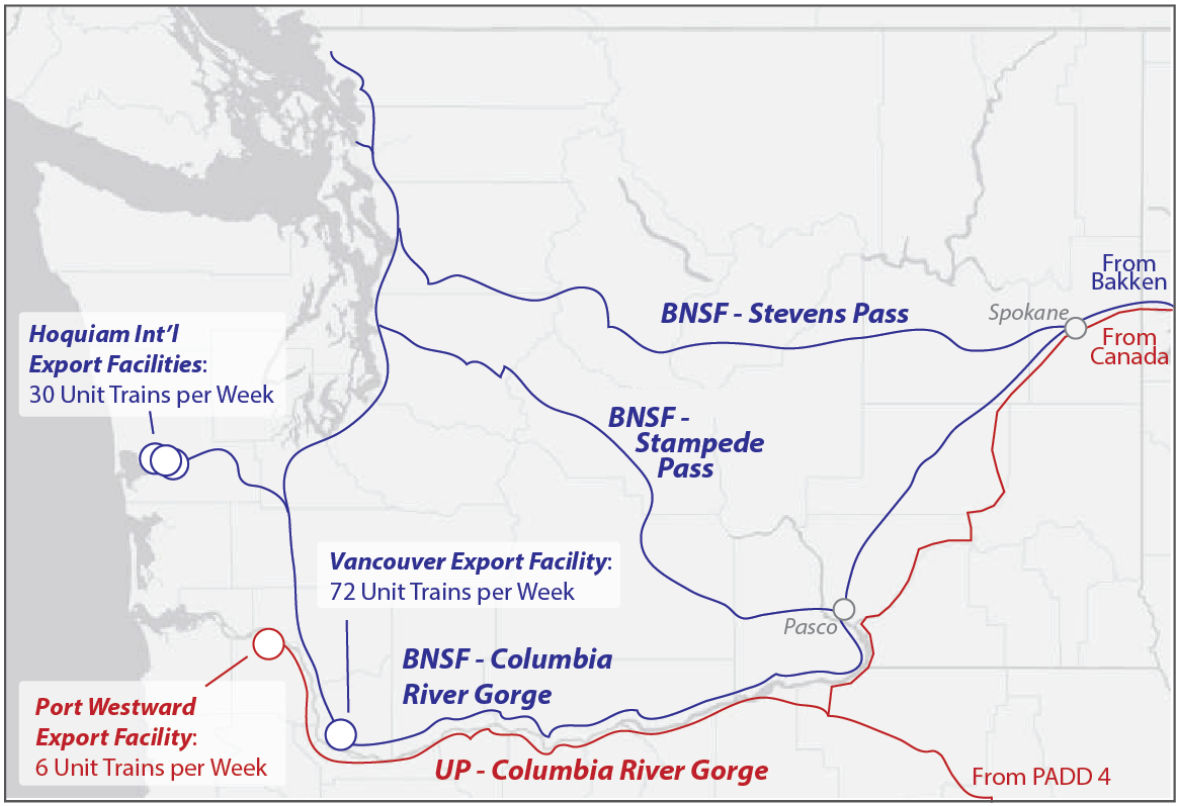
- Development projects are being pursued in the PNW for new liquid bulk terminals to export Bakken crude to Asian markets, as well as to California refineries

- **One such project is being pursued by Tesoro in Vancouver, WA, with a capacity of 350,000 barrels/day**

- **A second export terminal is planned for Hoquiam (Grays Harbor)**

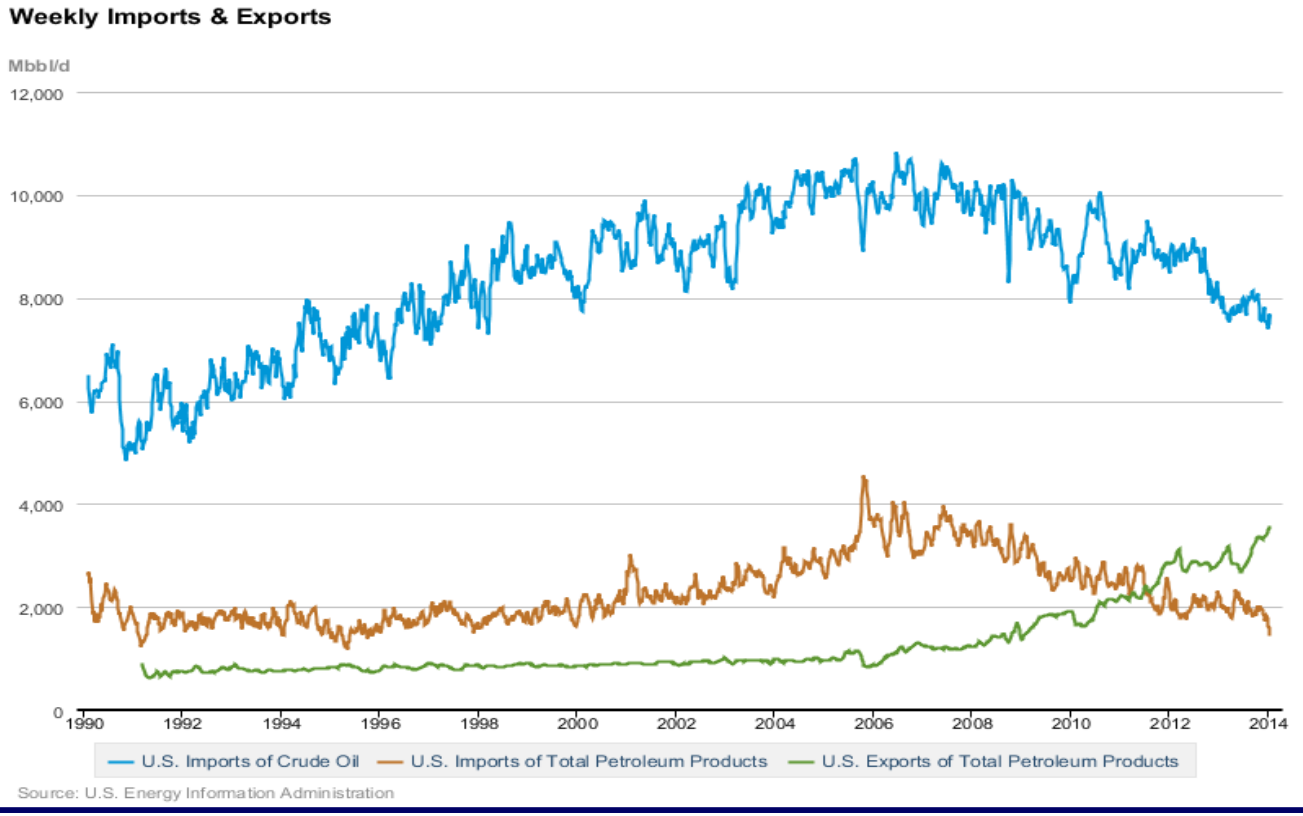
- **Both terminals would also be able to handle crude shipments from Alberta**

Rail Options for Crude Oil Deliveries to Washington Export Terminals



Shale Oil and US Petroleum Imports/Exports

- As domestic crude oil production has surged, US oil imports have declined, as have imports of petroleum products
- Moreover, US exports of petroleum products (such as diesel fuel) have increased, as Gulf Coast refineries have exploited "trapped" domestic crude at discounted prices



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- **Impacts of implementation of MARPOL Annex VI sulfur emission regulations on containership service patterns for North American liner trades**
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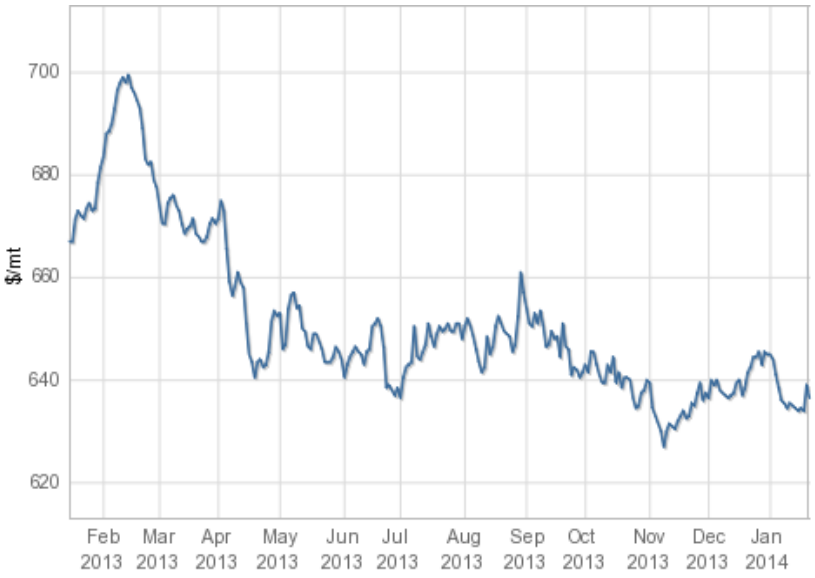
Overview of MARPOL Annex VI Sulfur Rules

- After January 1, 2015, ships operating in designated Emission Control Areas will be required to use fuel with a maximum sulfur content of 0.1% of mass, per regulations of the IMO
- Almost all of the Pacific and Atlantic coasts of the US and Canada lie within the North American ECA

- Ships could be fitted with exhaust scrubbers and use regular bunker fuel (with 3.5% sulfur content) or otherwise will have to burn ultra low-sulfur fuel while traversing through an ECA

Cost Impacts of Annex VI Sulfur Rules

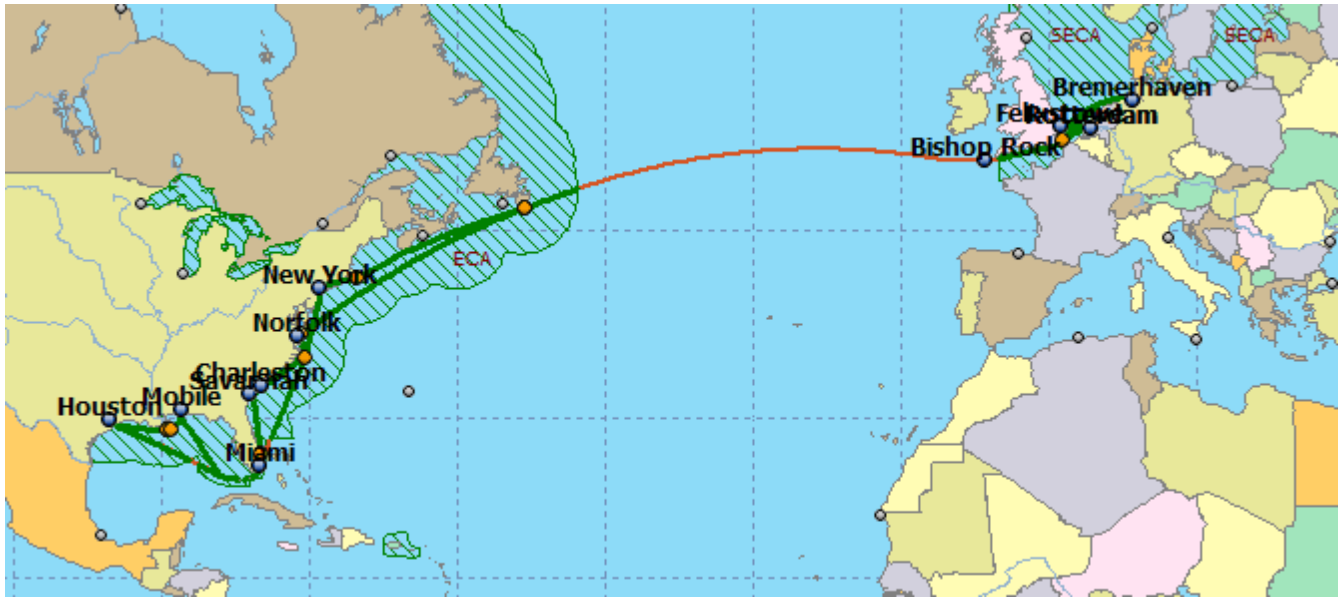
- The cost difference between heavy fuel oil (regular bunker fuel) and marine diesel oil (with 1.0-1.5% sulfur) has been substantial, averaging about $300/ton for the past year



- For ultra low-sulfur marine gas oil (with <0.1% sulfur), the current spreads (in Houston, Rotterdam, and Singapore) are even higher, ranging between $320 and $400/ton
- These spreads are likely to increase after January 2015 – our preliminary analysis indicates an adjustment of 15-20%, based on a 3% gain in global demand for the low-sulfur MGO

Impacts of Annex VI Sulfur Rules on Voyage Costs

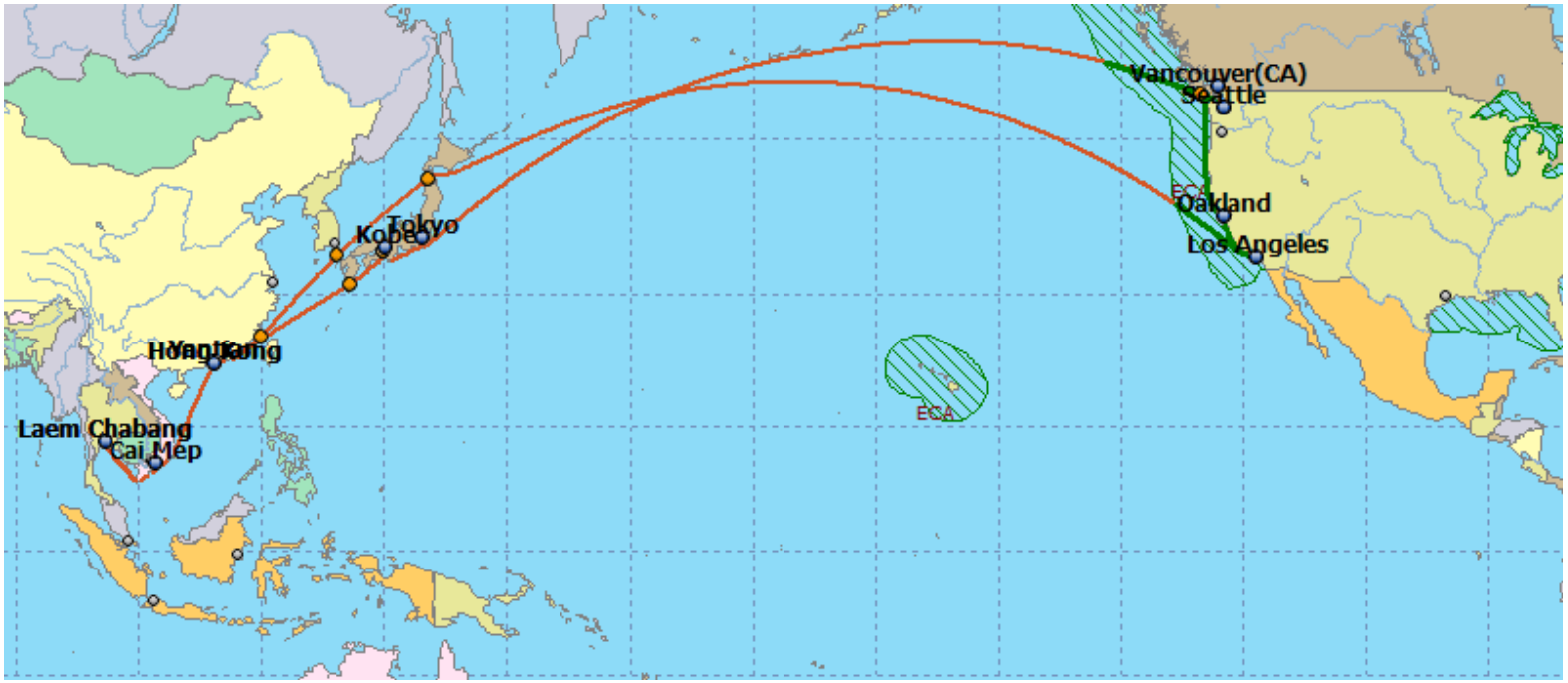
- For many containership services that are calling at multiple North American ports, implementation of the Annex VI rules for vessel sulfur emissions will likely cause a significant increase in voyage cost per TEU
- For example, the cost to operate the TA-2 deployment of Maersk between North Europe, the US East Coast, and US Gulf Coast could increase from $300 to $400 per round-trip TEU



- Other vessel services that call at both Gulf Coast and East Coast ports in this trade will also be negatively impacted, but with lower increases than the TA-2

Impacts of Annex VI Sulfur Rules on Voyage Costs

- For Transpacific vessel strings that cover both the PSW and PNW ports, Annex VI rules will also impose a penalty
- As an example, if MOL continues in 2015 to operate its PSX deployment from Asia to California to SEA/VCR to Asia – instead of returning directly – the incremental cost of the coastal leg will be about $75 per round-trip TEU (based on current differentials)



Voyage Cost Impacts and Carrier Responses

Ocean carriers will likely respond to the increases in voyage costs imposed by Annex VI implementation in various ways:

- ✧ Enact surcharges for cost recovery
  - Easier to implement in lanes where all of the lines are equally impacted (example – Montreal/Europe)
- ✧ Modify vessel service designs
  - Reduction or elimination of Transpacific strings covering PSW and PNW regions
  - Separate Europe – South Atlantic/Gulf strings
  - Greater use of Caribbean hubs and feeders
  - Eliminate line-haul calls at secondary ports
- ✧ Deploy larger ships where feasible
  - Use scale economies to partially mitigate the higher fuel costs

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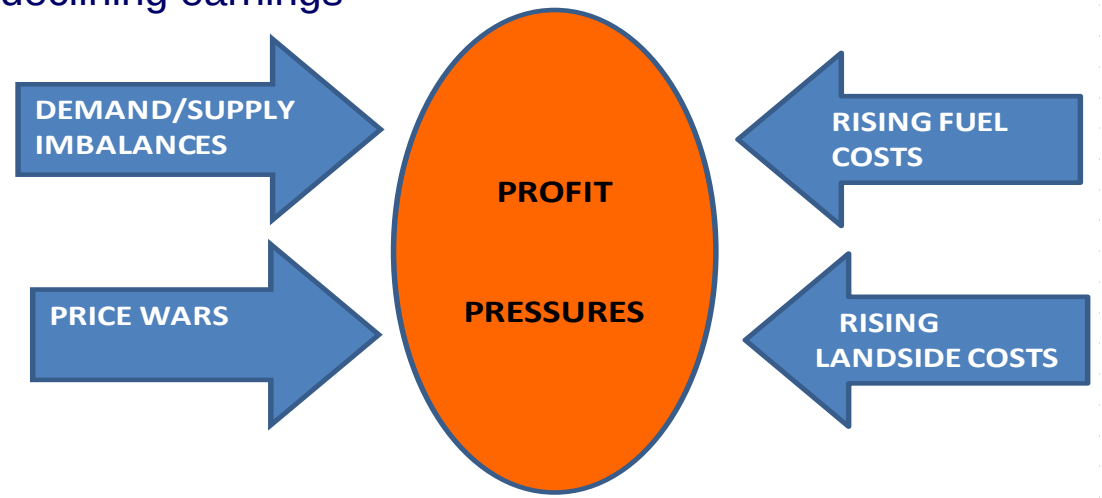
Forces for Use of Larger Ships

- Use of larger ships and more vessel sharing alliances is a direct response to volatile and declining earnings

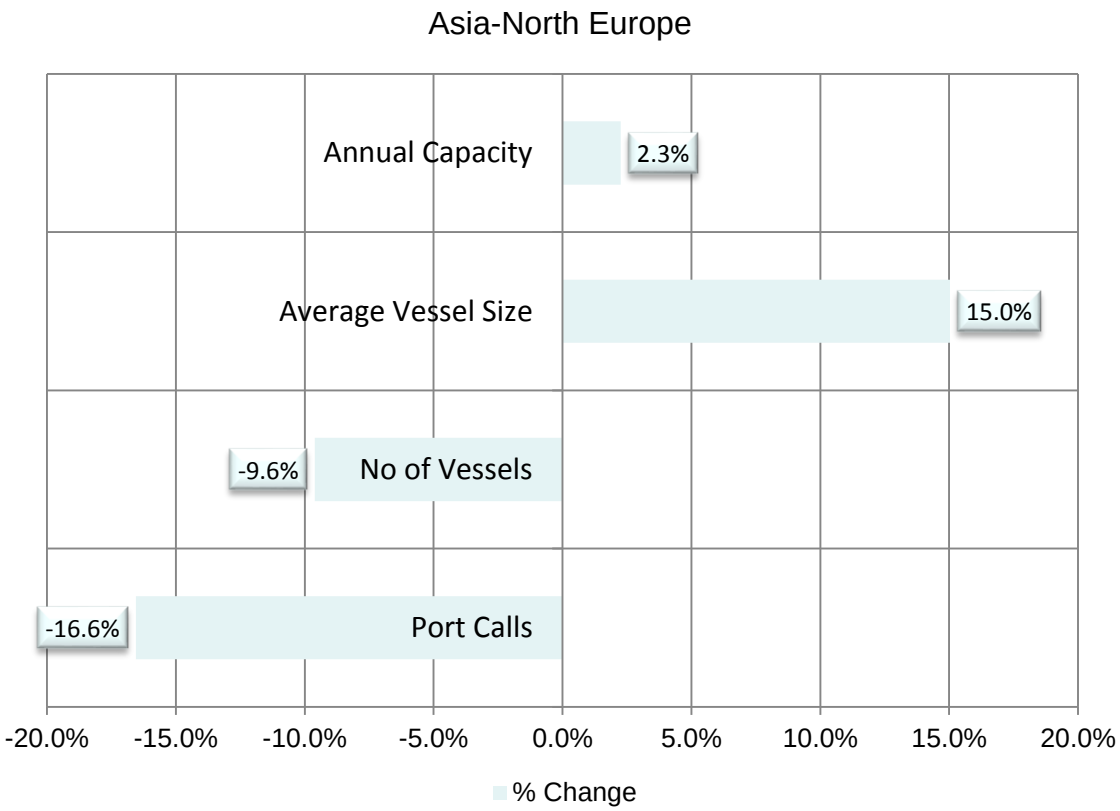


- Ocean transport is the one component of a container traffic flow's cost chain that ship lines can control

- Hence, the continued pursuit by carriers of vessel scale economies

Service Impacts of Larger Ships

- Deployment of 13-18,000 TEU ships plus formation/expansion of alliances has led to fewer sailings and reductions in port calls in Asia/North Europe trade over past five years

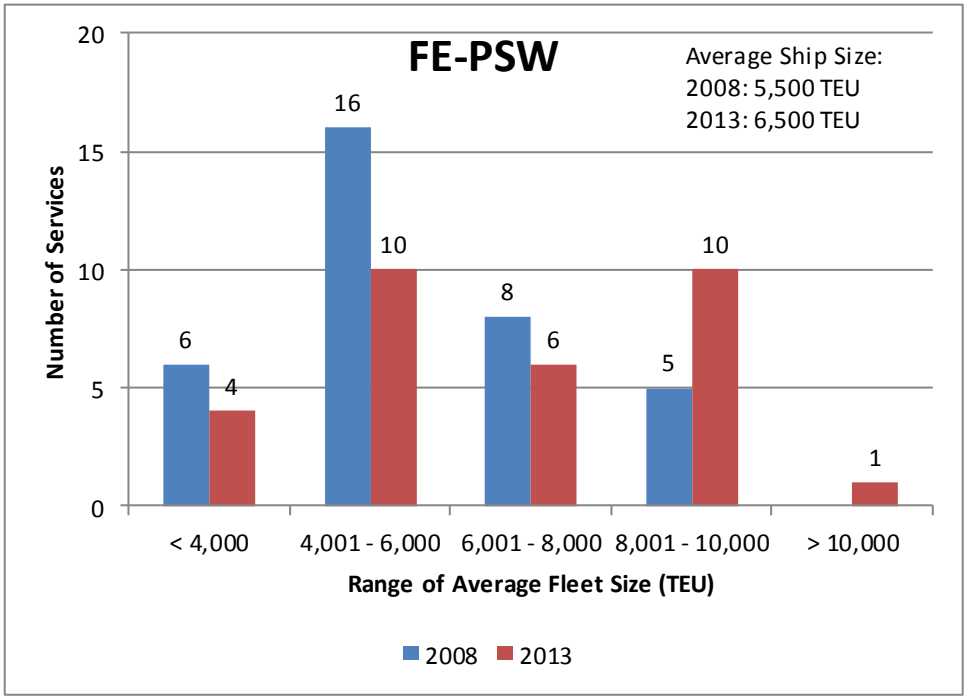


Source: Alphaliner

- A similar pattern will likely emerge in the Asia – US East Coast trade after 2015

Service Impacts of Larger Ships

- Service frequency has already declined in the Asia – California trade since 2008, due to vessel upsizing, from 35 to 31 weekly sailings in September 2013 – with total lane capacity almost static , and with declines in direct port call coverage

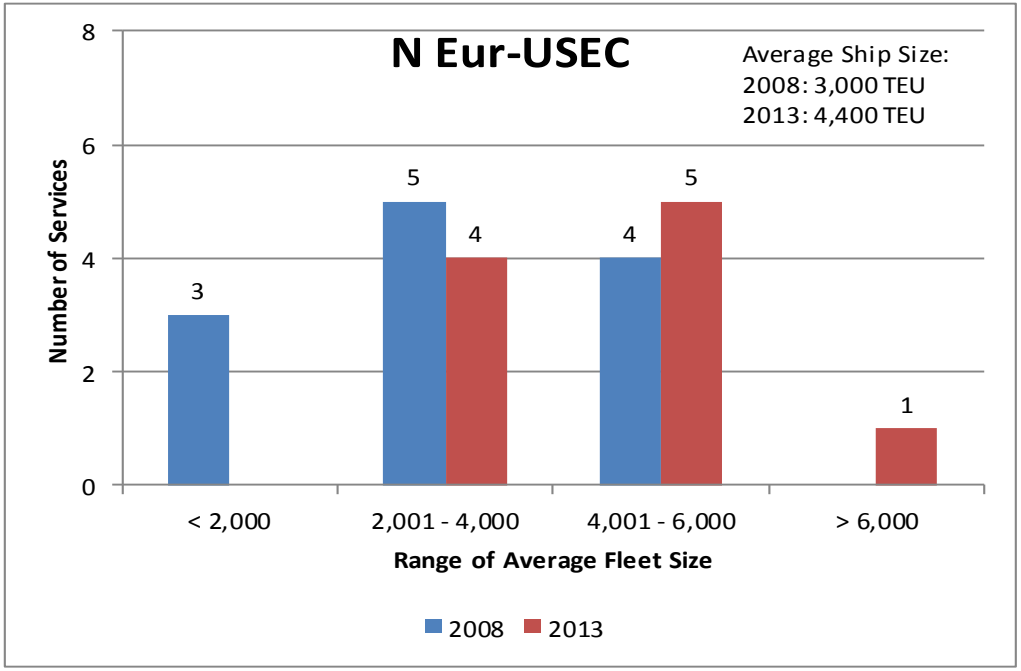


Source: Alphaliner

- Over next five years, we would project further declines in the number of weekly sailings (into the mid-20s), due to further upsizing and to alliances consolidating vessel strings

Service Impacts of Larger Ships

- The Transatlantic trade has also experienced vessel upsizing, but to a lesser extent than the Transpacific, with the aggregate number of weekly sailings declining from 12 to 10



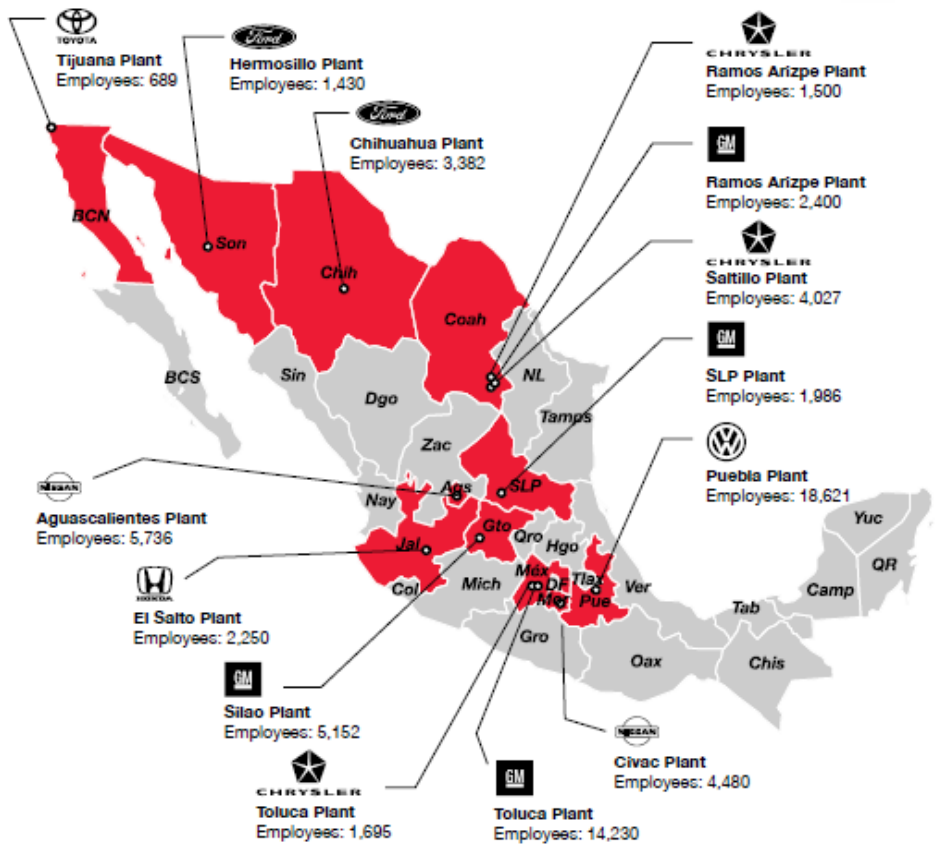
Source: Alphaliner

- By or before 2018, the P-3 and G-6 alliances will likely cause a loss of 2-4 weekly sailings, and a corollary increase in average ship size to at least 6500 TEU
- With a smaller base of services, there will likely be a reduction in the number of ports receiving direct calls

Potential Growth in RO-RO Volumes

- The rapid growth of vehicle manufacturing in Mexico in the past two years, coupled with rail line congestion issues and multi-level railcar shortages (in both Mexico and the US) have caused inventories of finished vehicles to expand

- Prospects for new RO-RO services to ship vehicles from Veracruz and Altamira to US Gulf and South Atlantic ports are increasing each day



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Thank You

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