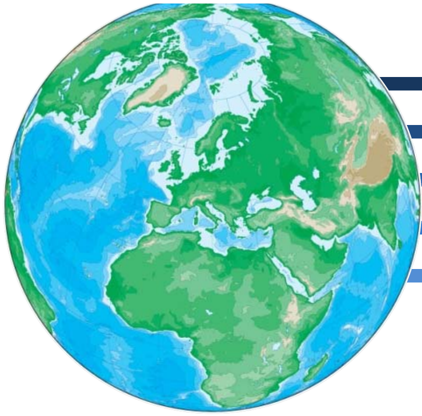

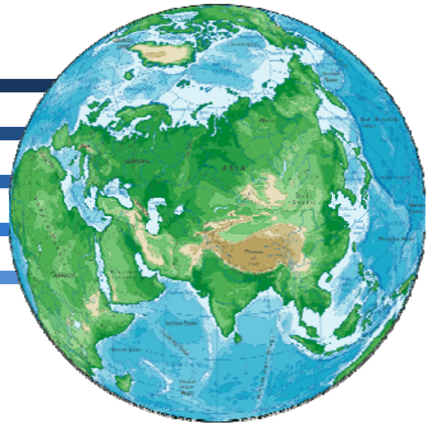

The Changing U.S. Refining Landscape

Past, Present and Future

John R. Auers, P.E.

Executive Vice President

Energy and the Economy

Federal Reserve Bank of Dallas

Dallas, TX

September 7, 2018

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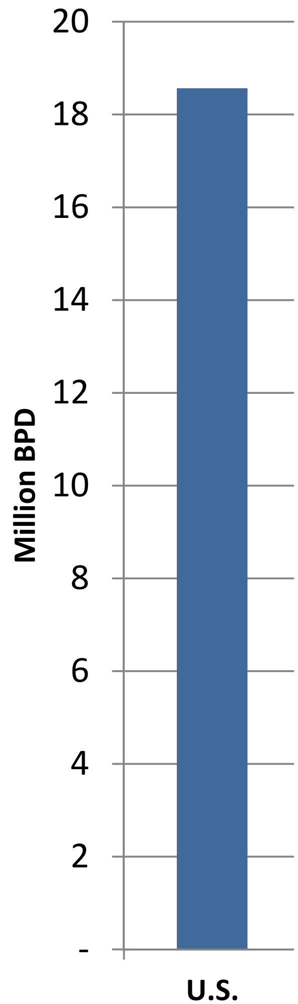
U.S. Refining is YUGE!

Agenda

- Evolution to Dominance

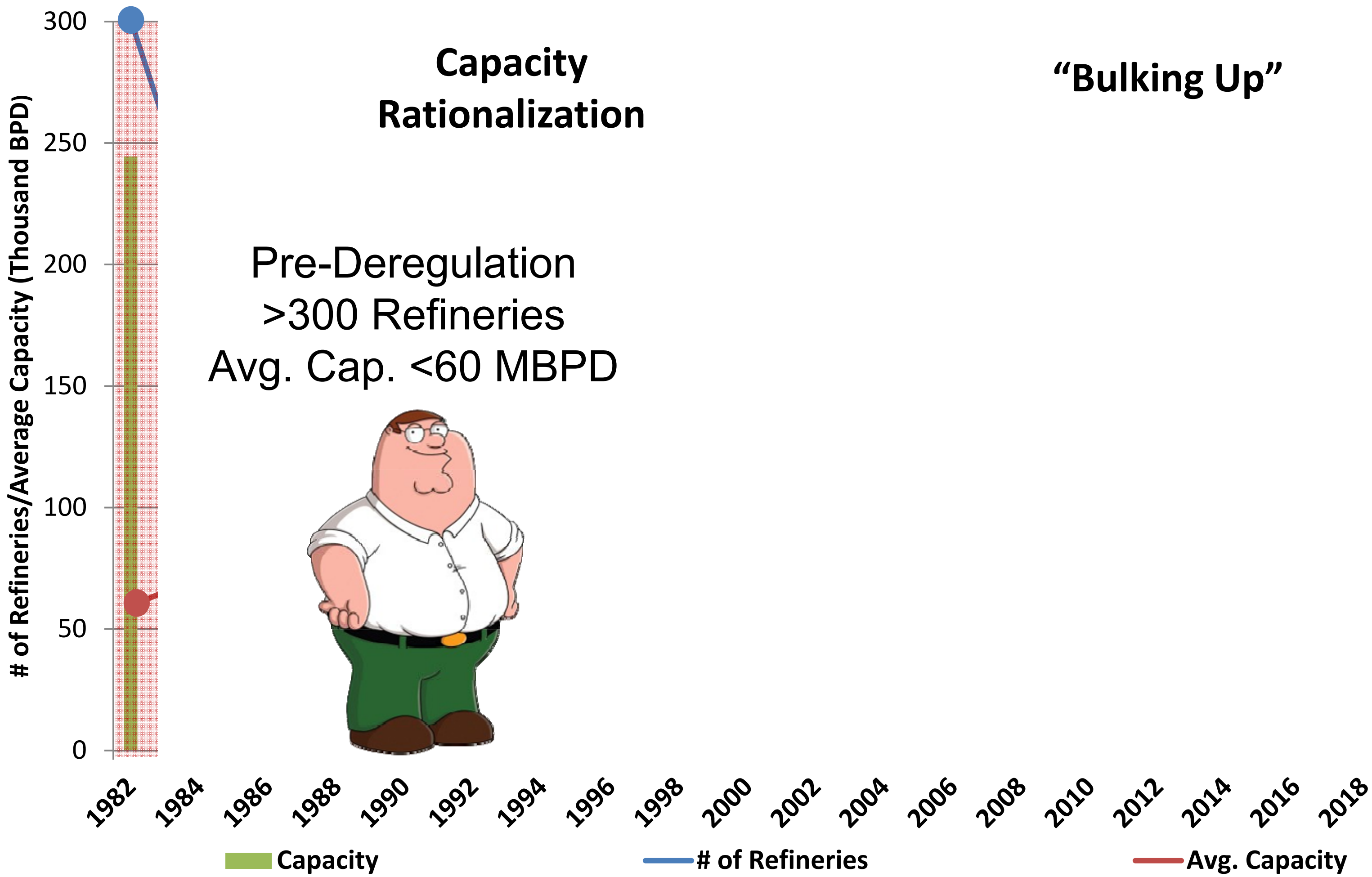
- Key Issues and Challenges

U.S. Refining Industry is the Global Leader

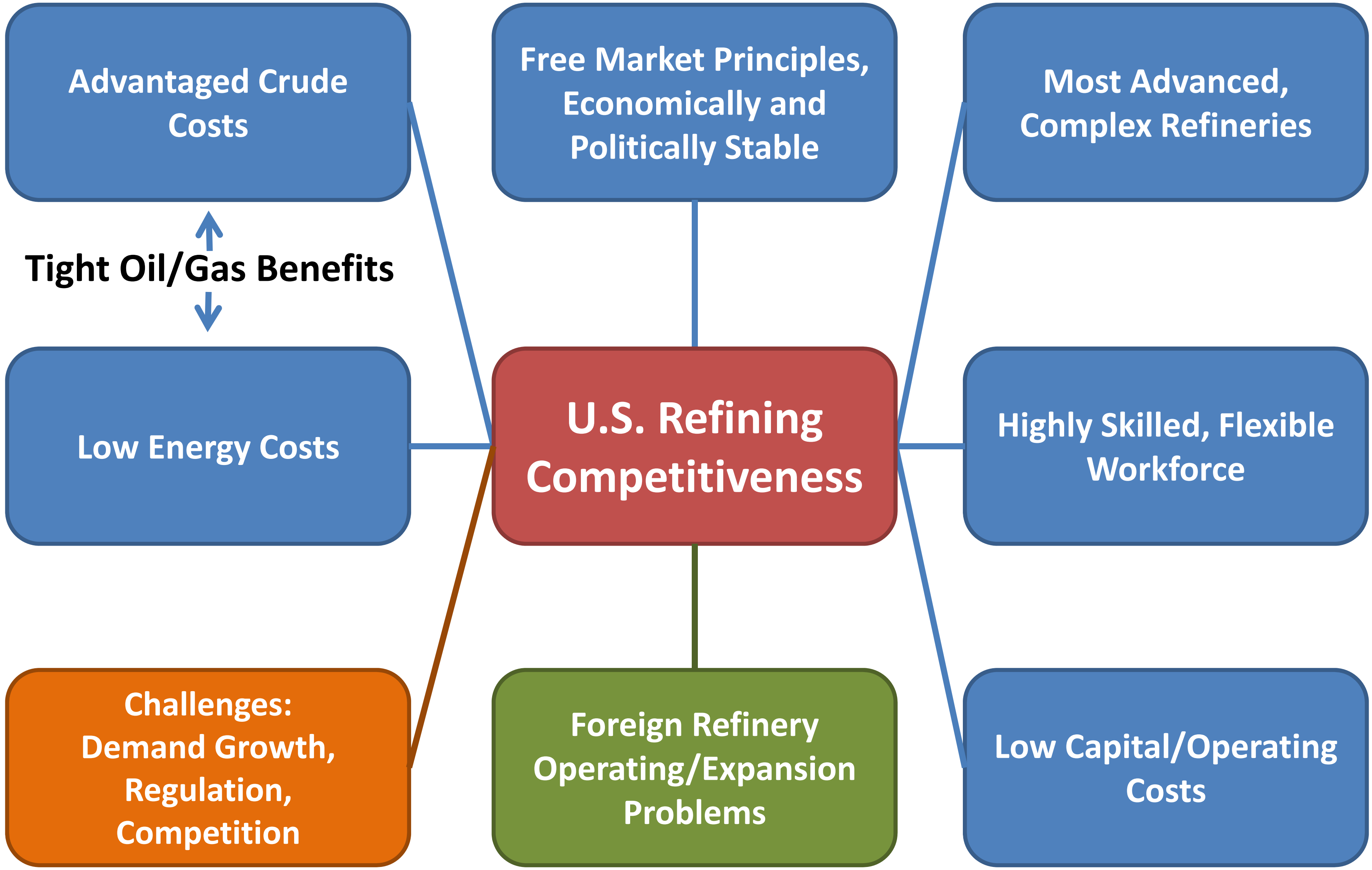


Complexity, % Upgrading Capacity	
U.S.	62%
China	30%
India	35%
Rest Asia/Pac	21%
Europe	27%
Middle East	11%
Former USSR	14%
Cent/South America	26%
Africa	9%

Becoming Lean and Mean

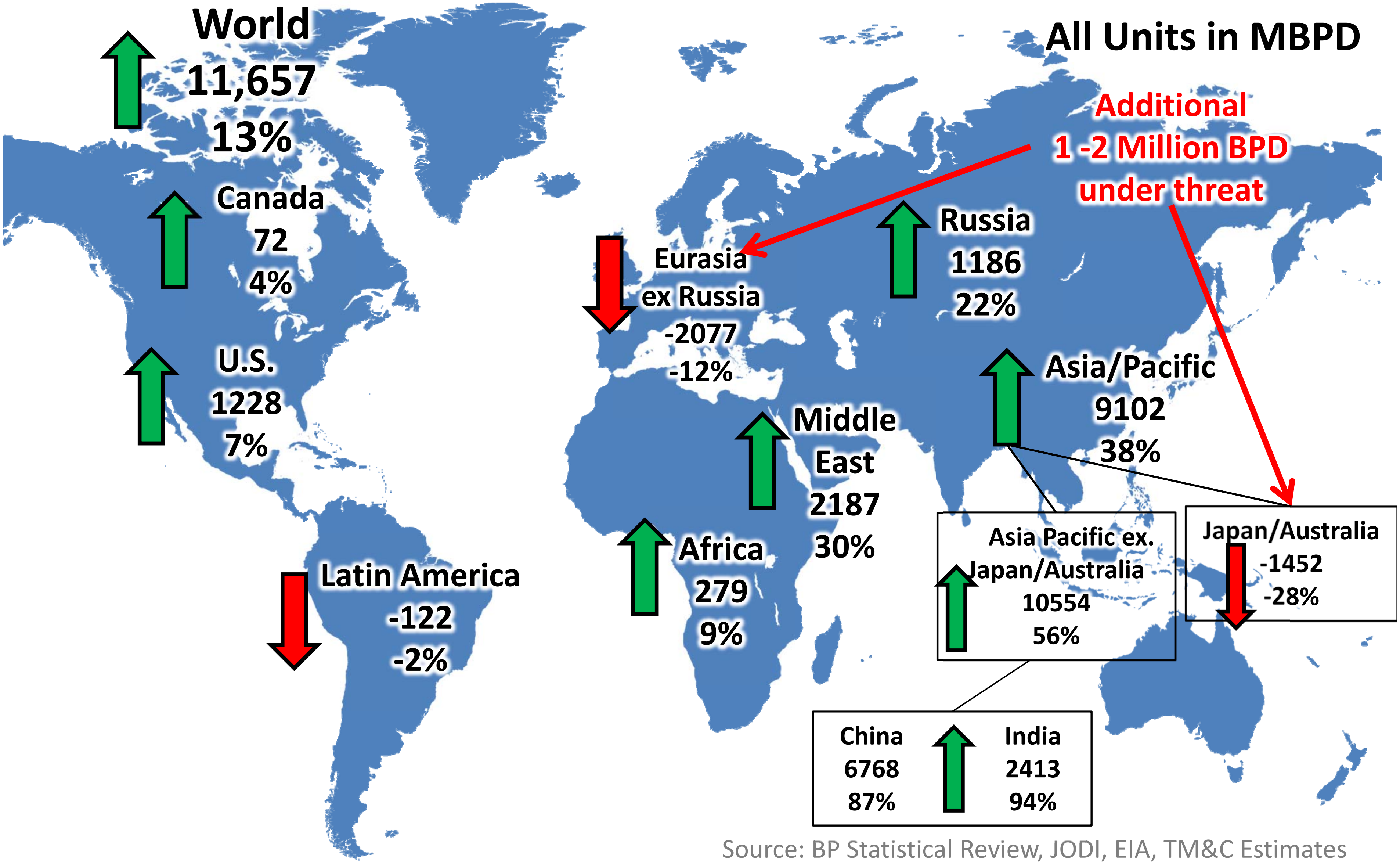


Factors Leading to U.S. Dominance



Global Refining Capacity Shifts

2005-2017



Source: BP Statistical Review, JODI, EIA, TM&C Estimates

Others

U.S. Moves From #1 Importer to #1 Exporter of Products

2005

Exporters

1:	Russia
2:	Kuwait
3:	Saudi Arabia
4:	Venezuela
5:	Algeria

Importers

1:	**U.S.**	**2455 MBPD**
2:	Japan	
3:	Spain	
4:	China	
5:	Indonesia	

2017

Exporters

1:	**U.S.**	**3062 MBPD**
2:	Russia	
3:	Kuwait	
4:	India	
5:	South Korea	

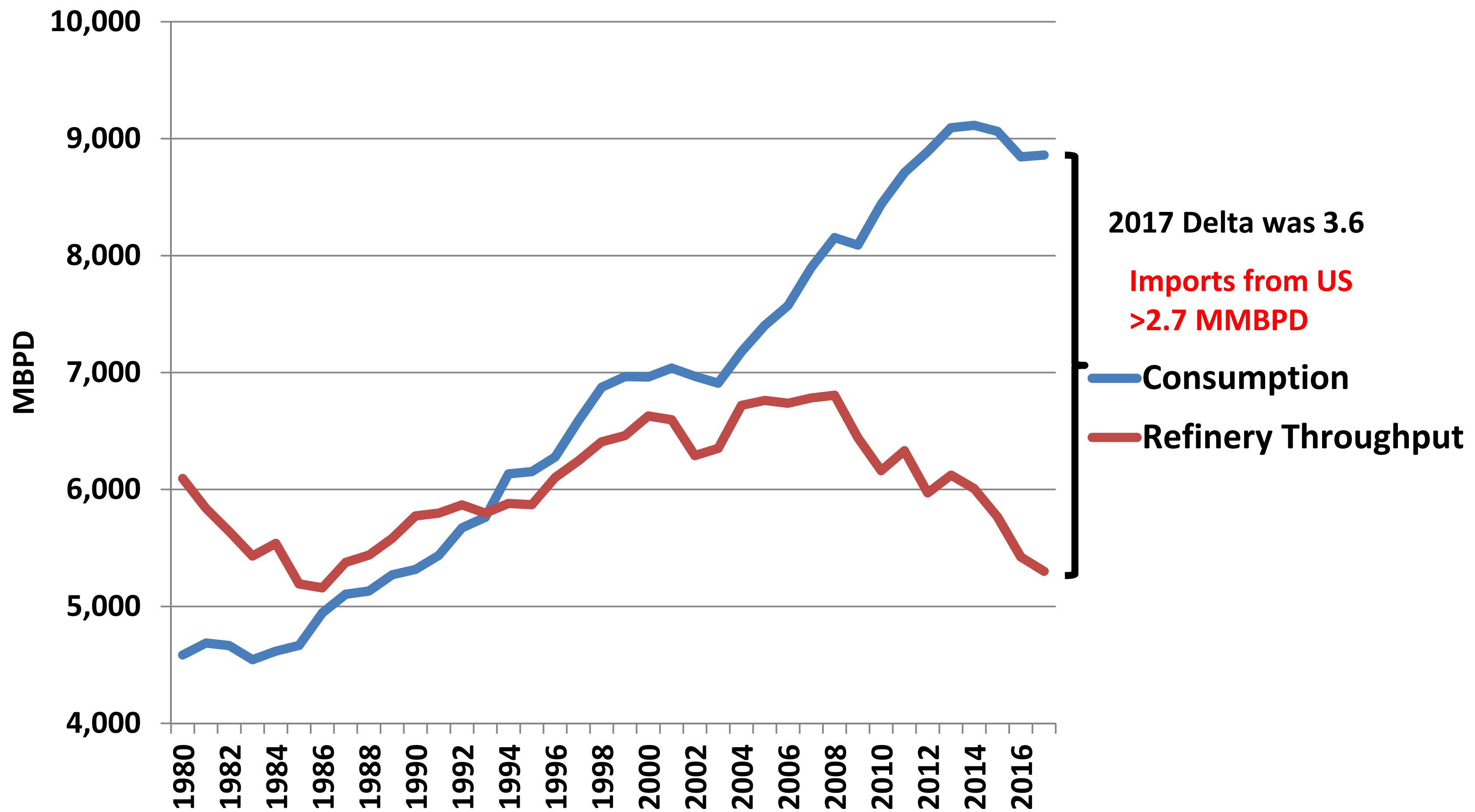
Importers

1:	Japan
2:	Mexico
3:	Australia
4:	Indonesia
5:	Brazil

Source: EIA/IEA/Pemex/JODI

*All Values Represent Net Imports / Exports

US Refiners Take Advantage of LatAm Troubles



Source: BP Statistical Review, EIA, Pemex, Others

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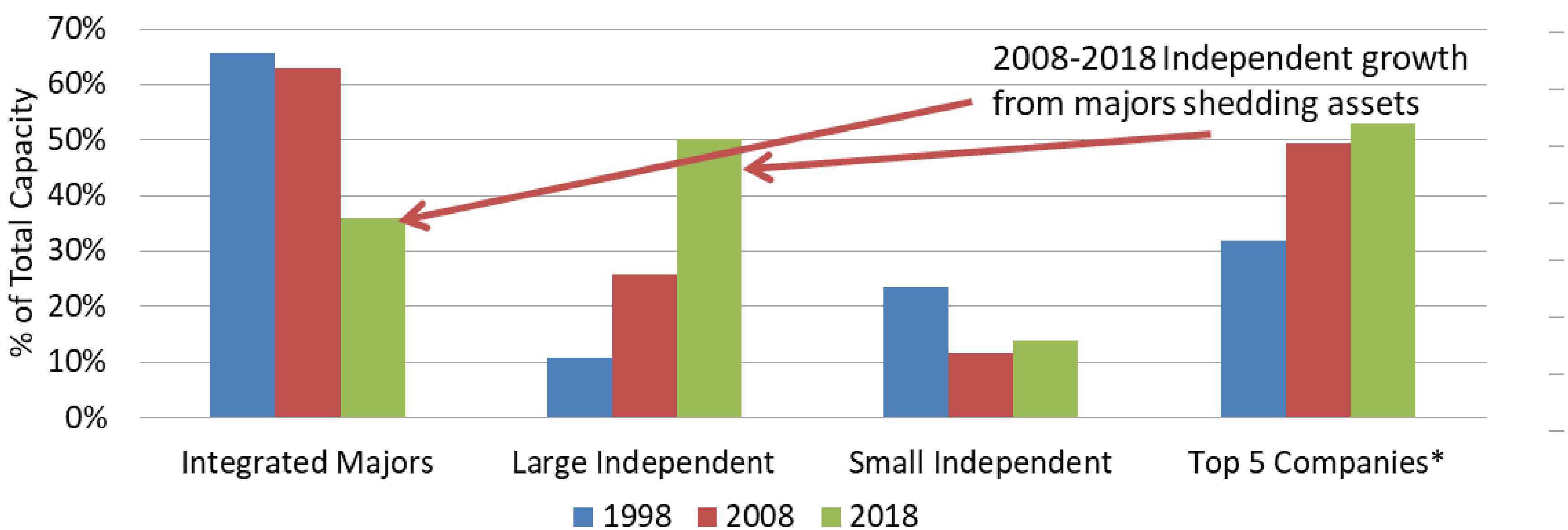
Corporate Transformation

- Free markets drove not only rationalization but also restructuring
  - Ownership shift from integrated model to independents
  - Consolidation and concentration
- Both developments led to more efficient operations
  - More price responsive (profit centers not cost centers)
  - More directed and efficient deployment of capital



*Pro forma data assuming completion of Marathon-Andeavor merger

Agenda

- Evolution to Dominance

- Key Issues and Challenges

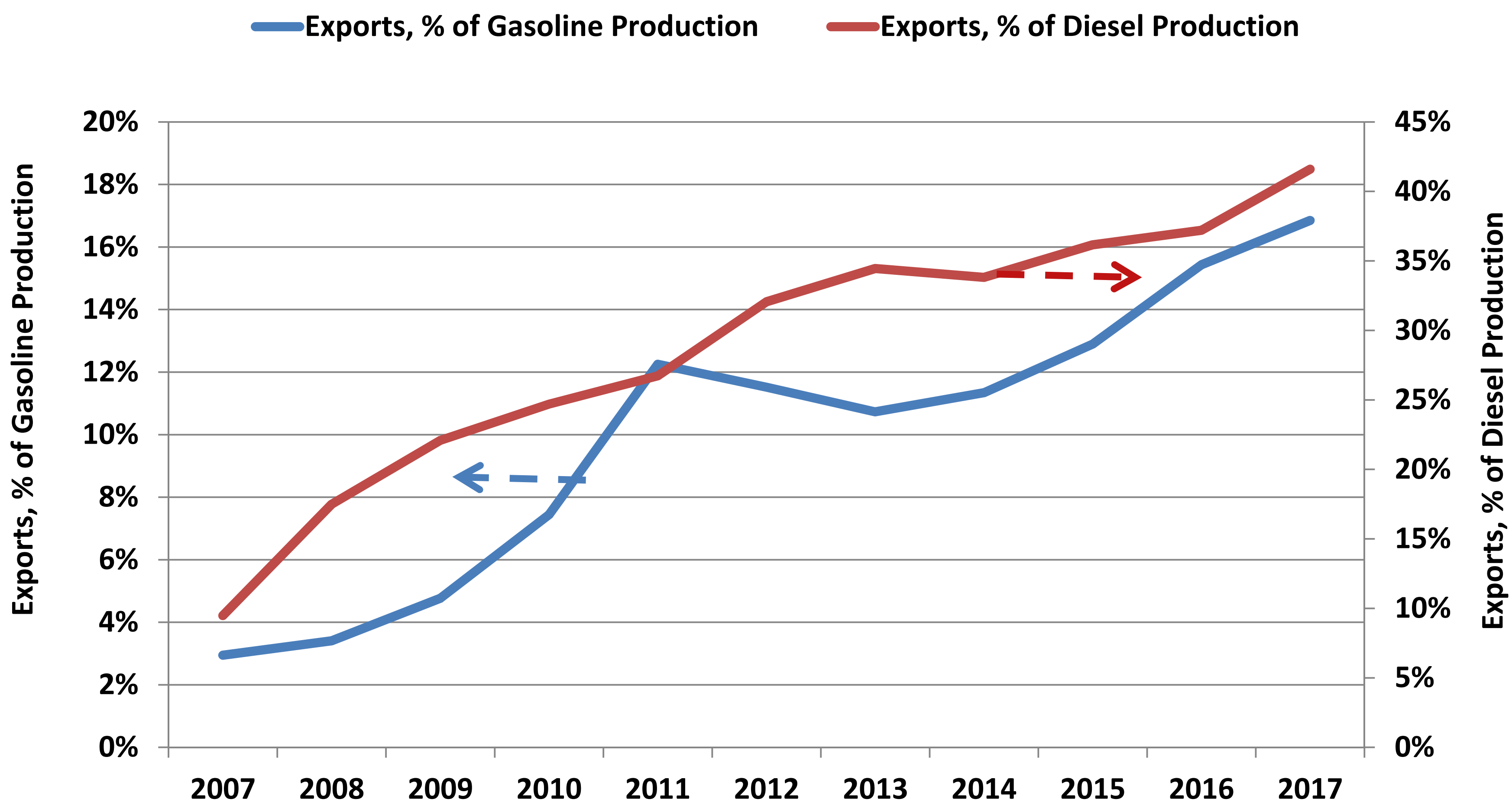
Future Challenges

- Market Issues
  - Growing dependency on export markets
  - Market saturation in traditional markets; will have to extend reach to markets where U.S. has fewer advantages/more competition
  - Risk of global refining capacity overbuilding
    - Importing countries – Asia/LatAm/Africa and exporting countries - ME/India/Russia

- Demand Growth and Threat of "Peak Demand"
  - Impact of higher prices
  - Competition from alternatives
    - Direct substitutes – biofuels/CNG/LNG/CTL/GTL
    - Move to Electrical Vehicles (EV's)

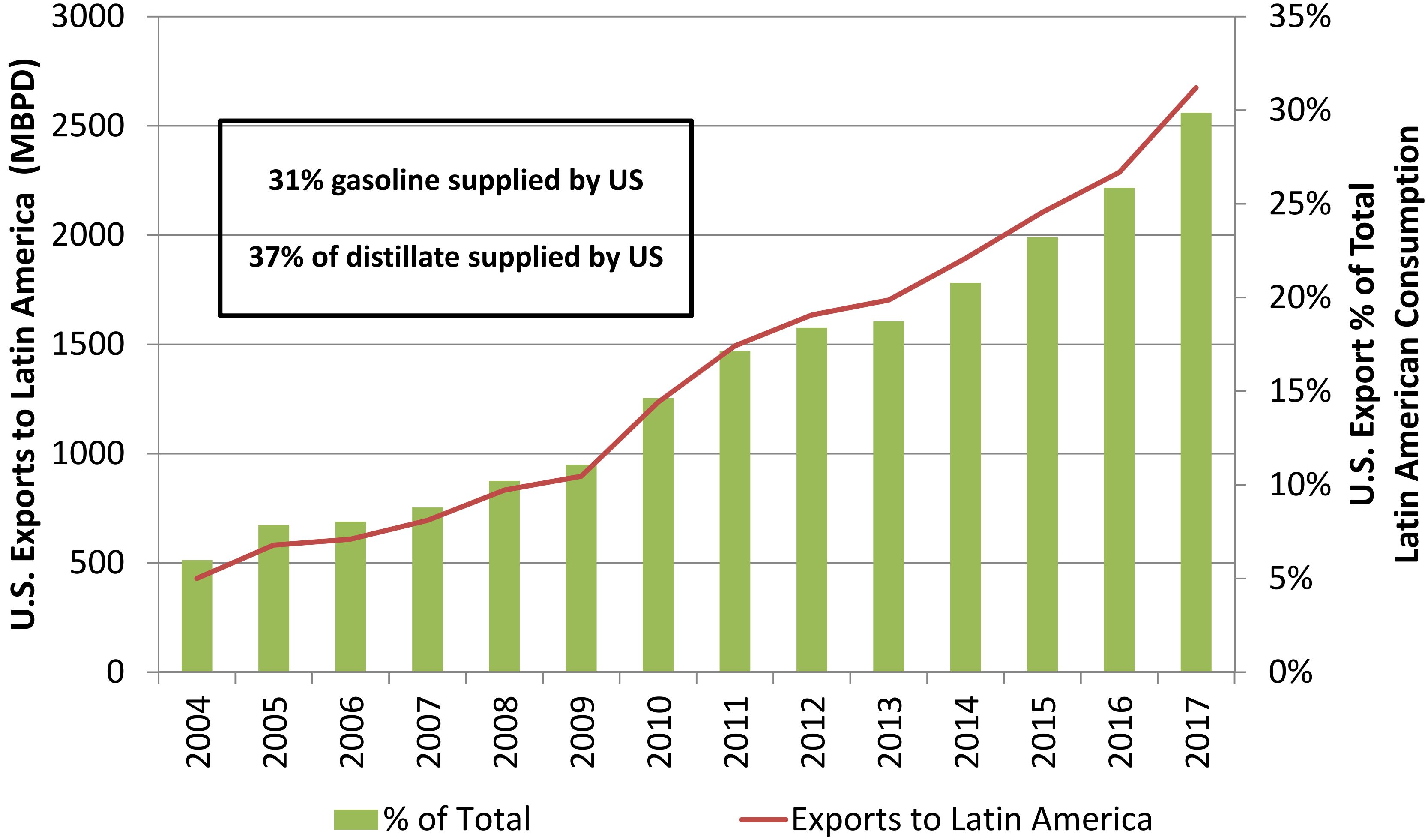
- Regulations
  - Stifle demand/increase costs/limit access/distort markets
  - Increased regulation in other regions can advantage U.S. refiners
    - Tighter fuel specifications in developing countries provide opportunities
    - IMO LS Bunker rules (2020) could be a substantial boost for a a few years

USGC Increasing Dependency on Exports



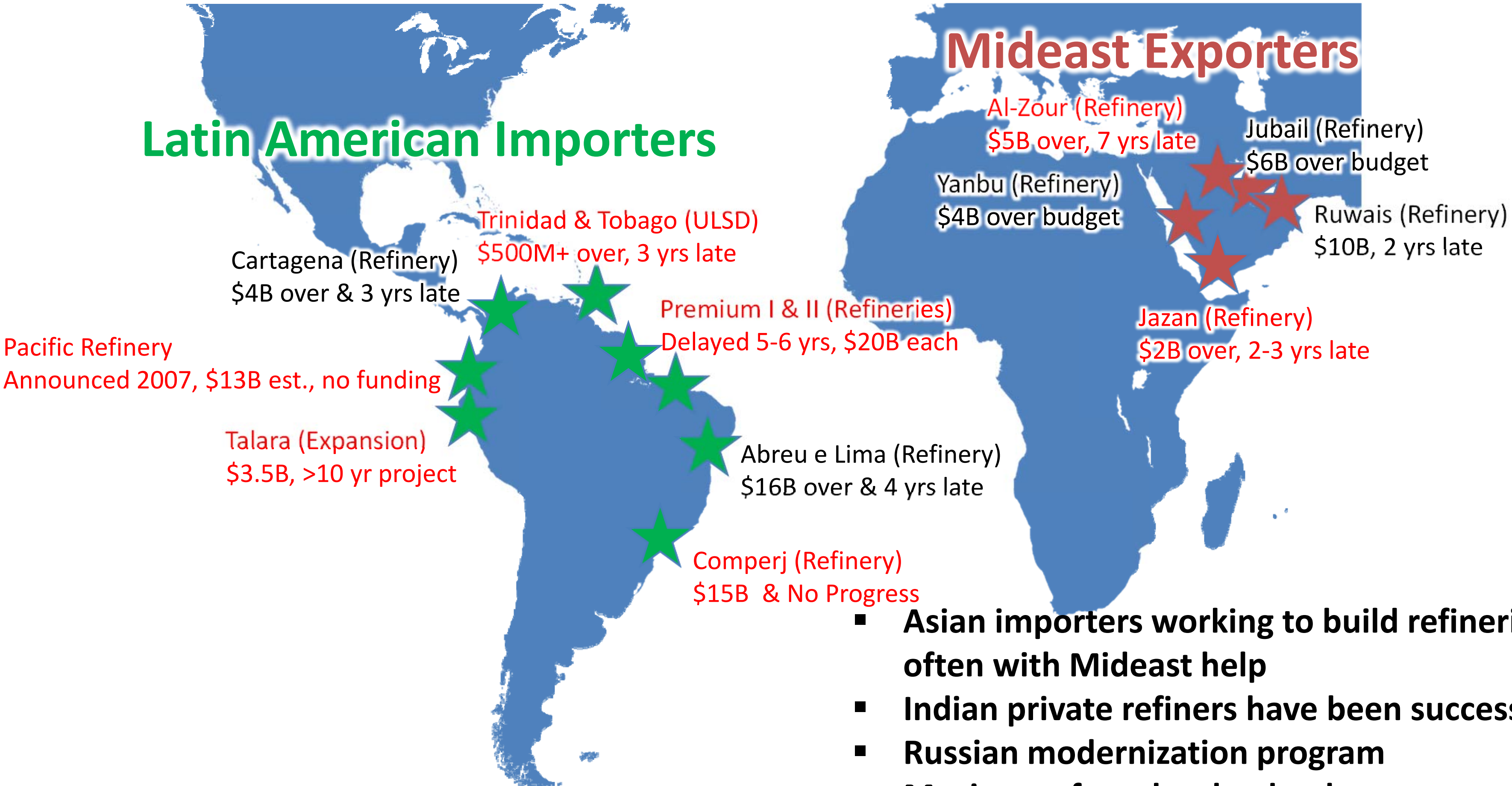
Source: EIA

LatAm Market Approaching Saturation?



Source: BP Statistical Review, EIA, Pemex, Others

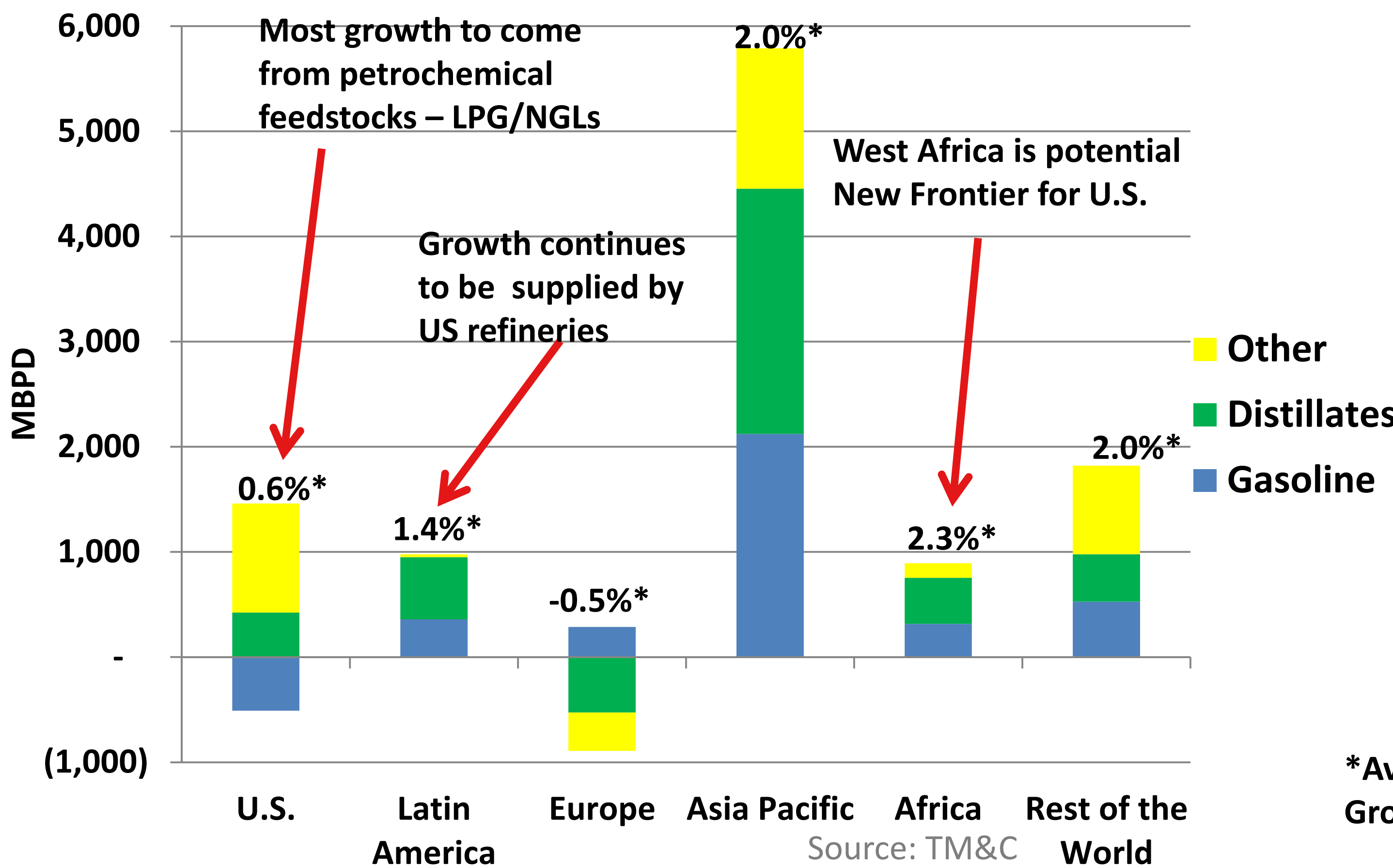
Foreign Refinery Projects Have Been Troubled



- **Asian importers working to build refineries, often with Mideast help**
- **Indian private refiners have been successful**
- **Russian modernization program**
- **Mexican reform has lead to lower utilization/more imports – AMLO impact?**

Global Demand Growth

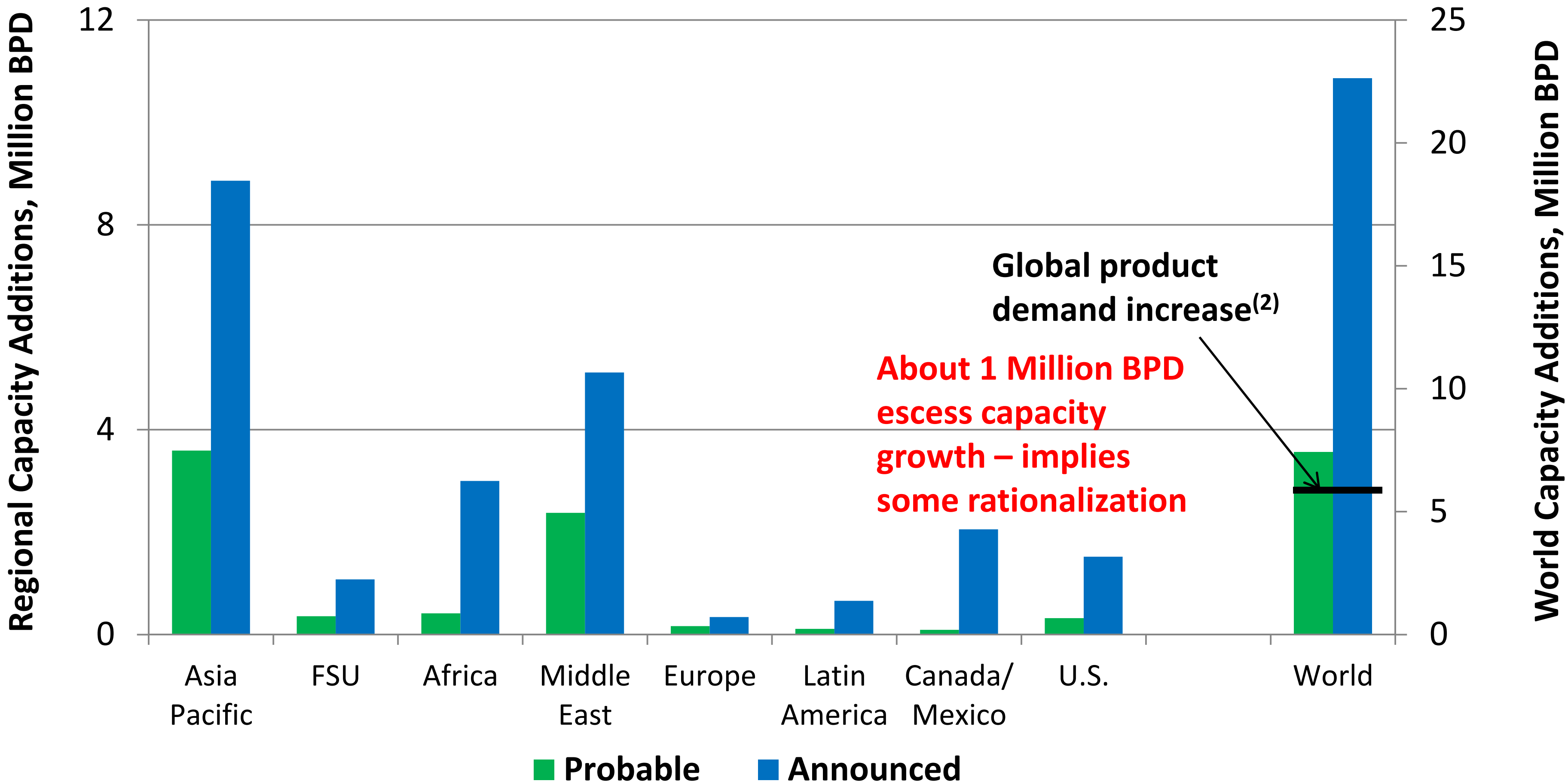
2018 to 2025 Global Growth by Product (MBPD)				
Gasoline	Distillates	Other	Total	Annual %
3,102	3,707	3,020	9,829	1.2%



*Average Annual Growth

Source: TM&C

Global Crude Capacity Additions 2018-2022[1]



(1) Adjusted for projected utilization of 88%
(2) Adjusted for non-petroleum fuels

Source: TM&C forecast

Regulatory Environment - The Trump Factor

- Climate Change – Moving rapidly away from any anti-carbon policies

- Alternative Fuels – No new initiatives/existing programs threatened
  - CAFE relaxation post-2021 is most significant move by the Administration

- RFS – Politics are complicated and bipartisan
  - Small refiner waivers and possible rule changes to ease burden have caused RIN costs to drop significantly this year

- Permitting – Major positive change vs. Obama Administration
  - All segments of industry (upstream, midstream, and downstream) benefitting

- General Deregulation – Fewer roadblocks, lower costs for industry

- **Tax Policy – Lower corporate taxes are stimulating investment/growth**

- Trade Policy – Potential for major negative impacts to the industry
  - Trade war would significantly decrease global economic growth
  - Positive movement with Europe/Mexico – China is the big unknown

IMO - Who Goes First?

Poor Company Financials
Charter Model Disincentives
LNG Retrofits Not Economic
Waste Disposal Issues

High Capital Cost
Long Lead Times
Permitting Hurdles
Refineries With Greatest Need are
Least Capable Financially

Both Ship's owners and refineries delay (or don't have time for) investments – leading to surplus fuel oil in 2020

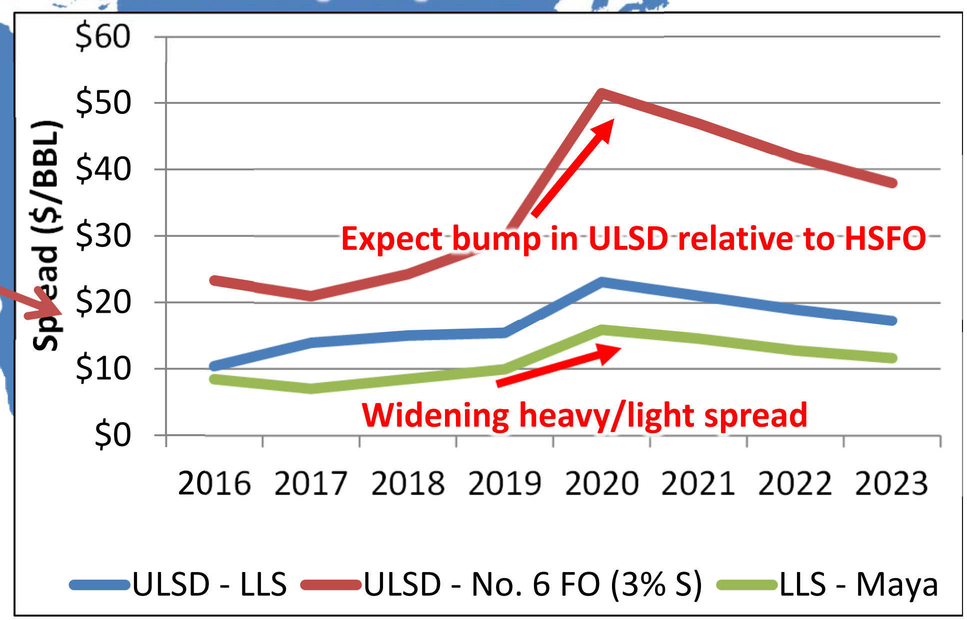
Impacts of IMO Regs.

U.S. Refineries – Limited FO production
Most refiners will benefit from: higher distillate cracks/bigger heavy crude discounts

Europe and Asia have greater fuel oil production, impacts could be significant for some refineries – especially privately owned European plants

Significant Compliance Uncertainty

TM&C estimates about 2 Million BPD of fuel oil will be displaced by distillates.



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Prospects Very Regional

- PADD I – Continue to be most challenged
  - Very competitive market ; USGC/Canada/Europe all fighting for share
  - Disadvantaged crude supply environment (no P/L's, Jones Act)
  - Lost 500 MBPD earlier in decade; More rationalization possible
  - RFS relief is welcome development

- PADD II – IMO advantaged; pipeline approvals key
  - Heavy capable refiners will benefit from IMO crude discounts
  - Advantaged access to Canadian crude; cross border pipeline constraints
  - Stagnant regional demand; pipelines to access PADD I markets needed

- PADD III – Significant variability/ability to export products is key
  - IMO will advantage heavy crude refiners; those with hydrocrackers
  - Given P/L constraints, advantaged access to Permian crude is big plus
  - Demand and refining developments in Latin America and globally will determine product export prospects

Regional Trends/Prospects (cont.)

- PADD IV – Both supply and demand benefits
  - Only region where domestic production exceeds crude runs
  - Access to Canadian/Bakken crude adds to supply advantage
  - Relatively strong demand growth
  - Disadvantages: small/limited ability to access other markets/isolated

- PADD V – Strong potential; stronger threats
  - Challenging Regulatory Environment – costs, permitting, demand
  - Region about 1 refinery long; outages cause shortages/high margins
    - Limited and high cost alternate product supply options
  - Declining local crude supply/limited access to new LTO production
    - LCFS/Lack of pipeline capacity limit Canadian crude access
  - Any regulations which lead to a refinery closure could result in extended period of elevated margins (HF alky ban, etc.)

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Final Thoughts

- Product Demand Will Be Key to Refining Prospects
  - Dependent on economic growth; tougher than ever to forecast
  - Demographics – population growth, economic maturation, lifestyle changes,
  - Impacted by new technologies – breakthroughs in alternatives and efficiencies, driverless vehicles, others
  - **Still A Number of Years Away From Peak Demand Globally – Although we are likely at "Peak Demand Growth"**

- U.S. Should Continue to Be World Leader in Refining
  - Ability to maintain and grow product exports will be critical (esp. for USGC)
  - Challenged by new refining capacity in both importing/exporting countries
  - Important not be handicapped by excess regulation
  - IMO LS Bunker rules will be a major competitive benefit for many U.S. plants
  - **U.S. product exports should grow; reach/exceed 6 MMBPD by 2025**
  - **Can expect more rationalization of capacity in Europe/OECD Asia/LA**
    - **Perhaps as much as 2 million BPD post-2020**

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Presenter

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