Oil Market Update: Searching for Stability

Challenges in the Refining Sector

John R. Auers, P.E.

Executive VP - Turner, Mason & Company

CSIS

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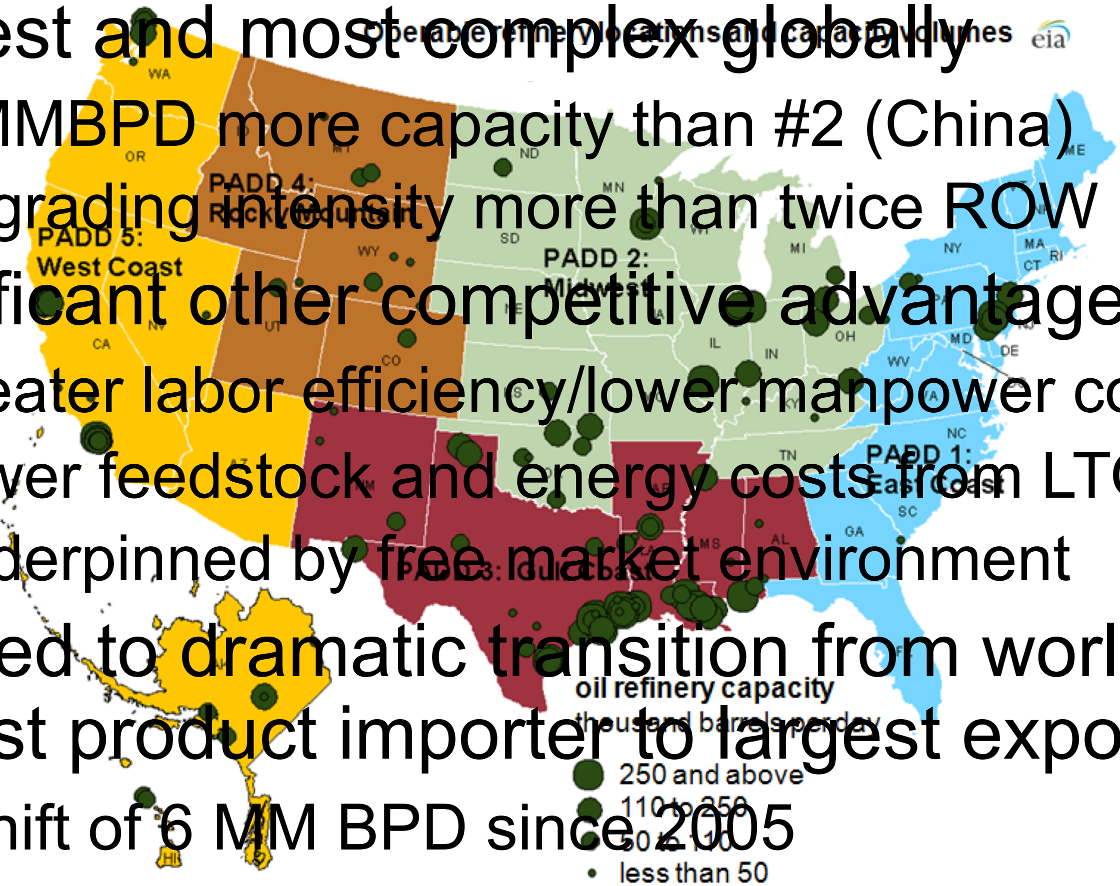
Turner, Mason & Company
CONSULTING ENGINEERS

U.S. Refining Industry

- Perhaps the most dominant U.S. manufacturing industry
- Largest and most complex globally
  - 4 MMBPD more capacity than #2 (China)
  - Upgrading intensity more than twice ROW
- Significant other competitive advantages
  - Greater labor efficiency/lower manpower costs
  - Lower feedstock and energy costs from LTO/LTG
  - Underpinned by free market environment
- Has led to dramatic transition from world's largest product importer to largest exporter
  - Shift of 6 MM BPD since 2005



No Shortage of Challenges

- Market Issues
  - Threat of demand slowdown/"Peak Demand"
  - More competition – foreign refineries/alternatives
- Increased Regulation
  - Decrease demand/increase costs/limit access/distort markets
  - Growing regulation in other regions can advantage U.S. refiners
- Changing Crude Qualities

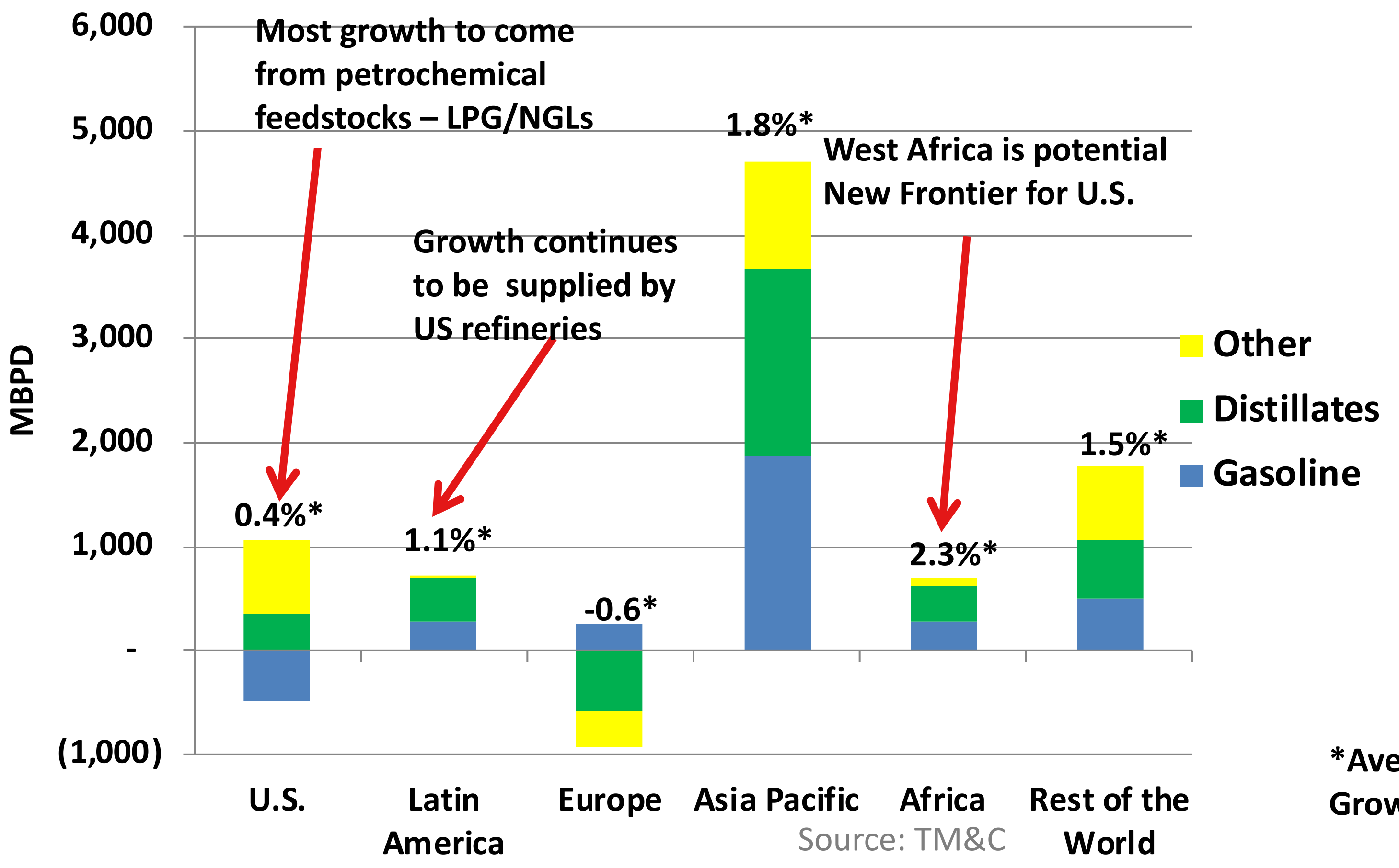
Market Issues

- Factors Threatening Slowing U.S./Global Demand Growth
  - Impact of higher prices
  - Fear of slowdown in China/economic headwinds and demographics
  - Latin American stagnation would be particularly harmful to U.S.
  - Competition from alternatives
    - Direct substitutes – biofuels/CNG/LNG/CTL/GTL
    - Move to Electrical Vehicles (EV's)

- Competitive Factors
  - 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

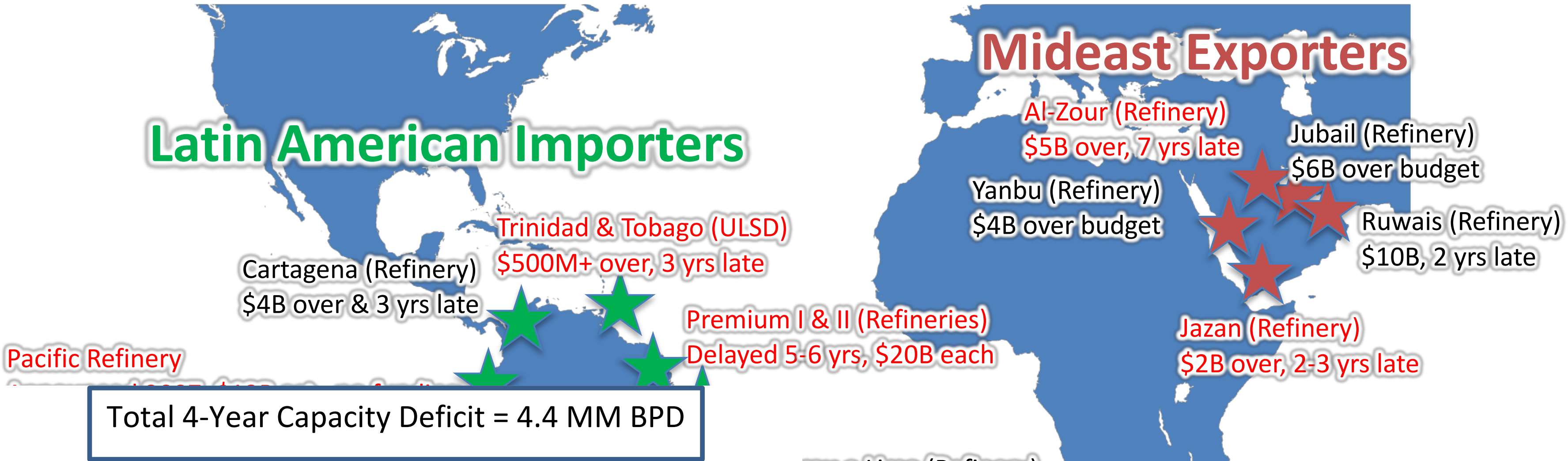
Global Demand Slowing But Still Strong

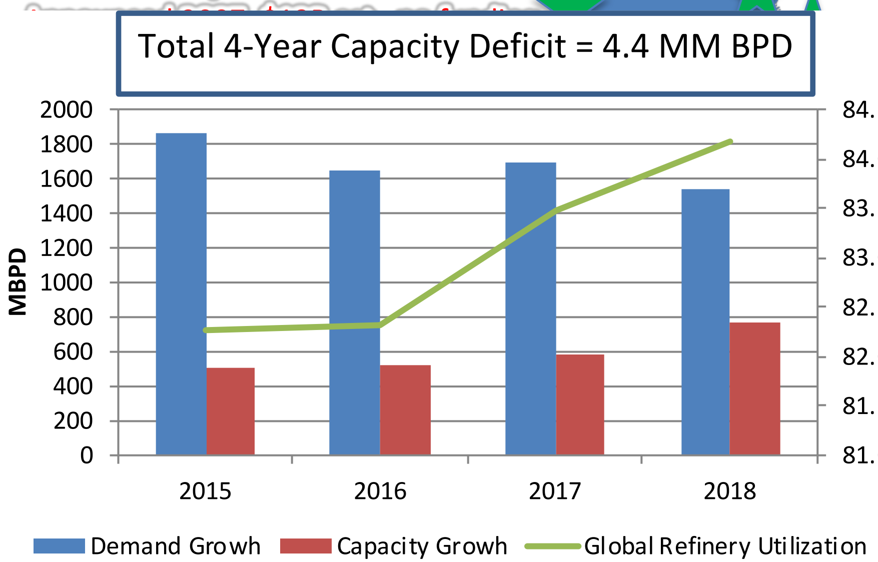
2018 to 2025 Global Growth by Product (MBPD)				
Gasoline	Distillates	Other	Total	Annual %
2,688	2,849	2,274	7,811	1.1%



*Average Annual Growth

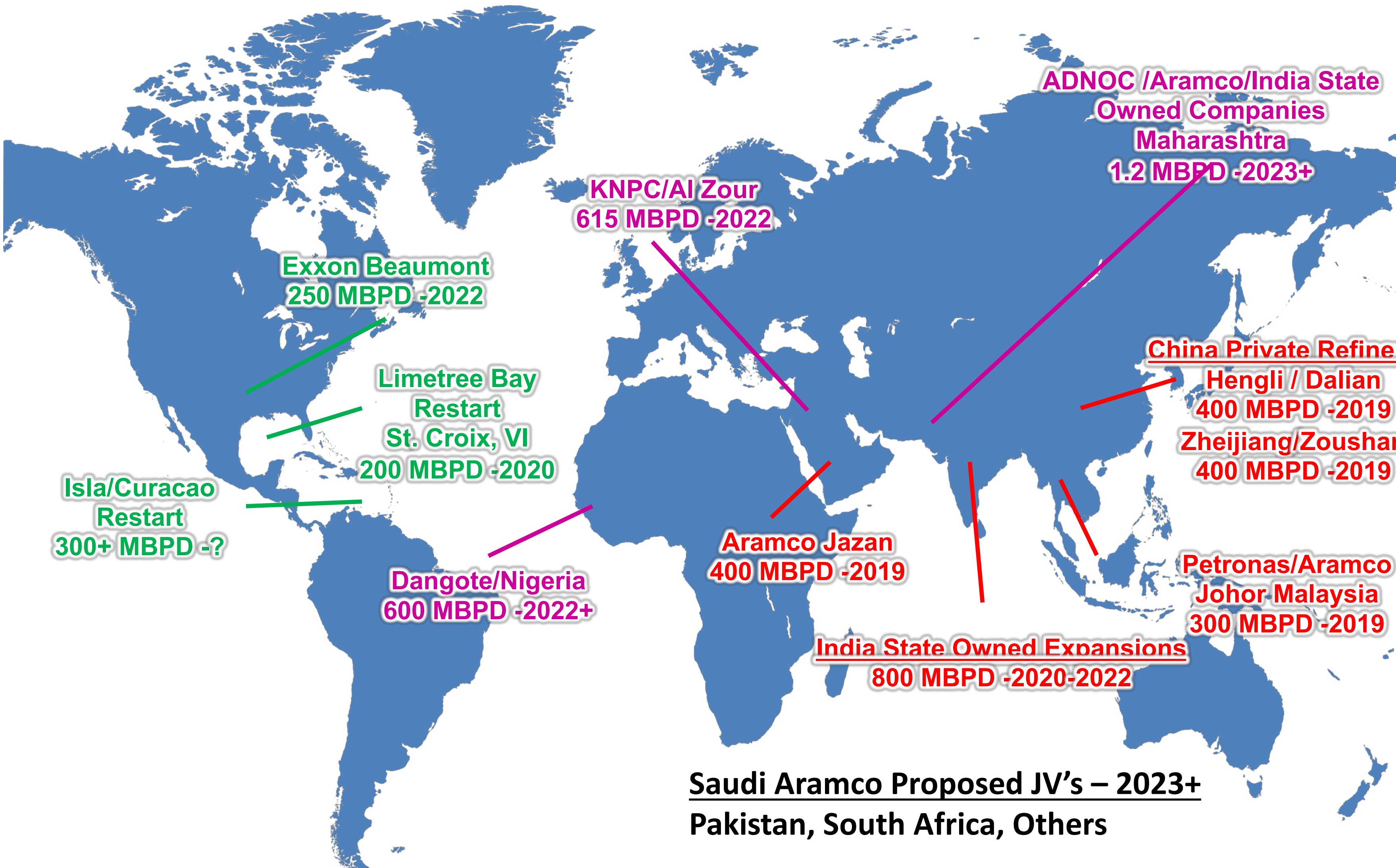
Foreign Refinery Projects Have Been Troubled





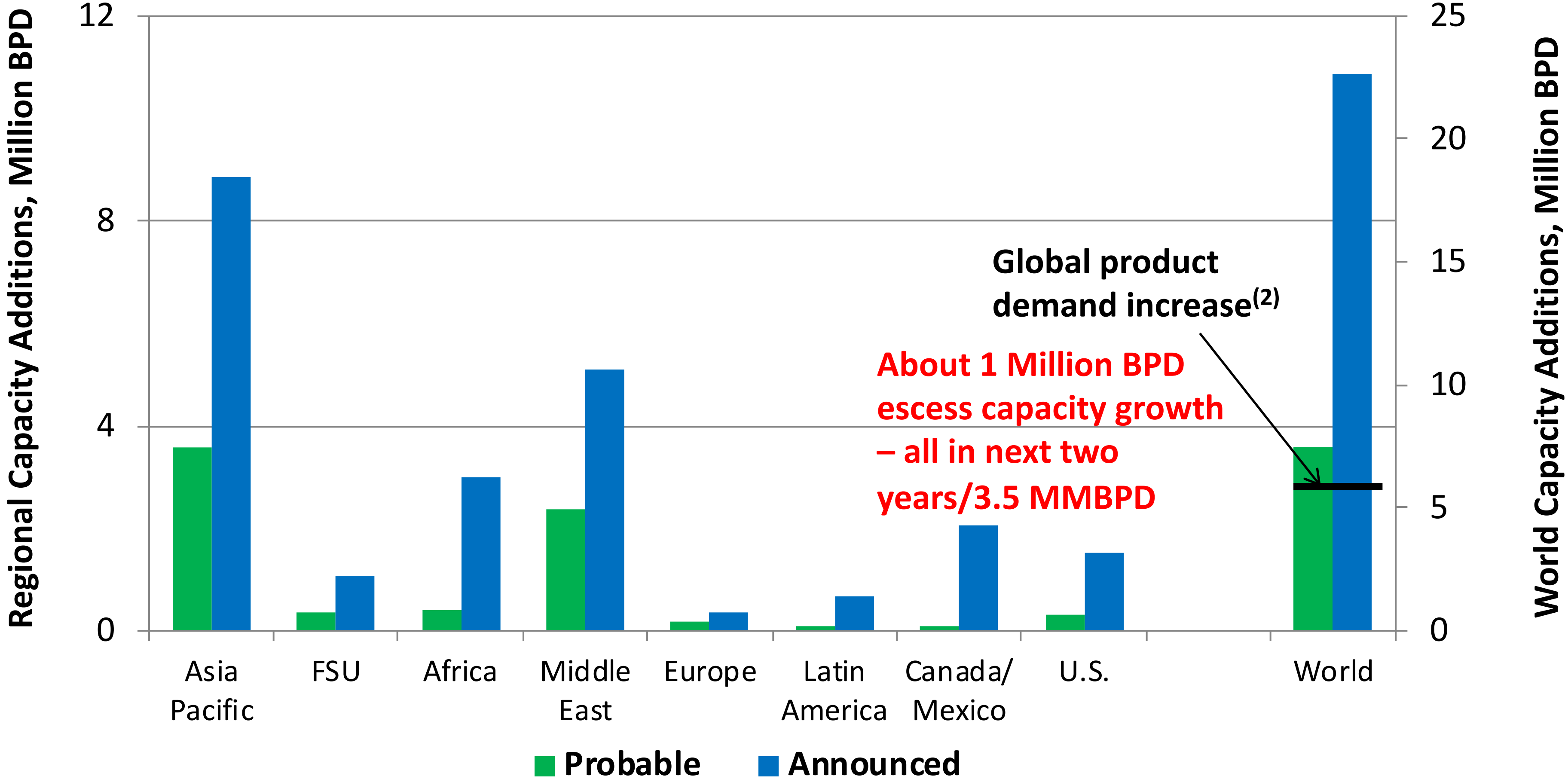
- LatAm product supply/demand balance has shifted by over (3.5) MMBPD in 15 yrs
- Issues in Mexico, Brazil and Venezuela have led the way; Mex/Ven utilization < 40%
- Chinese capacity flat since 2014

Refinery Expansions Picking Up



Saudi Aramco Proposed JV's – 2023+
Pakistan, South Africa, Others

Global Crude Capacity Additions 2019-2023(1)



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

Source: TM&C forecast

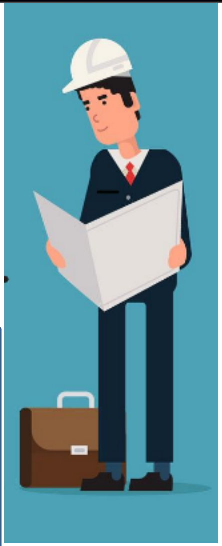
U.S. Regulatory Trends and Impacts

- Climate Change/Anti-Carbon Initiatives – Will be dependent on political developments; advancing at the regional level where politically popular
- Alternative Fuels – E15 summer waiver; other hurdles remain to adoption
- RFS – Politics are complicated and bipartisan; waivers and discussion of reset/reform has lead to significantly lower RIN prices
- CAFE – relaxation of 2022-25 standards beneficial to demand
- Streamlined Permitting/Deregulation – Lowers costs/enhances project prospects/improves access to markets
- Tax Policy – Lower corporate taxes are stimulating investment/growth
- **Trade Policy – Could be most critical due to impact on global economic growth and product demand; also impacts project costs**

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.

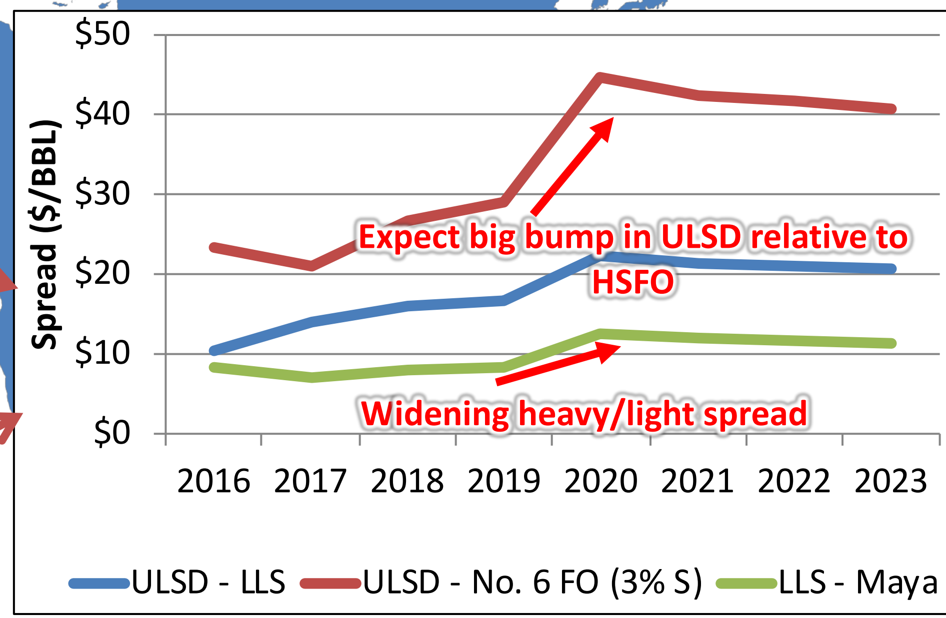
- U.S. Refineries – Limited FO production - 2.5%
- Most refiners will benefit from: higher distillate cracks/bigger heavy crude discounts
- Mexican refineries to take another hit – FO yields = 25%

- Refineries in the ROW also have higher FO yields – 11% on average but many >20%
- Will stress and likely lead to shutdowns of some uncompetitive refineries

Significant Enforcement Uncertainty

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

Gasoline margin impact dependent on VGO blending



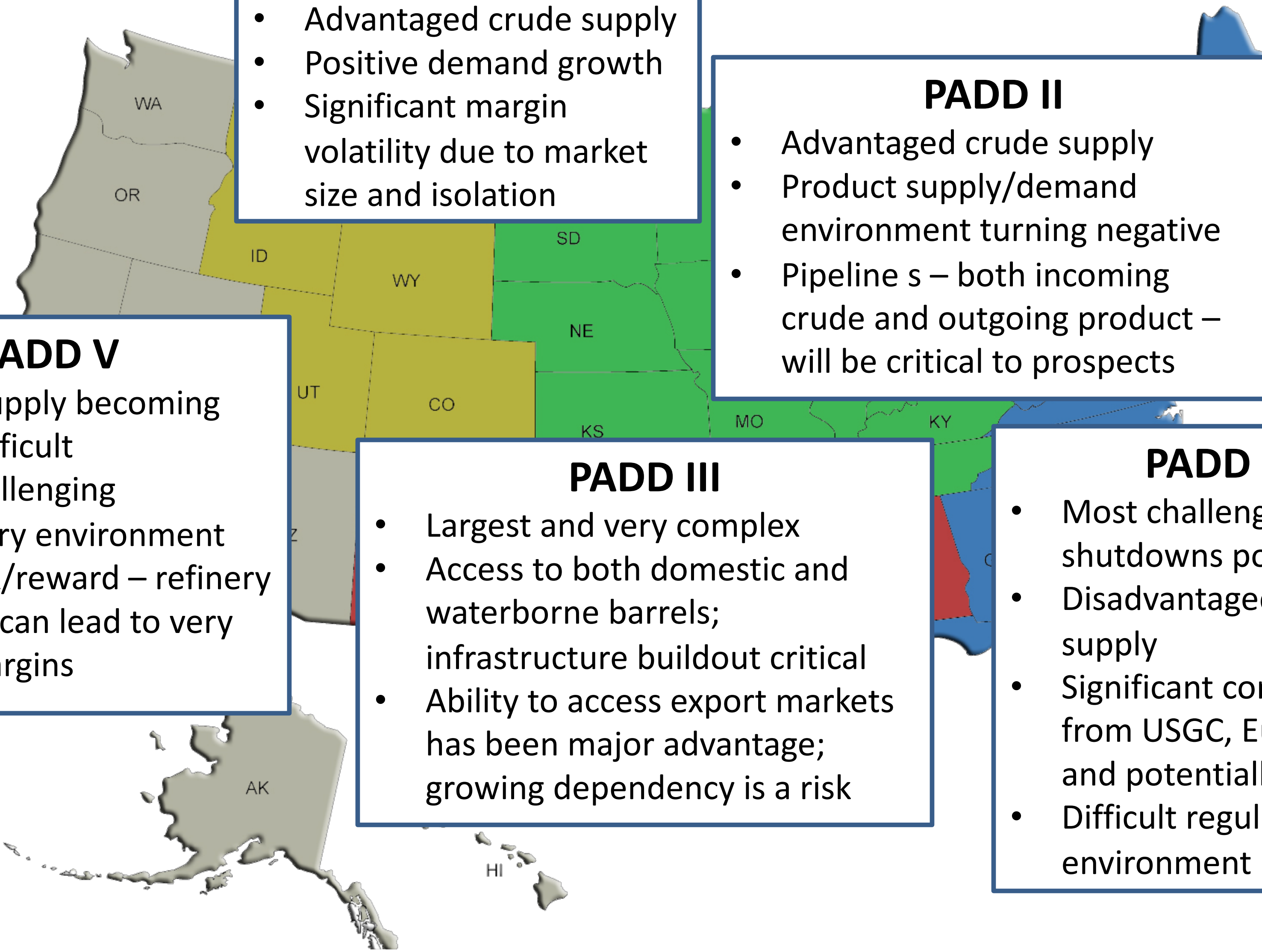
Crude Quality – Challenges and Opportunities

- Slowdown in heavy crude supply
  - Collapse of Venezuelan production/sanctions
  - Pipeline constraints limit access to Canadian barrels
  - Slumping production from Mexico
  - Has led to very narrow Heavy/Light spread; LLS – Maya less than $4/B
  - 2020 IMO will increase supply and heavy crude discount

- LTO doesn't fit well in complex U.S. refineries
  - Too many light components; both processing and market issues
  - Limits utilization of downstream deep conversion capabilities
  - Refiners have/are investing to process more LTO

- More problem crudes coming to market
  - Very light, waxy, high TAN and metals, cracked material, other properties
  - Can cause difficulties in transport, storage, processing and compatibility
  - Investment and operating experience can overcome all of these issues and provide opportunities to decrease feedstock costs

Challenges/Prospects Very Regional



PADD IV

- Advantaged crude supply
- Positive demand growth
- Significant margin volatility due to market size and isolation

PADD II

- Advantaged crude supply
- Product supply/demand environment turning negative
- Pipeline s – both incoming crude and outgoing product – will be critical to prospects

PADD V

- Crude supply becoming more difficult
- Very challenging regulatory environment
- High risk/reward – refinery outages can lead to very good margins

PADD III

- Largest and very complex
- Access to both domestic and waterborne barrels; infrastructure buildout critical
- Ability to access export markets has been major advantage; growing dependency is a risk

PADD I

- Most challenged - shutdowns possible
- Disadvantaged crude supply
- Significant competition from USGC, Europe and potentially PADD II
- Difficult regulatory environment

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 (2035+) – 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
  - **Over-expansion limited by fear of Peak Demand**
  - 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 uncompetitive plants in ROW**
    - **Perhaps as much as 2 million BPD during 2020-2025 period**

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Presenter

John R. Auers, P.E.

Executive Vice President – Turner, Mason & Company

- Univ. of Nebraska Chem. Engr.
- Univ. of Houston MBA
- Licensed Professional Engineer – Texas/Nebraska
- Formerly with Exxon
- Industry studies/analysis, forecasting, modeling, asset valuation, project assessment, strategic planning
- Leads Outlook team
- Publish weekly blog on industry issues
- Contact Info – jauers@turnermason.com
  Office Direct – 972-918-5004 General – 214-754-0898