

Global Propylene Market

Motivated to Change

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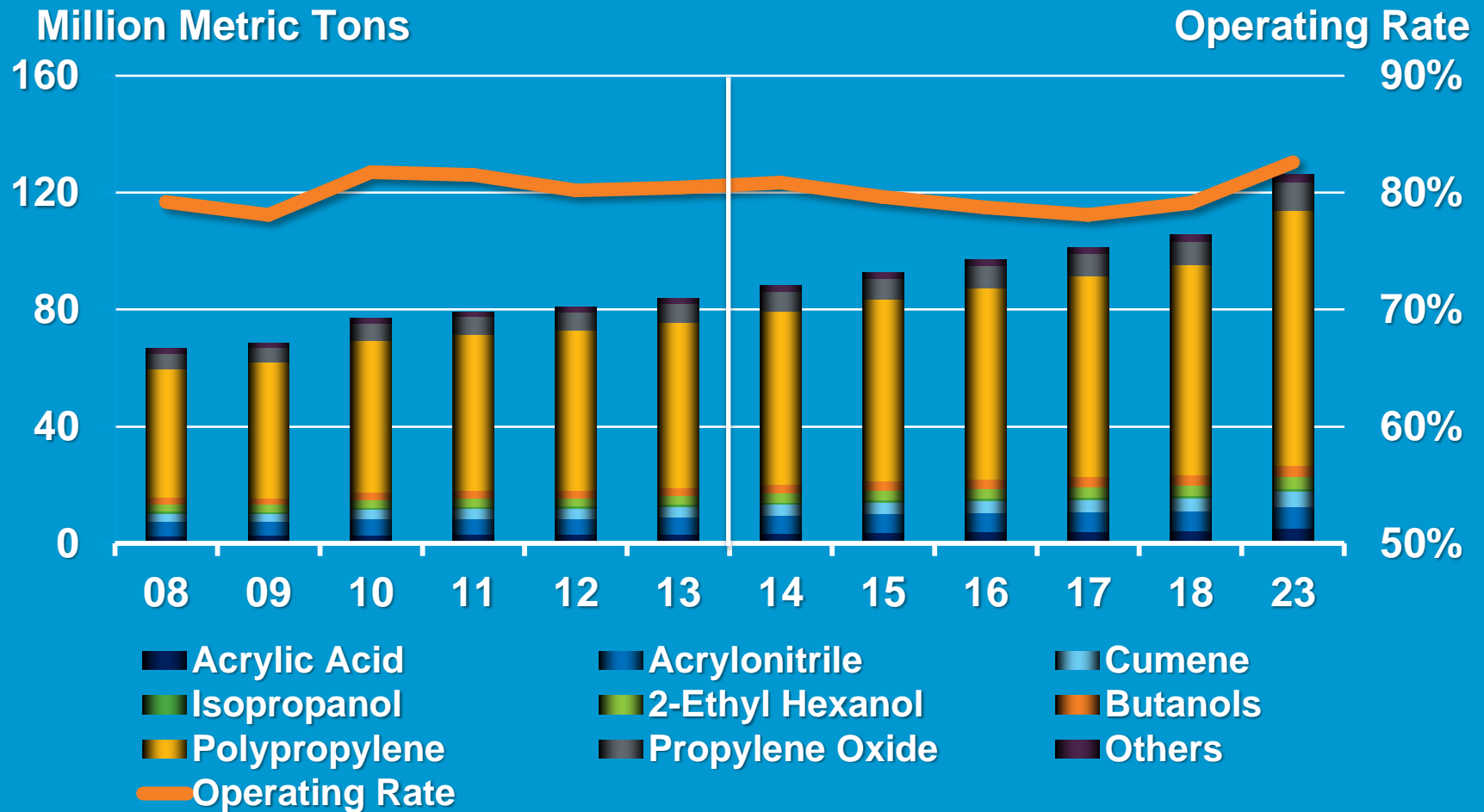
Global Propylene Market

- **The “Big Picture” and what is motivating the changes**
- **China continues to strive towards self sufficiency**
- **North America NGL’s impact supply**
- **Overbuild on the horizon.....prices forecast to weaken**

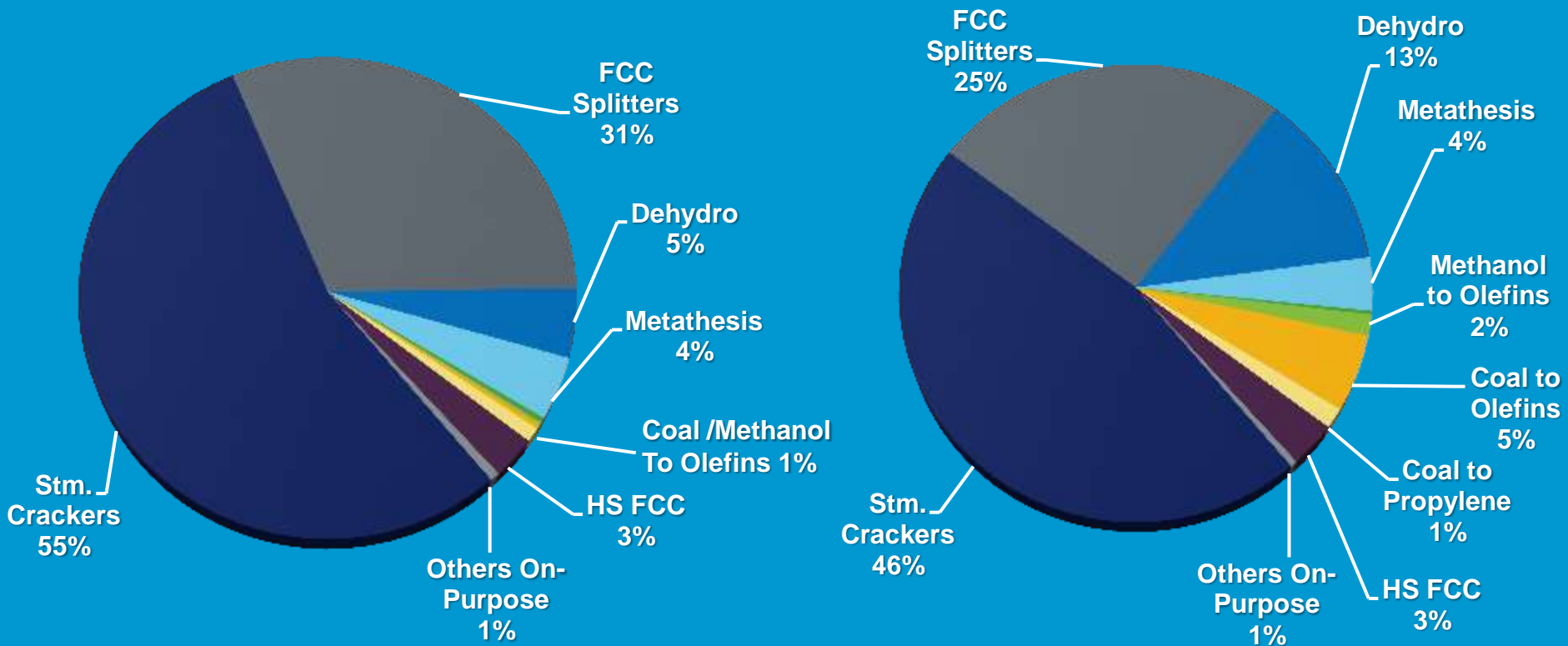
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Propylene Demand Growth Averages 4 mmt/yr



Capacity Additions....PDH and CTO Lead the On-Purpose Wave



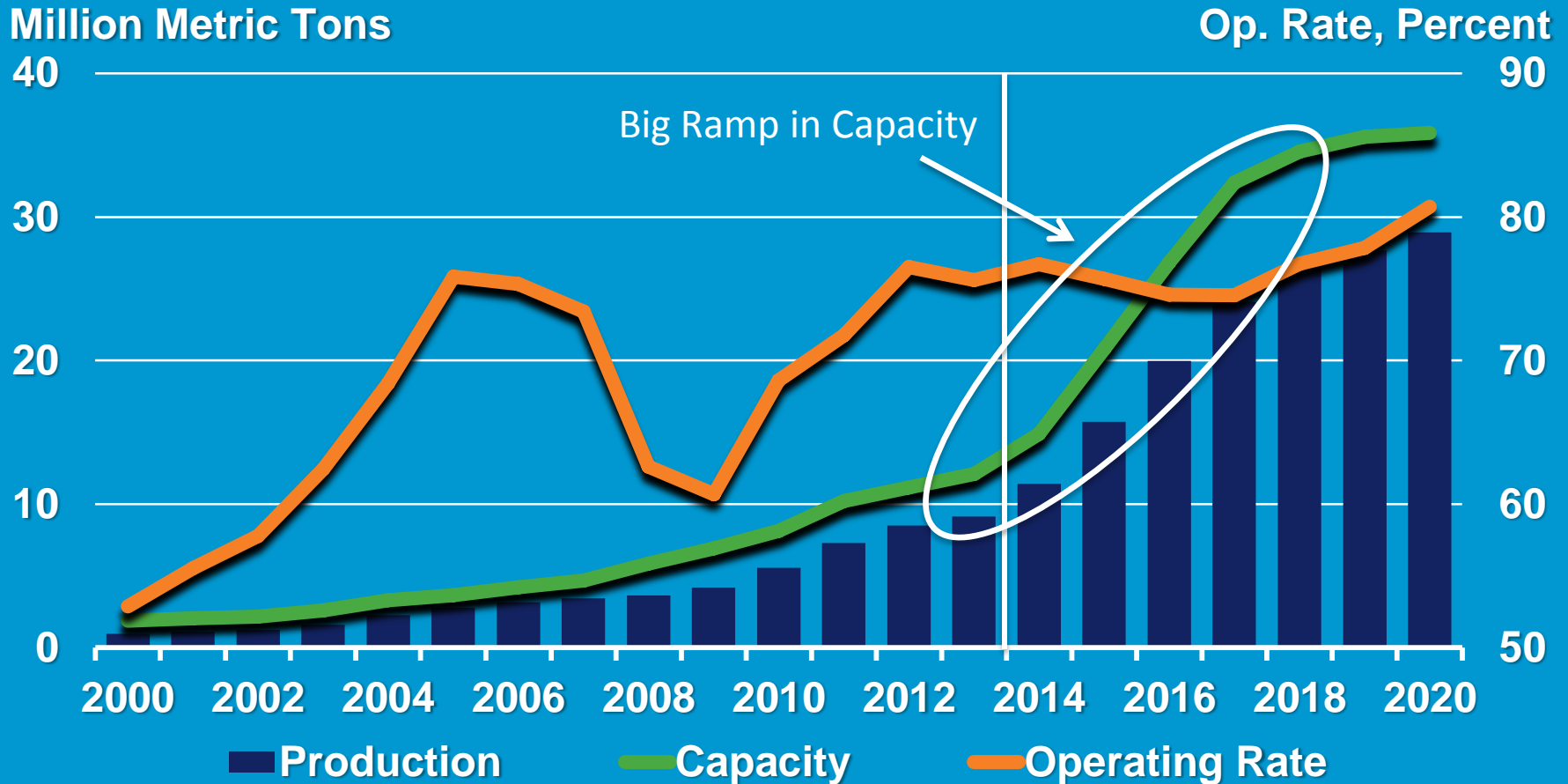
Doubling On-Purpose Capacity

2013



2018

Global On Purpose Production/Demand



Total World Propylene 2020+

**Refinery
FCC/Coker**

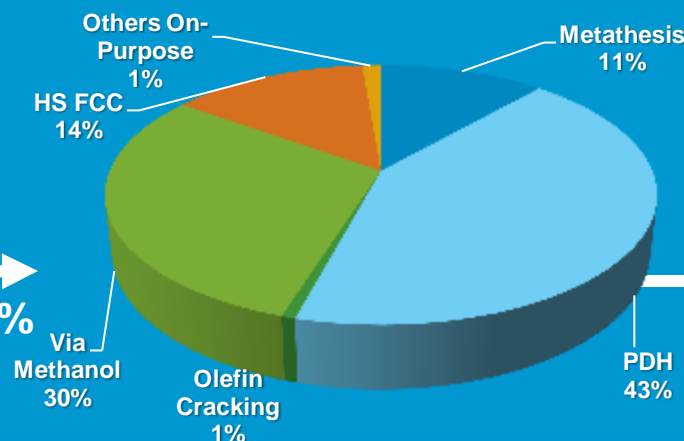
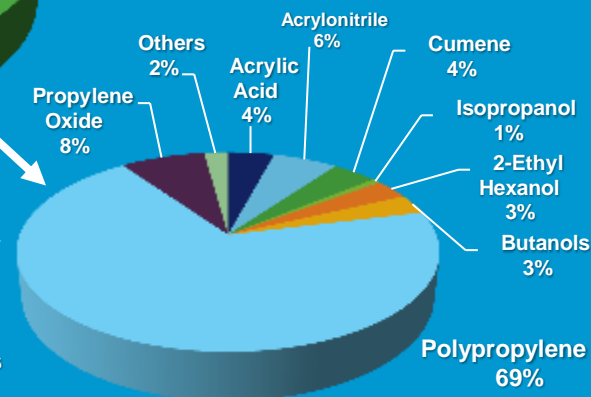
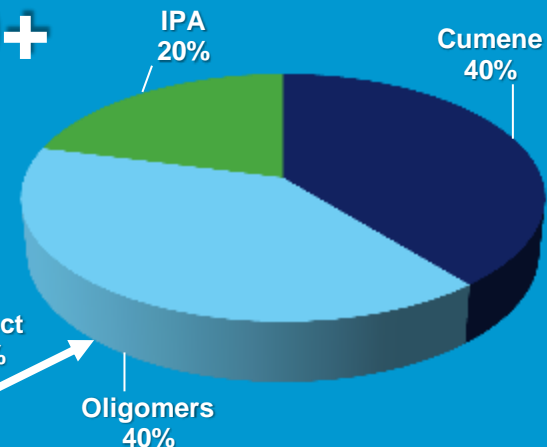
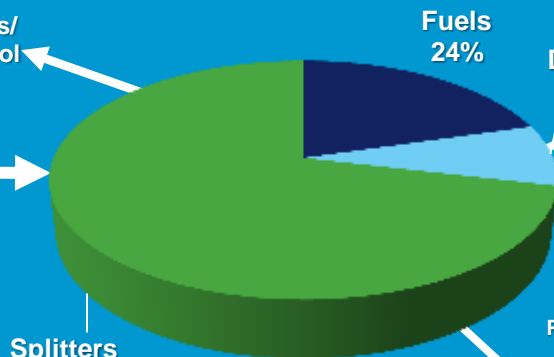
30% - 35%

**Steam
Crackers**

40% - 45%

On-Purpose

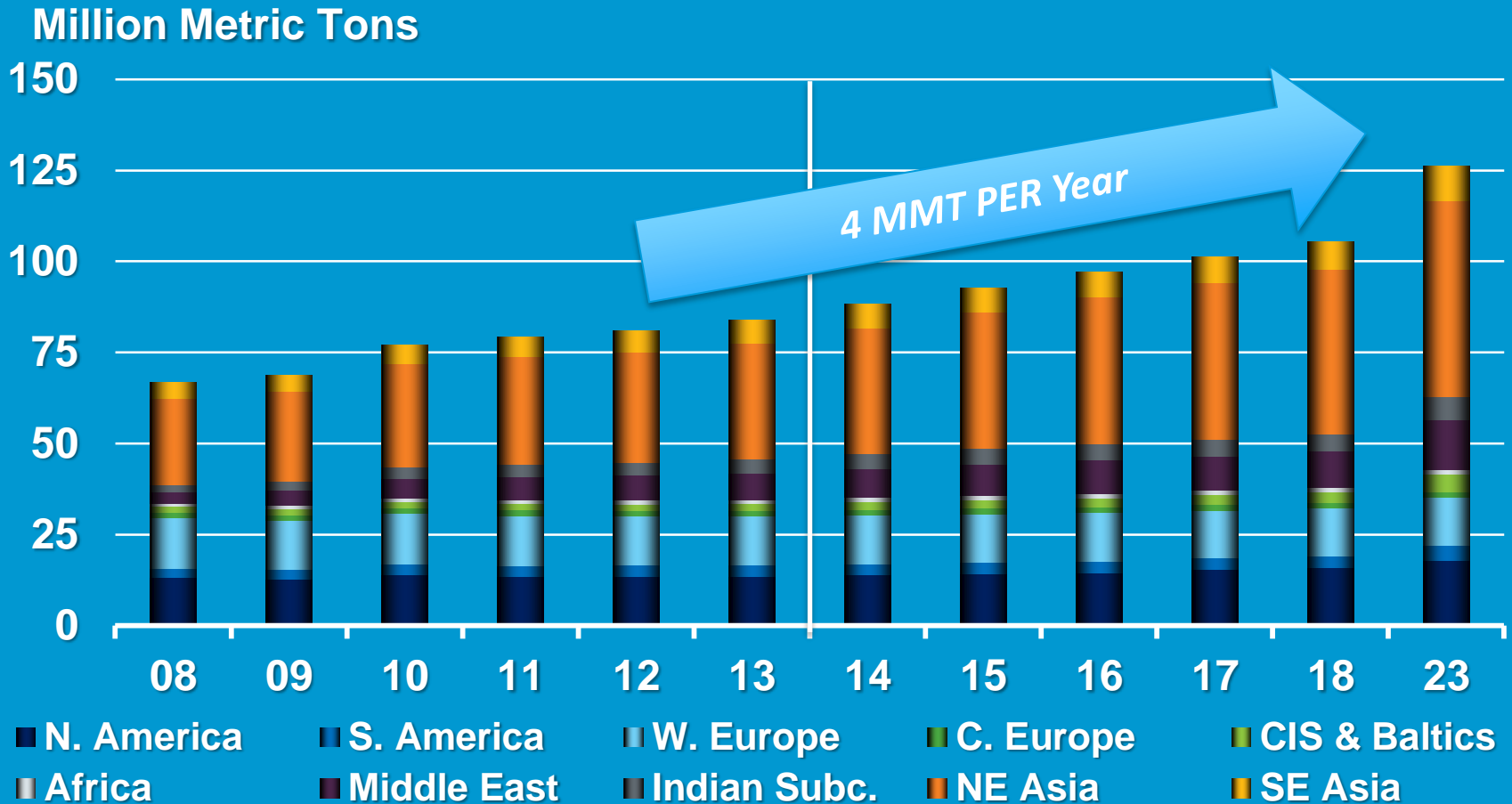
25% - 30%



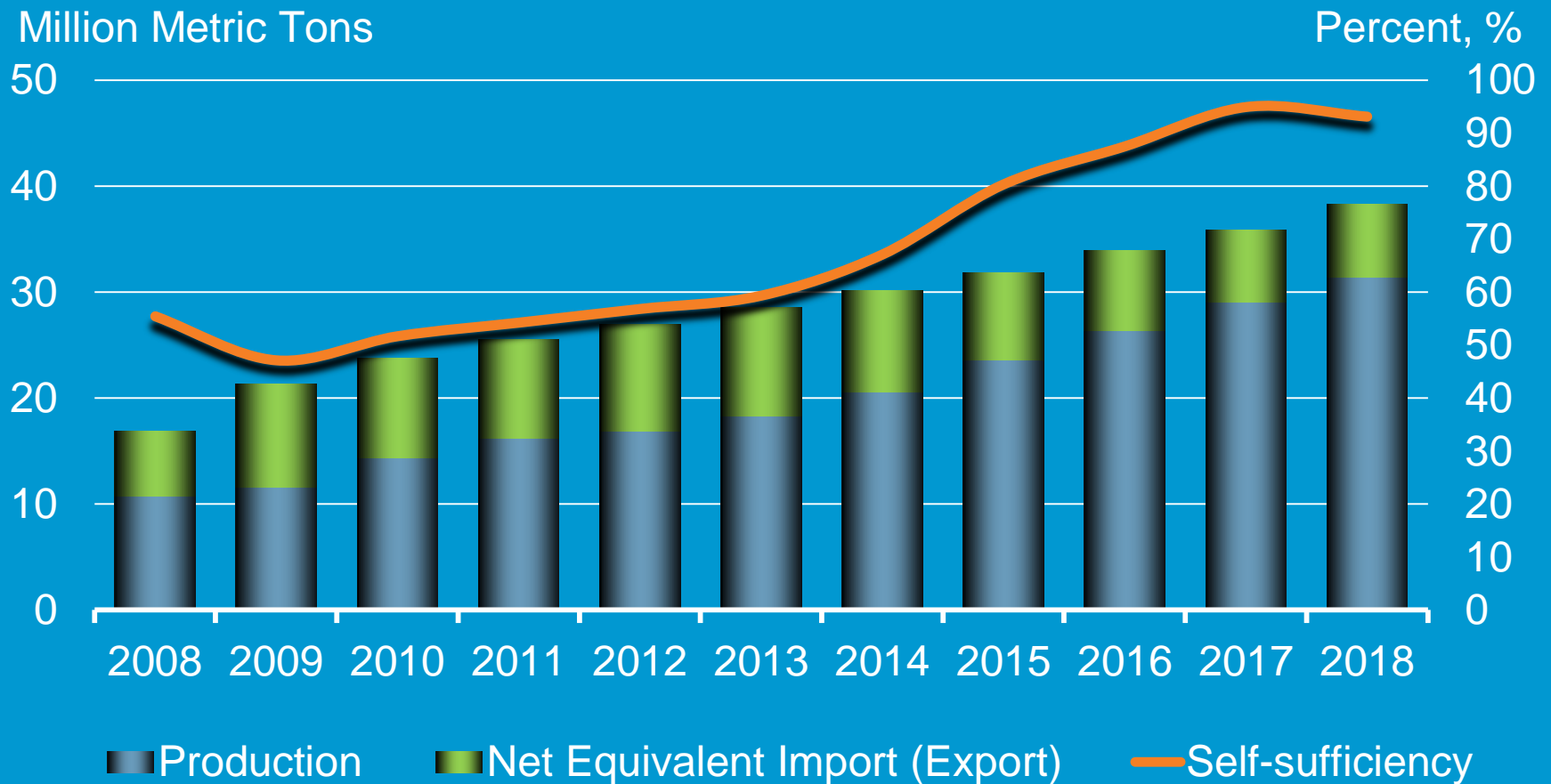
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Asia Leads Demand Growth.....

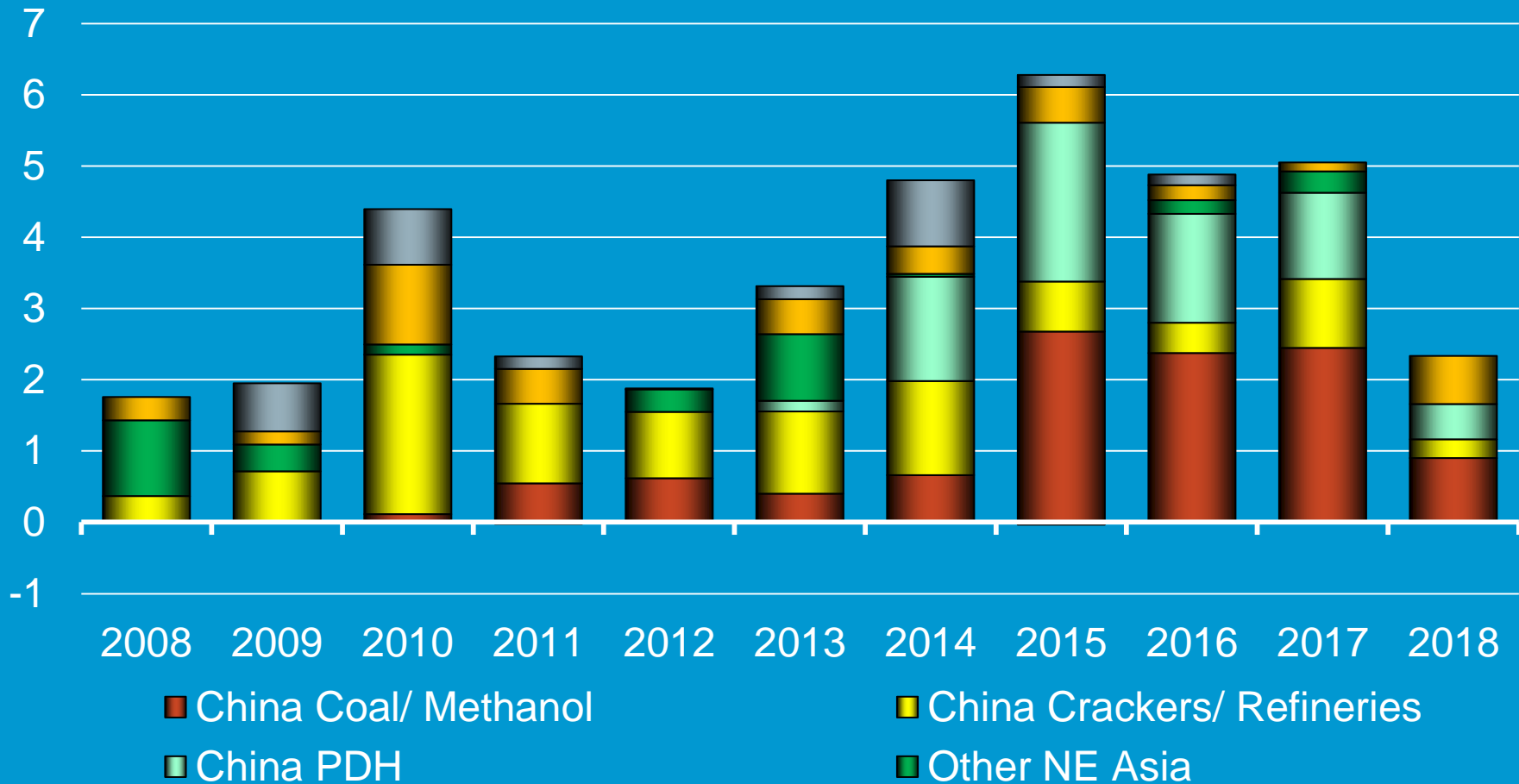


China's Propylene Self-Sufficiency is Rapidly Improving

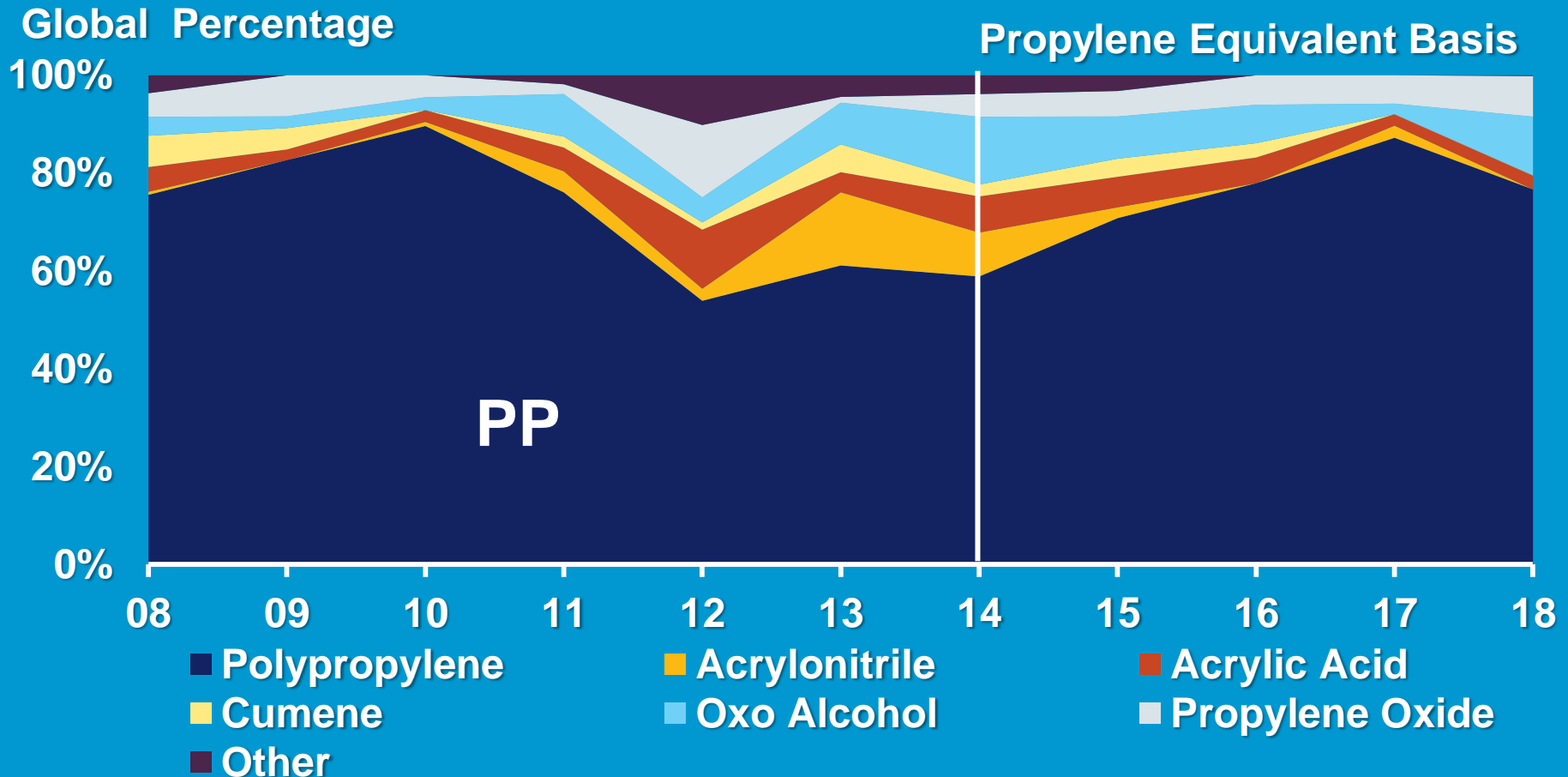


Not Surprising with All the New On-Purpose Capacity

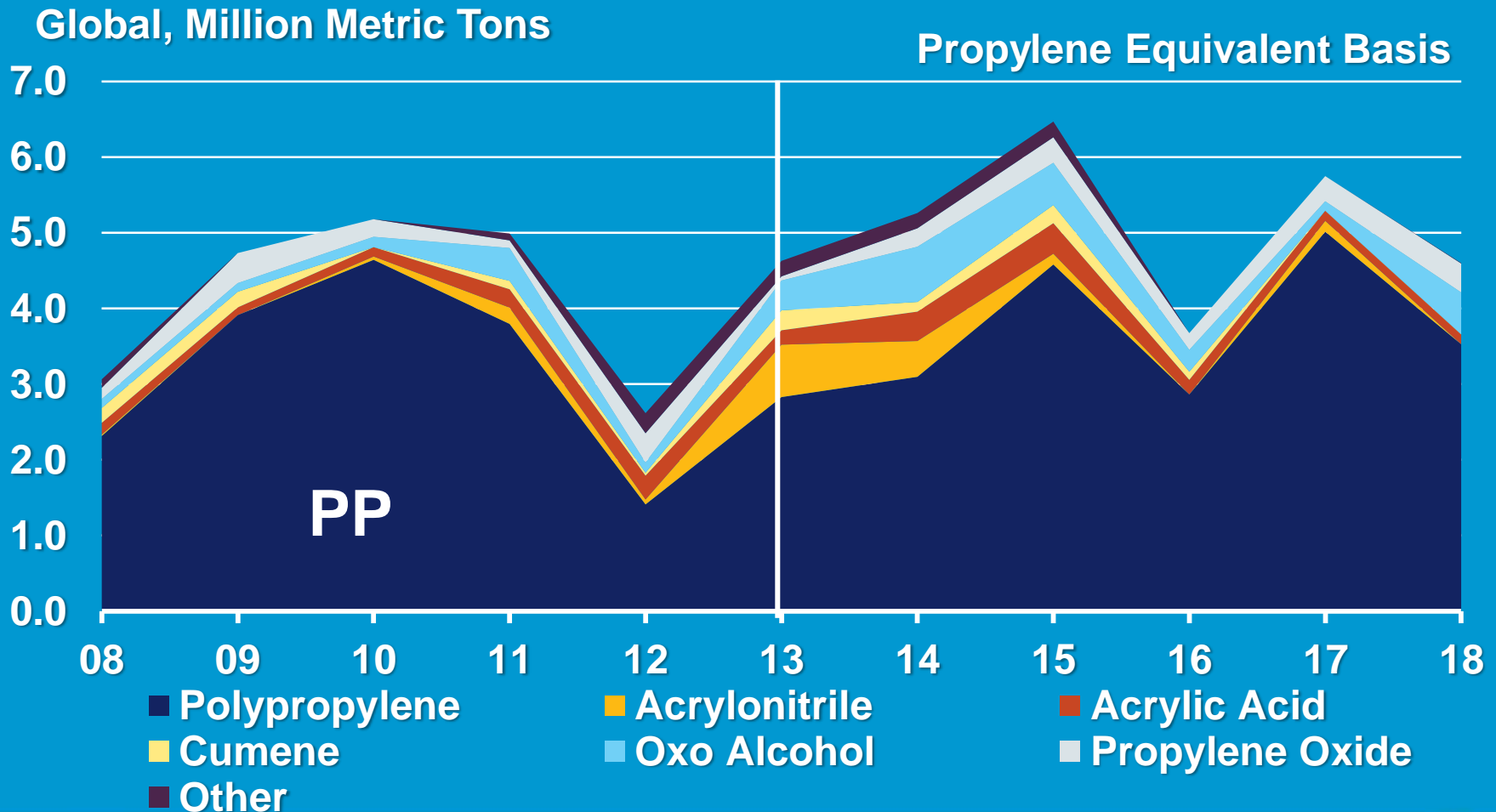
Asia Propylene Incremental Capacity, Million Metric Tons



Propylene Derivative Capacity Additions Shift Away from PP



And Provides Abundance of Non-PP Derivative Capacity...Mostly China



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NGL's Supplies: Effects on Propylene

Ethane

Negative



Propane

Positive



Butanes

Negative

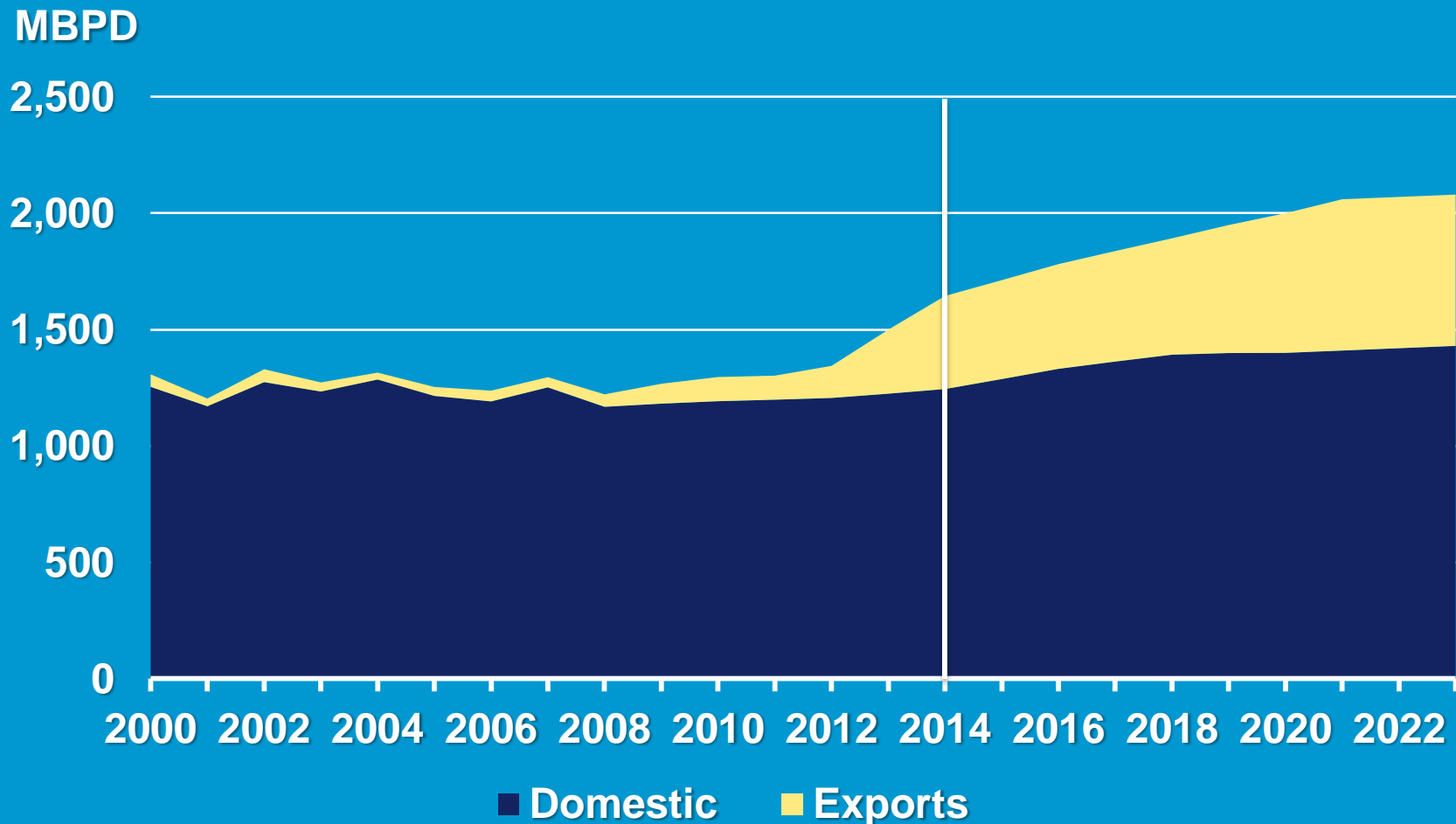


C5+



Provides alternatives for refiners and steam crackers

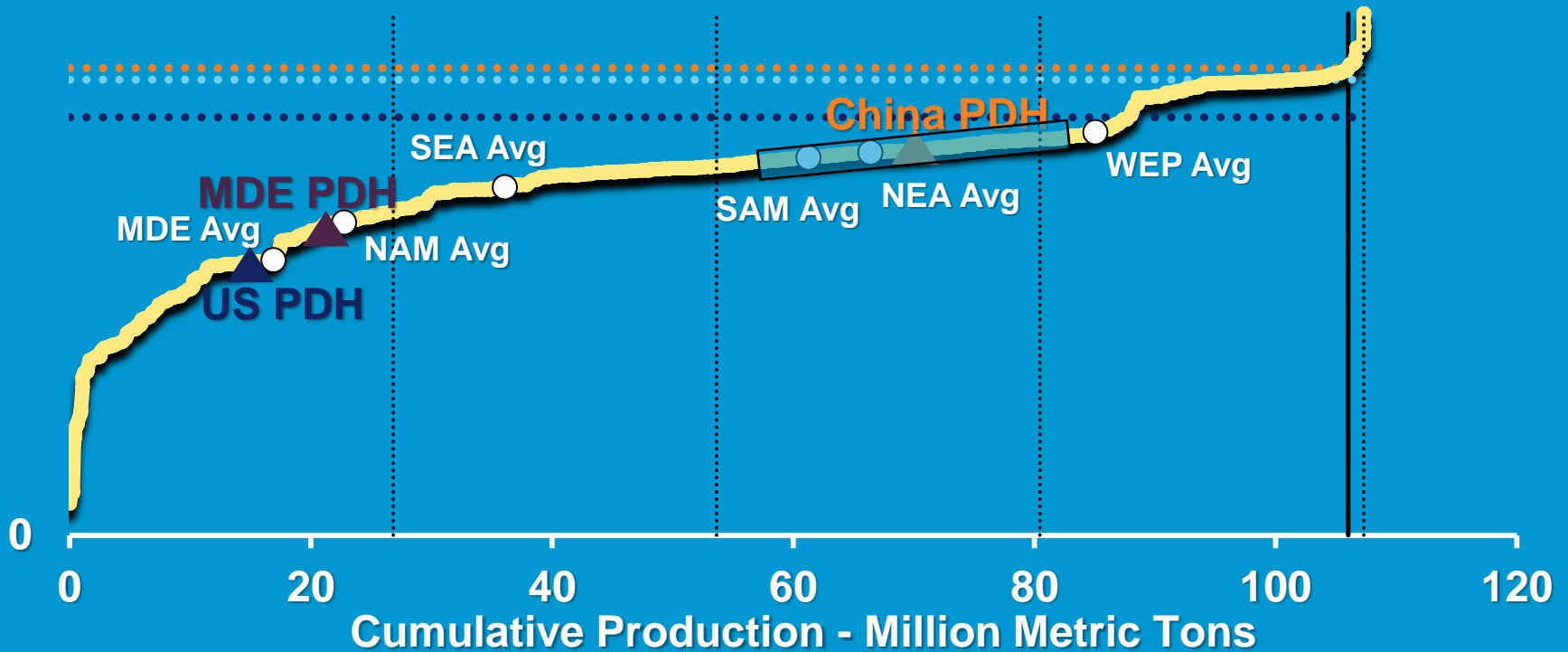
North America Propane Abundance Supports Global PDH Additions



World Propylene – PG/CG Cost Curve 2018

\$/Metric Ton

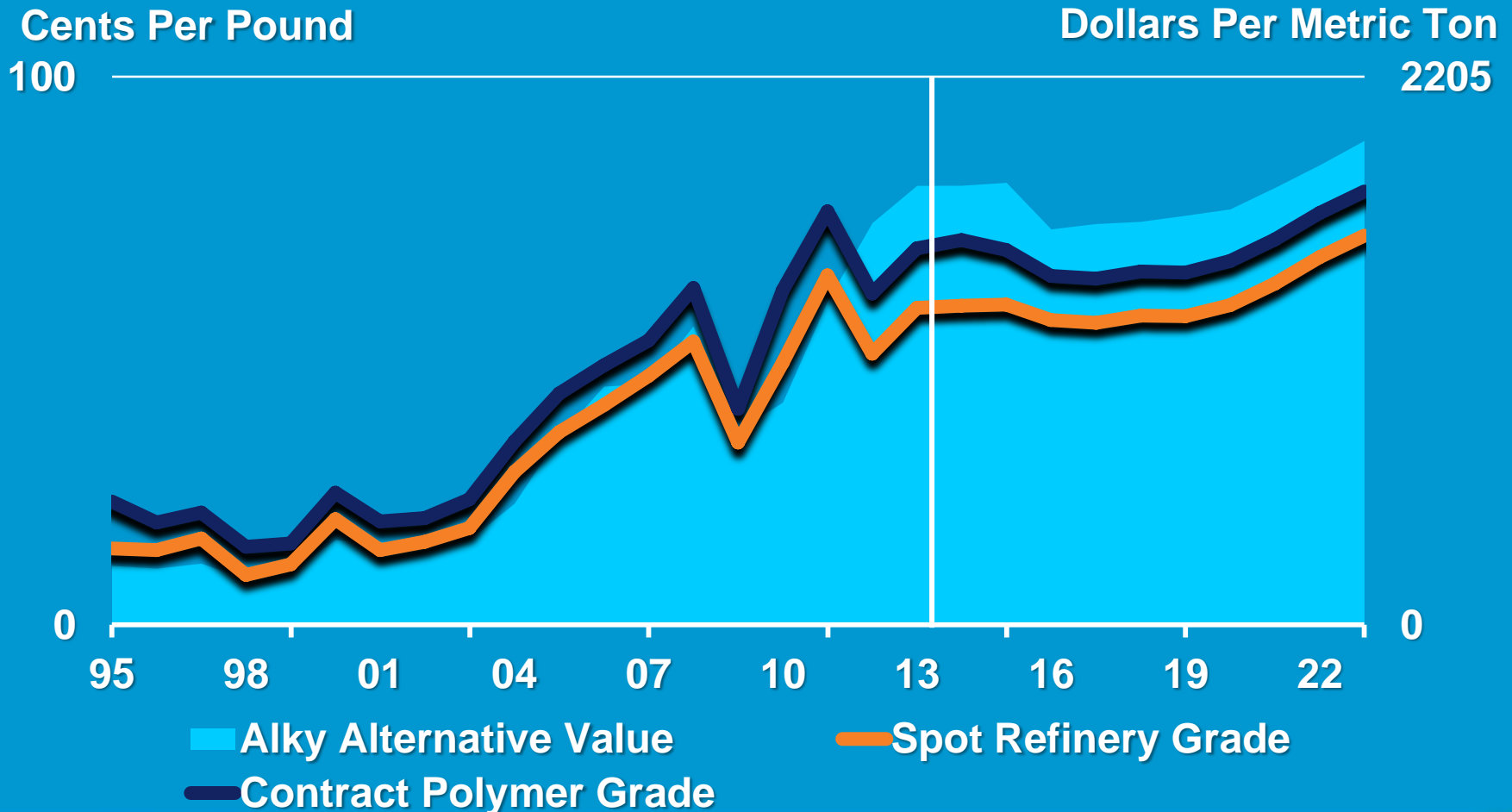
1800



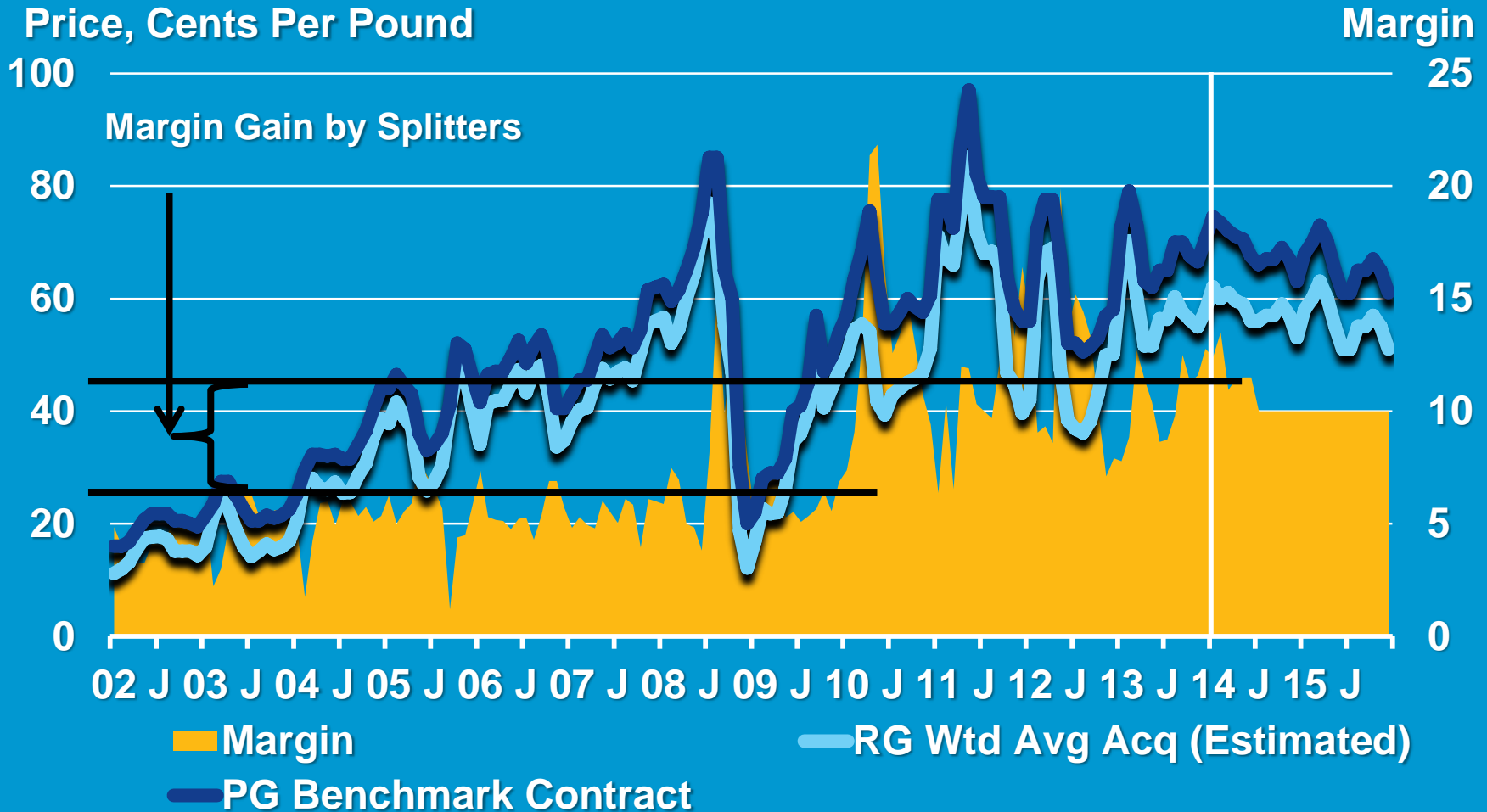
- Demand
- US Price
- NE Asia Price
- W Europe Price
- 2018



US Propylene Prices Stay Discounted Versus Alky Alternatives

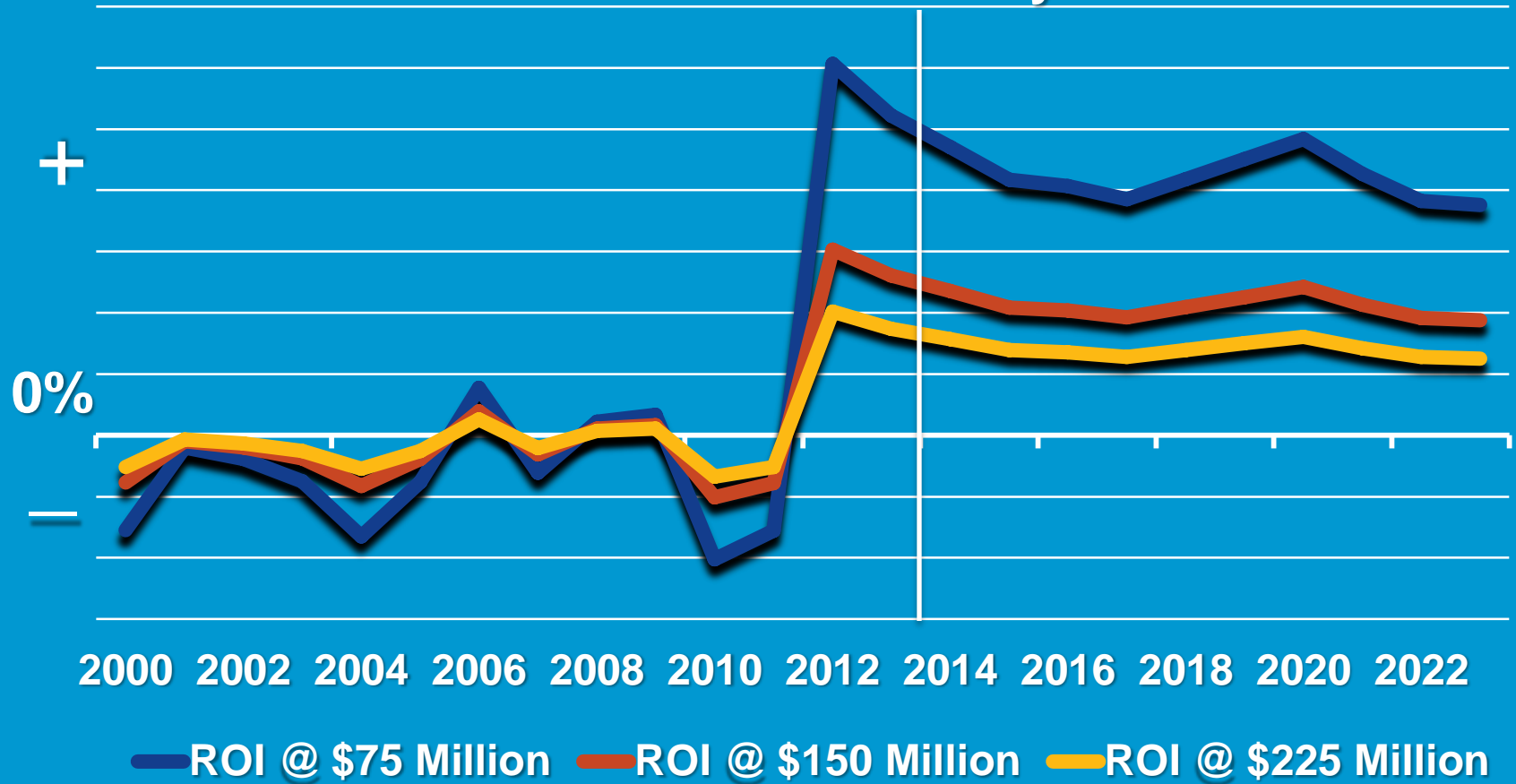


Propylene Splitter Margin – More Motivation for Refiners



Propylene Alkylation Economics Revived – Will Refiners Invest?

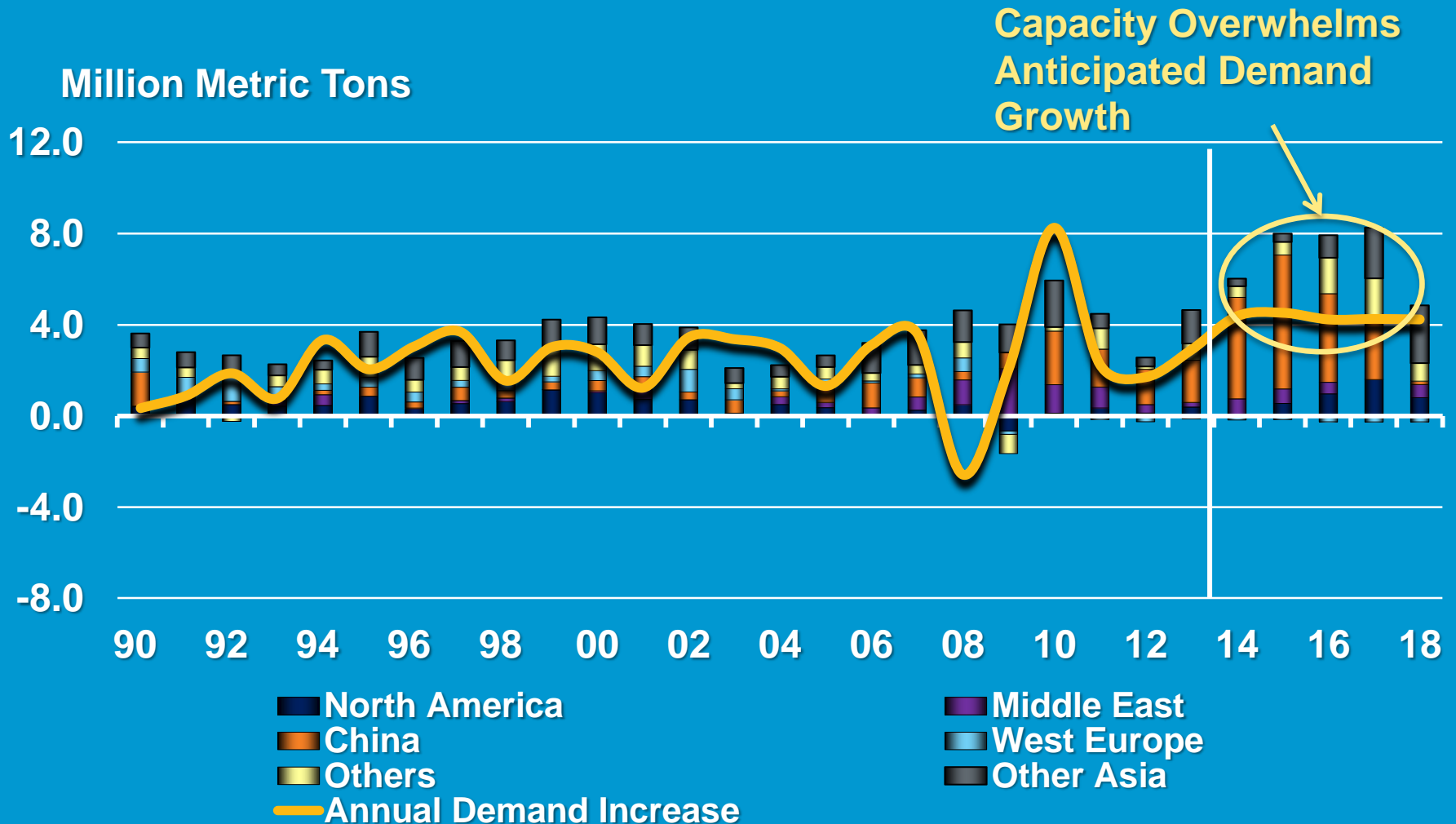
Return on Investment for an Alky Unit in US



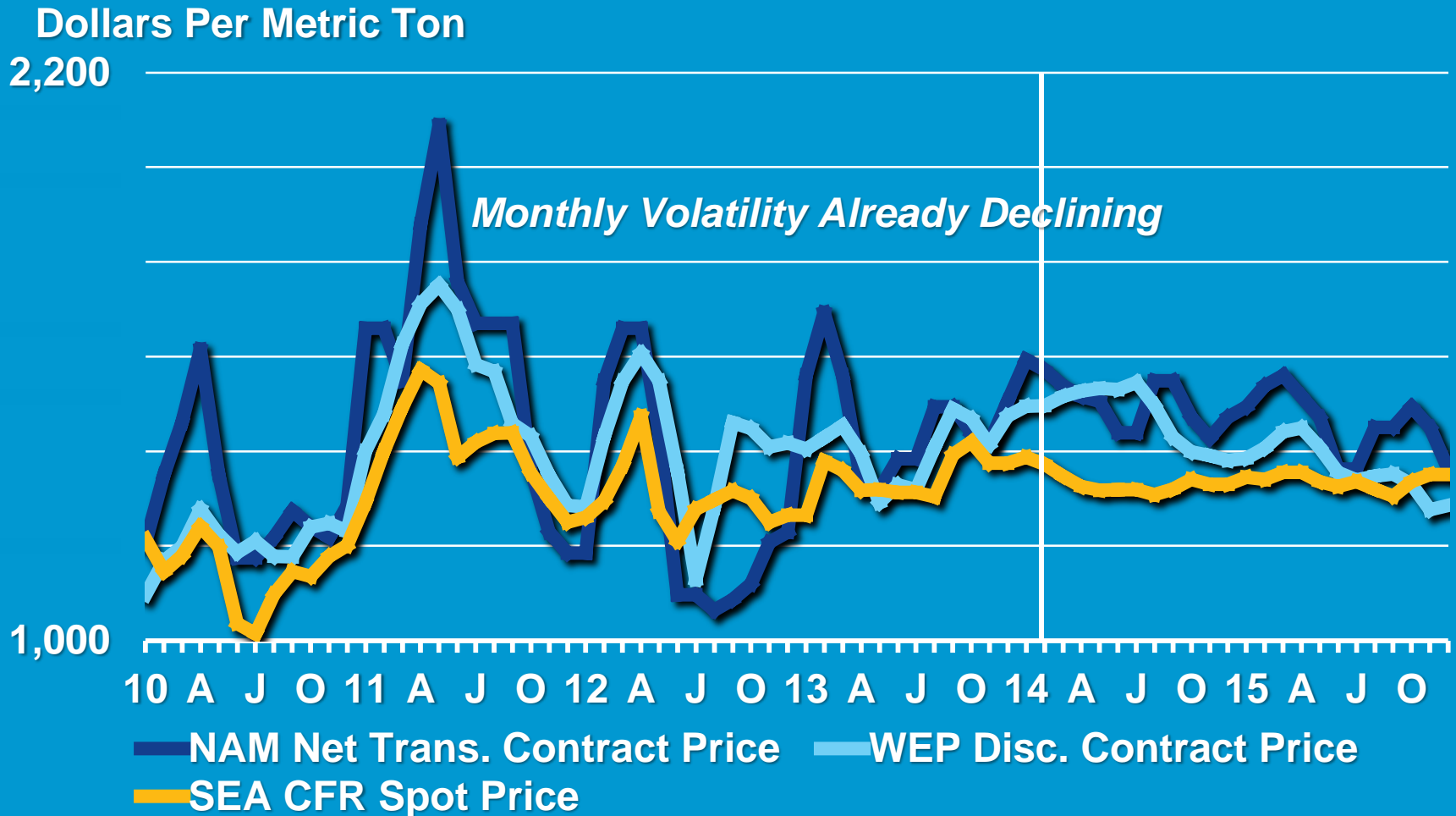
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- North America NGL’s revive supply
- **Overbuild on the horizon.....price forecast weakens**

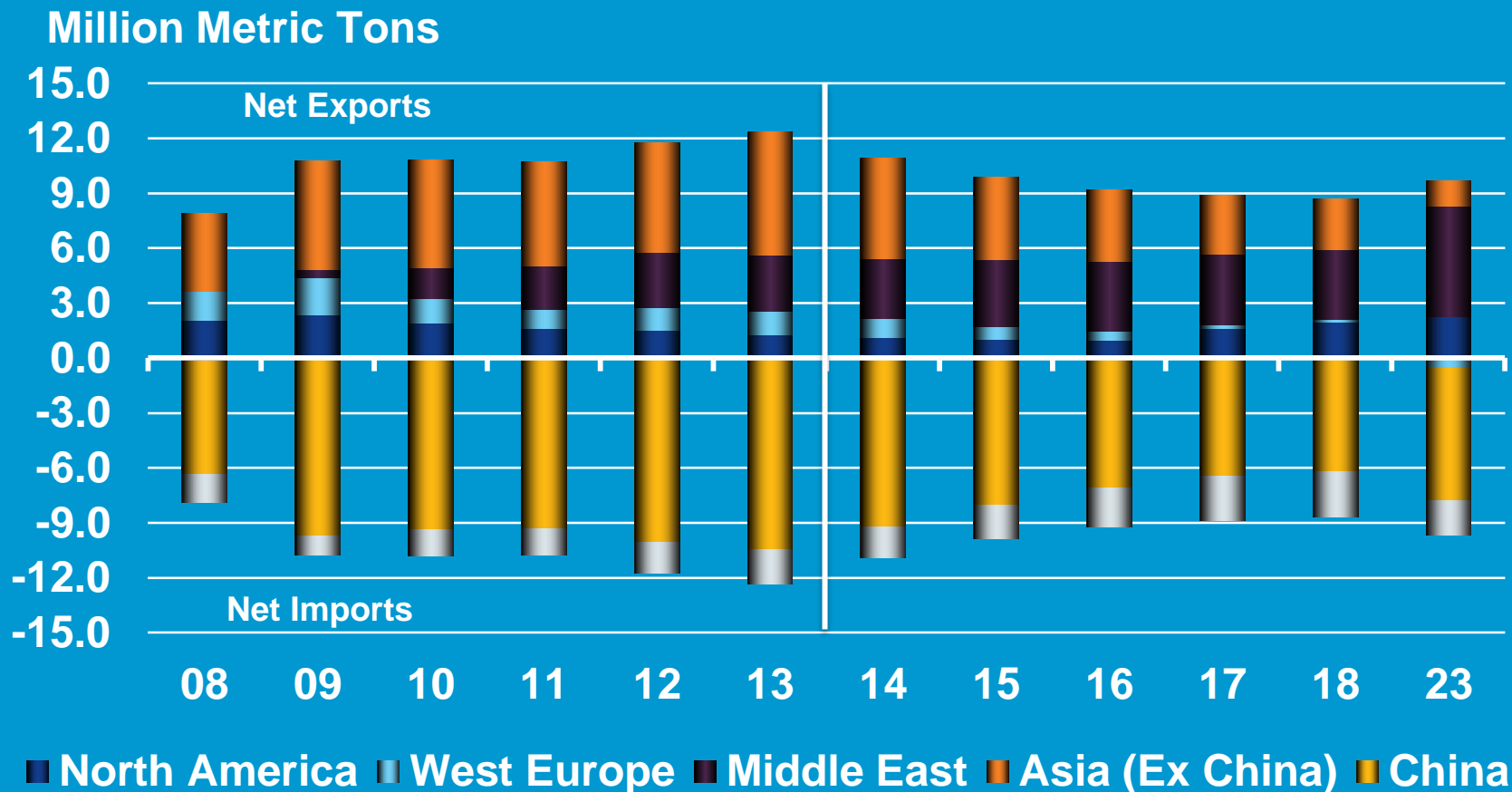
Global Propylene Capacity Additions Versus Demand Growth



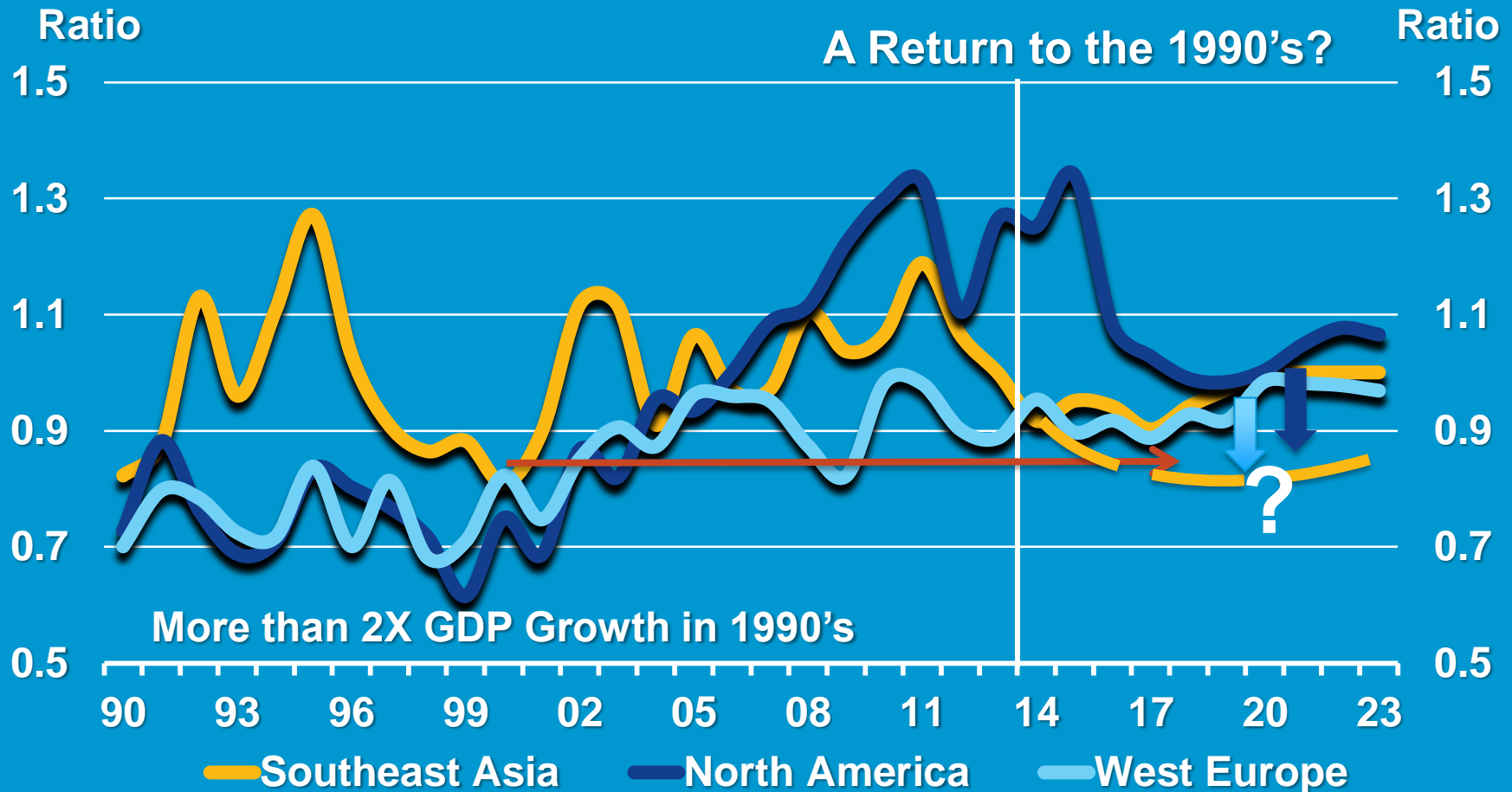
Global Monthly Propylene Prices



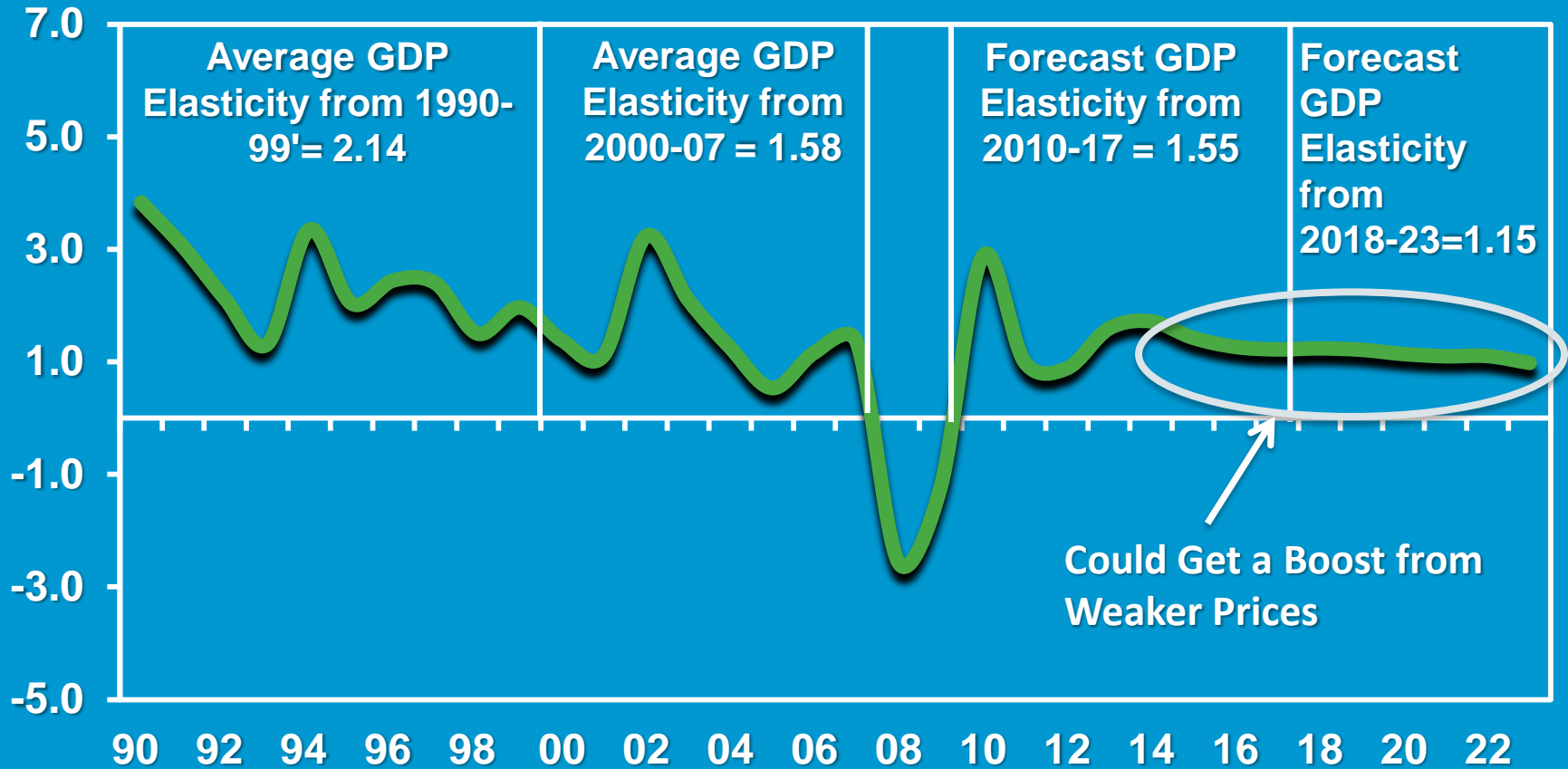
Global Propylene Net Equivalent Trade Contracts With the Overbuild



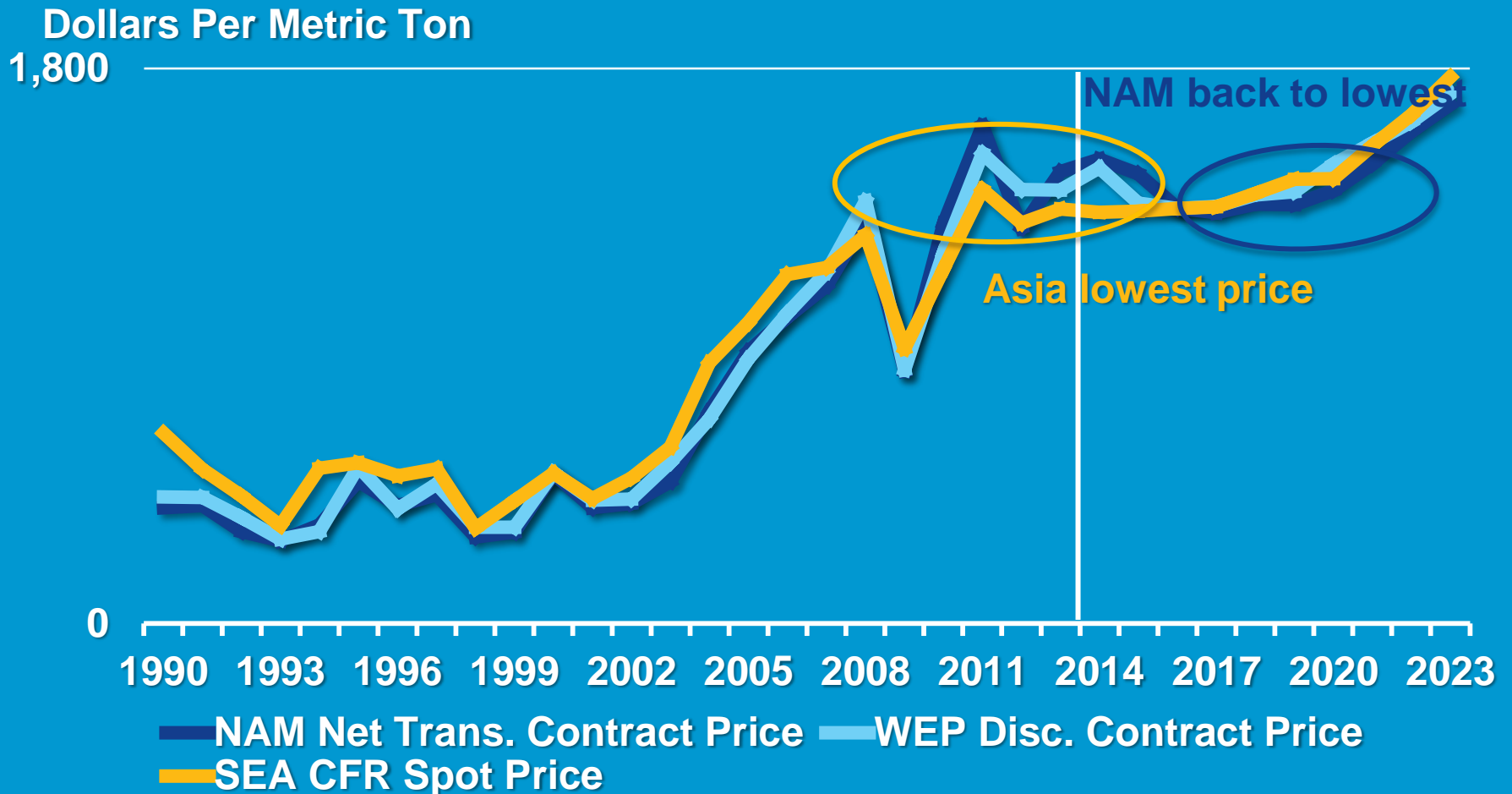
Propylene to Ethylene Price Ratios



World PG/CG Propylene GDP Elasticity



Global Annual Propylene Prices



Conclusions

- **Propylene demand growth could get a boost if oversupply of propylene and propylene derivatives significantly weakens prices**
- **Abundance of North America NGL's will provide a mixed impact on propylene supply**
- **On-purpose will continue to be the growth engine for propylene supply. Could methane based propylene via methanol could be the next wave**

Thank You

