

Positioning for What Comes Next in the Energy Feedstocks and Chemical Industry

Rice Global E&C Forum: Turning the Corner

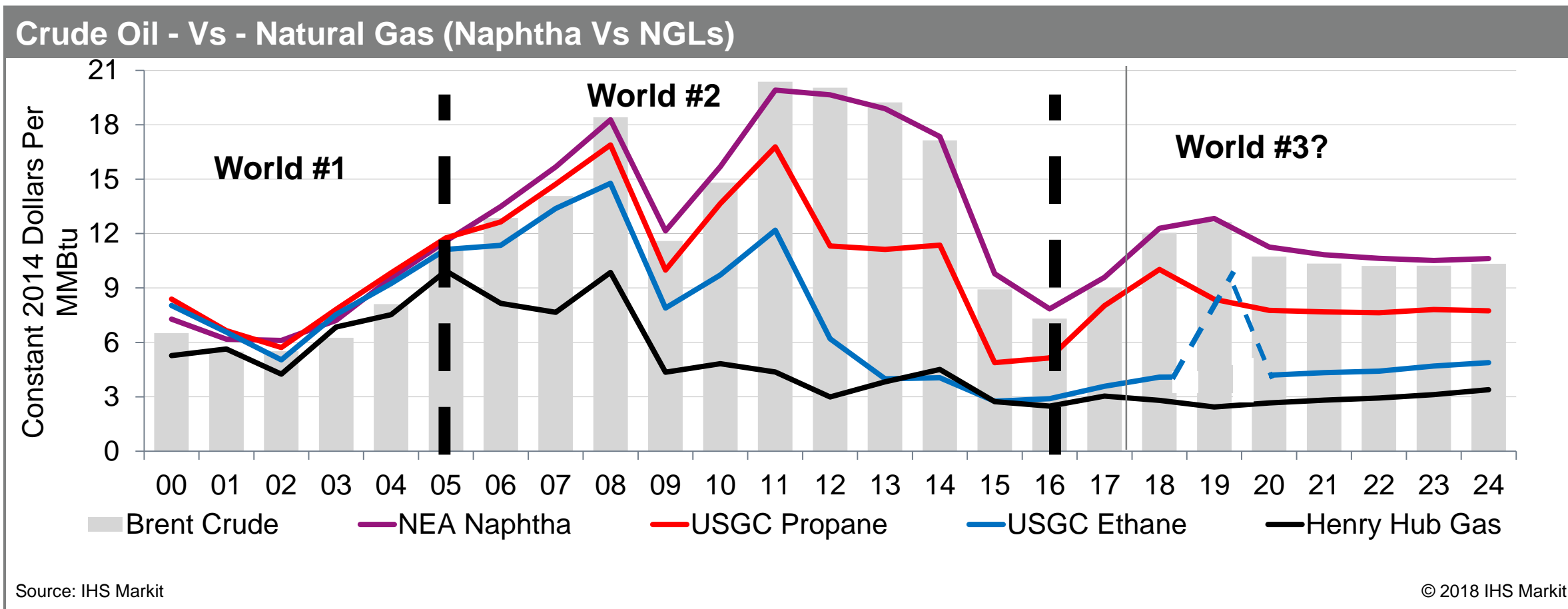
Houston Texas

November 13, 2018

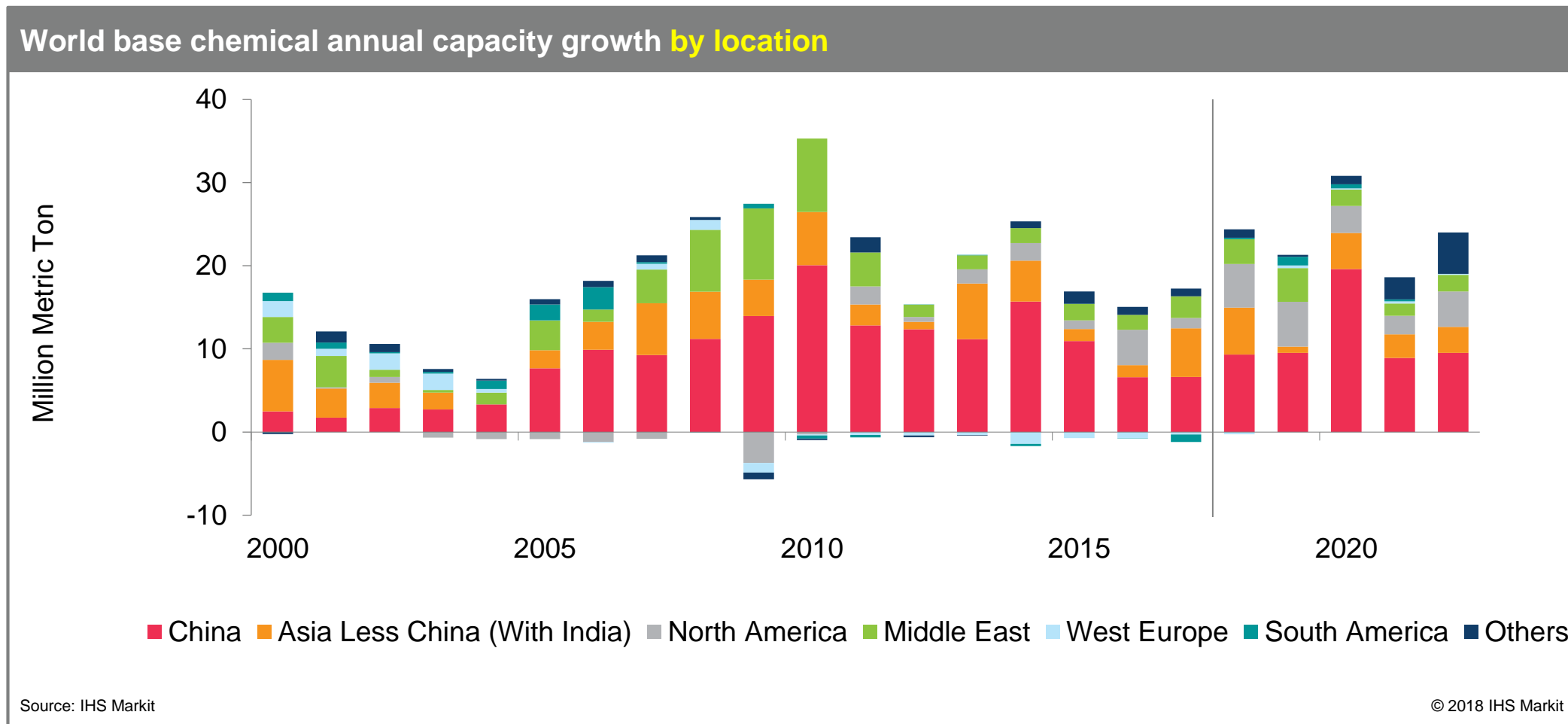
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Feedstock cost has traditionally been the most important and complex long-term decision determinant

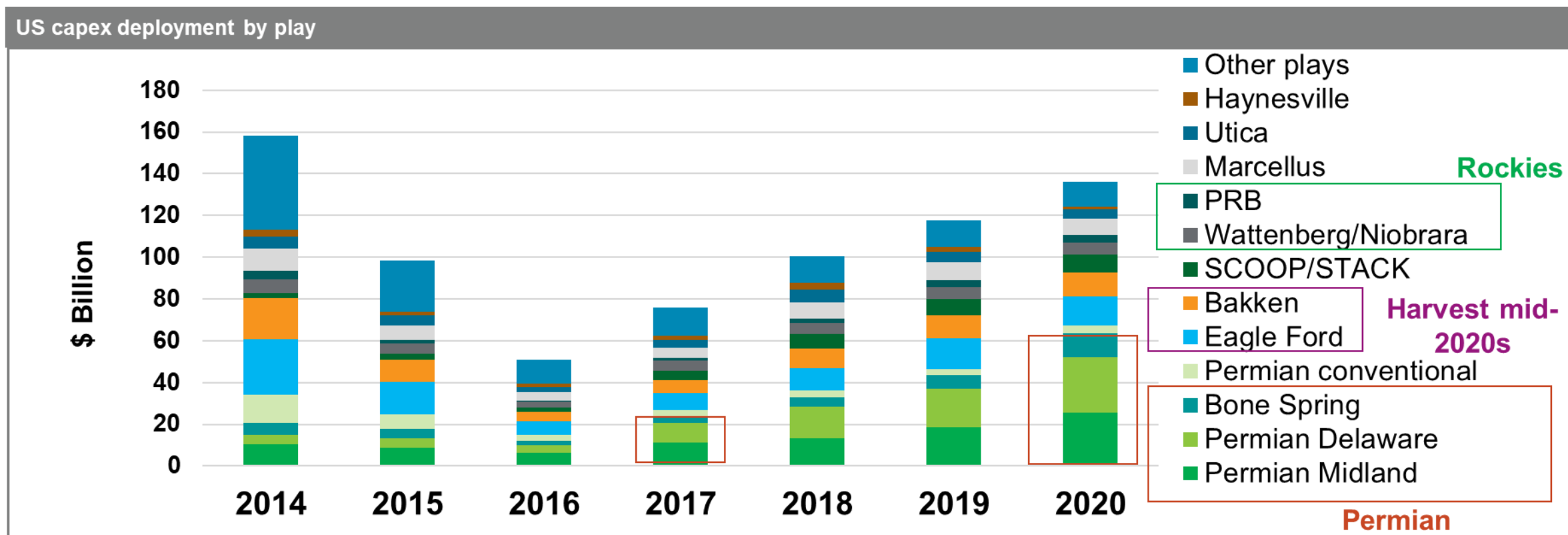


Global base chemical capacity will increase by 118+ million tons, 2018 – 2022
 Asia-Pacific (led by China) will add 60%; N. America – 20%; Middle East – 10%

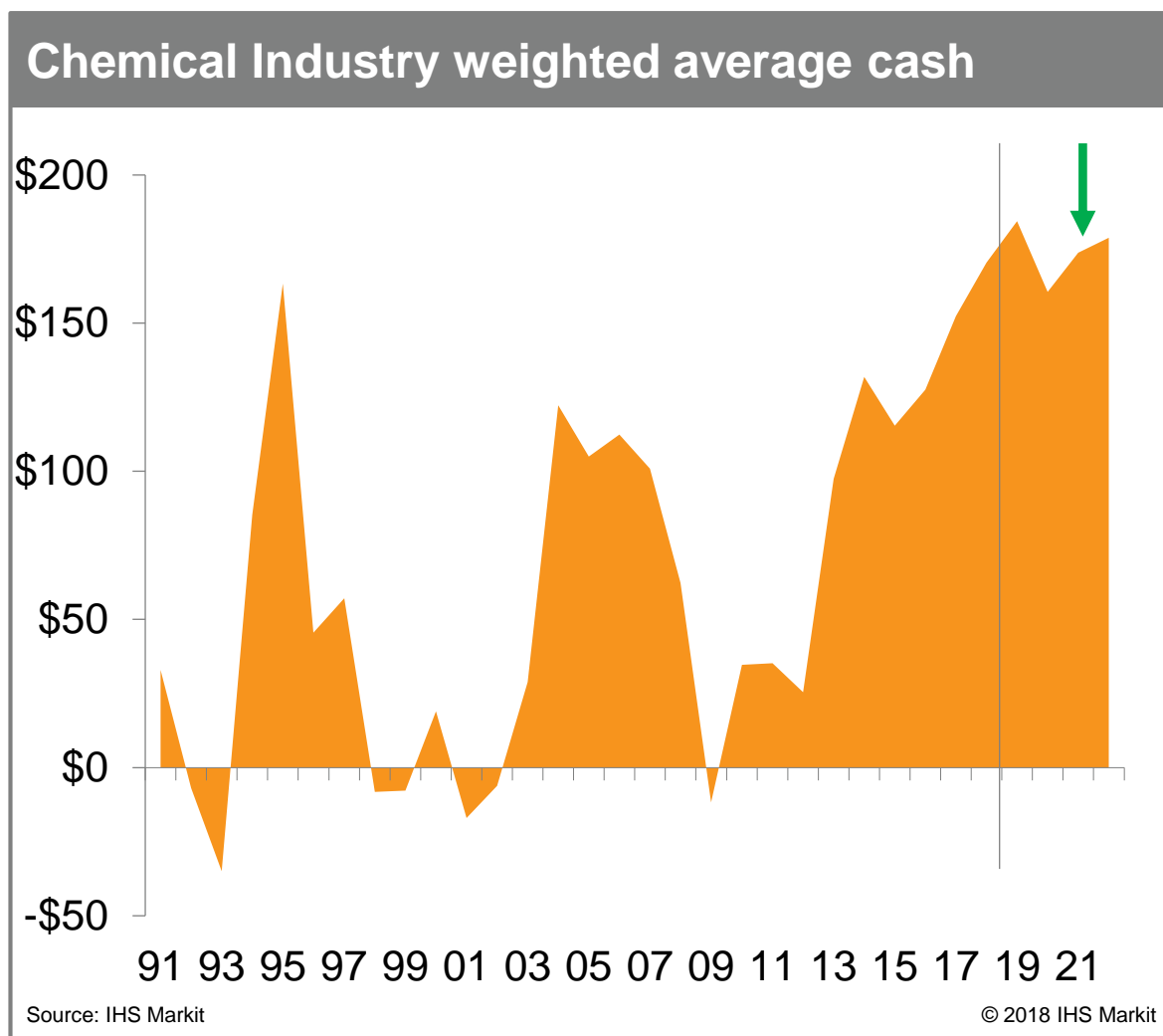


We expect capital spending to rise by an average of 21% annually between 2017 and 2020, to reach an estimated \$136 billion (onshore drilling and completion only).

- Spending will grow at a faster clip than growth in well counts due to more complex wells, drilling in more expensive areas, and slowly inflating service costs.



Chemical industry in a sustained and unprecedented peak earnings cycle

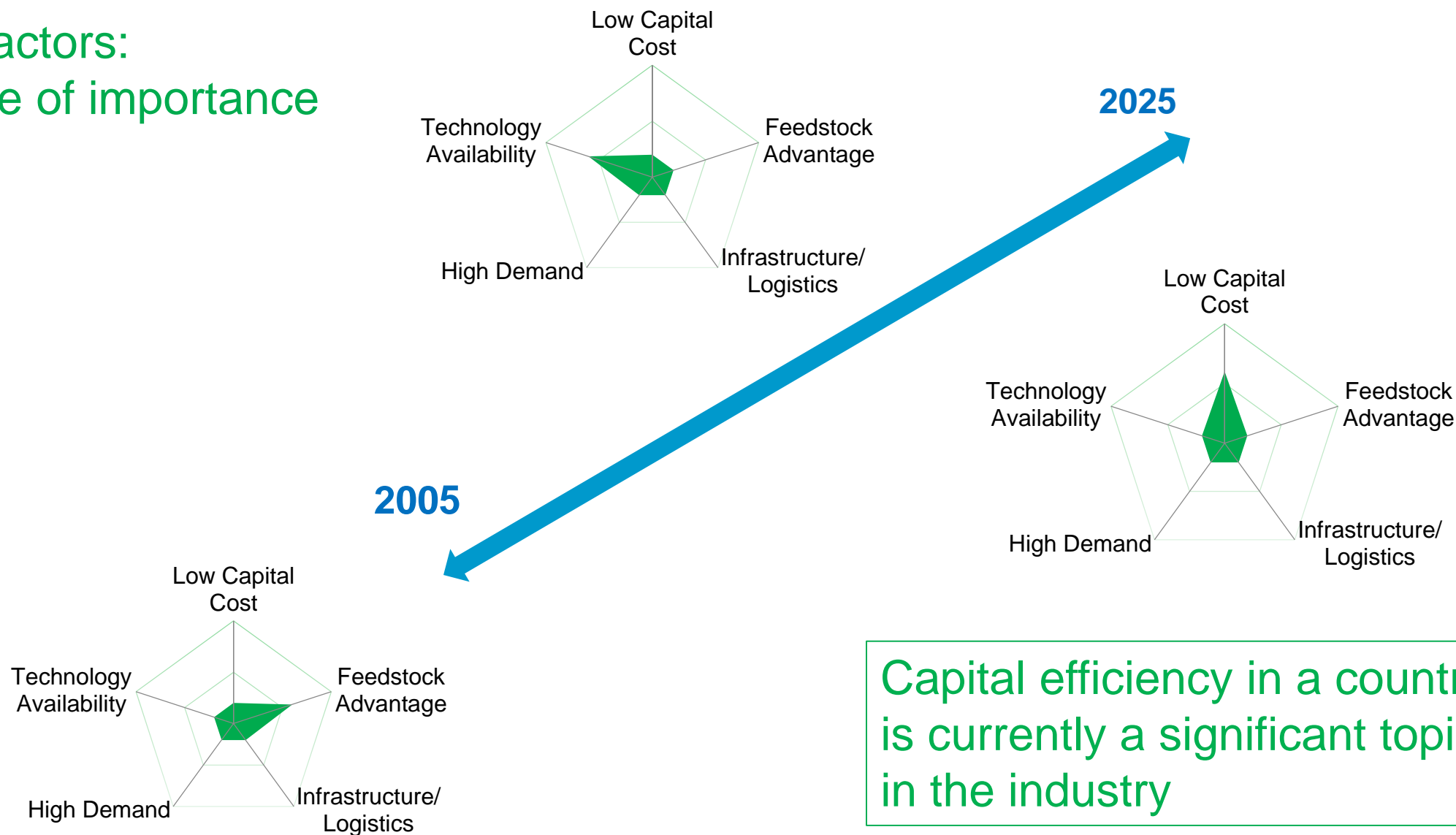


Real GDP

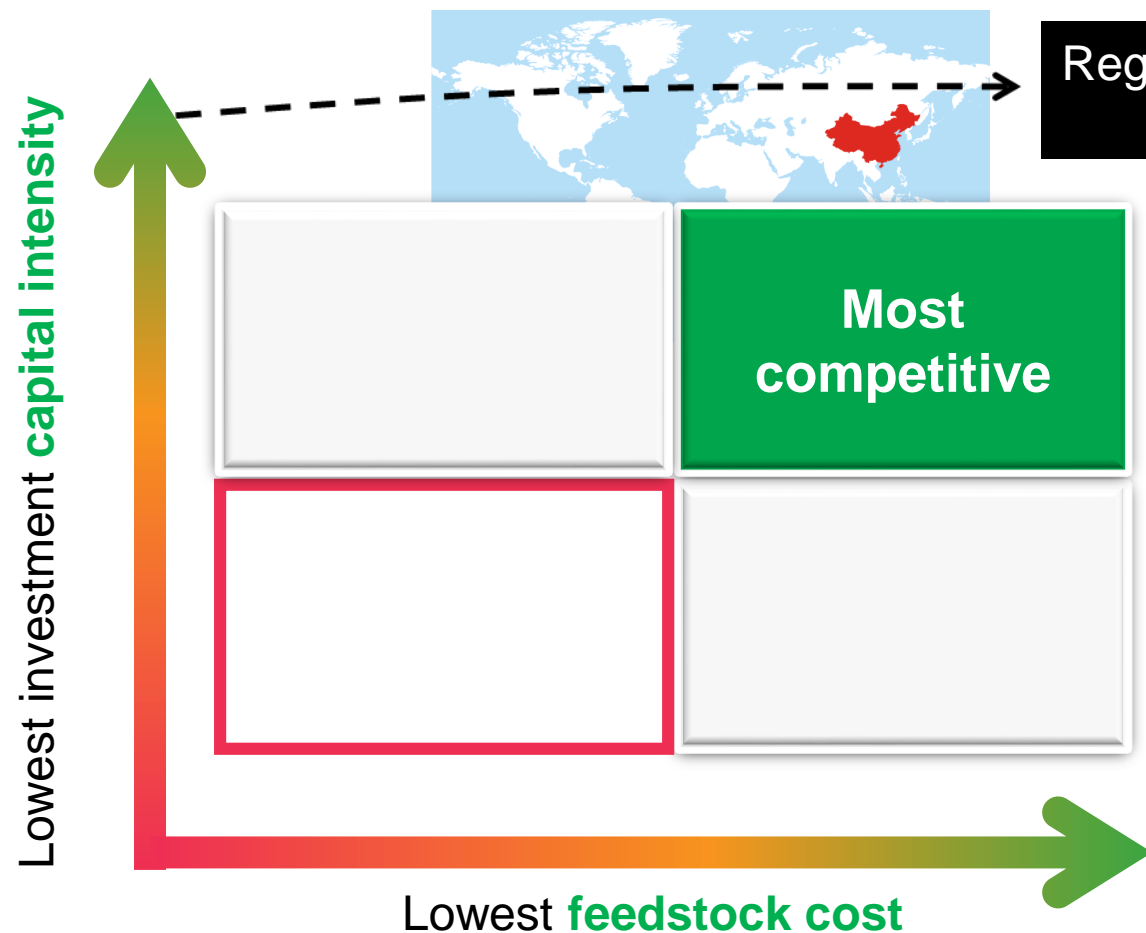
Percent change	2016	2017	2018	2019	2020
World	2.6	3.2	3.2	3.0	2.9
United States	1.6	2.2	2.9	2.7	2.0
Eurozone	1.8	2.5	2.0	1.6	1.3
China	6.7	6.9	6.7	6.1	6.0

- Steady global economic expansion driving growth across most markets
- Oil volatility, reduced Chinese reinvestment, and constrained capital and delayed investment decisions
- Strong margins or economic pull-back creates the potential for major overbuild post-2021

Critical factors: A timeline of importance



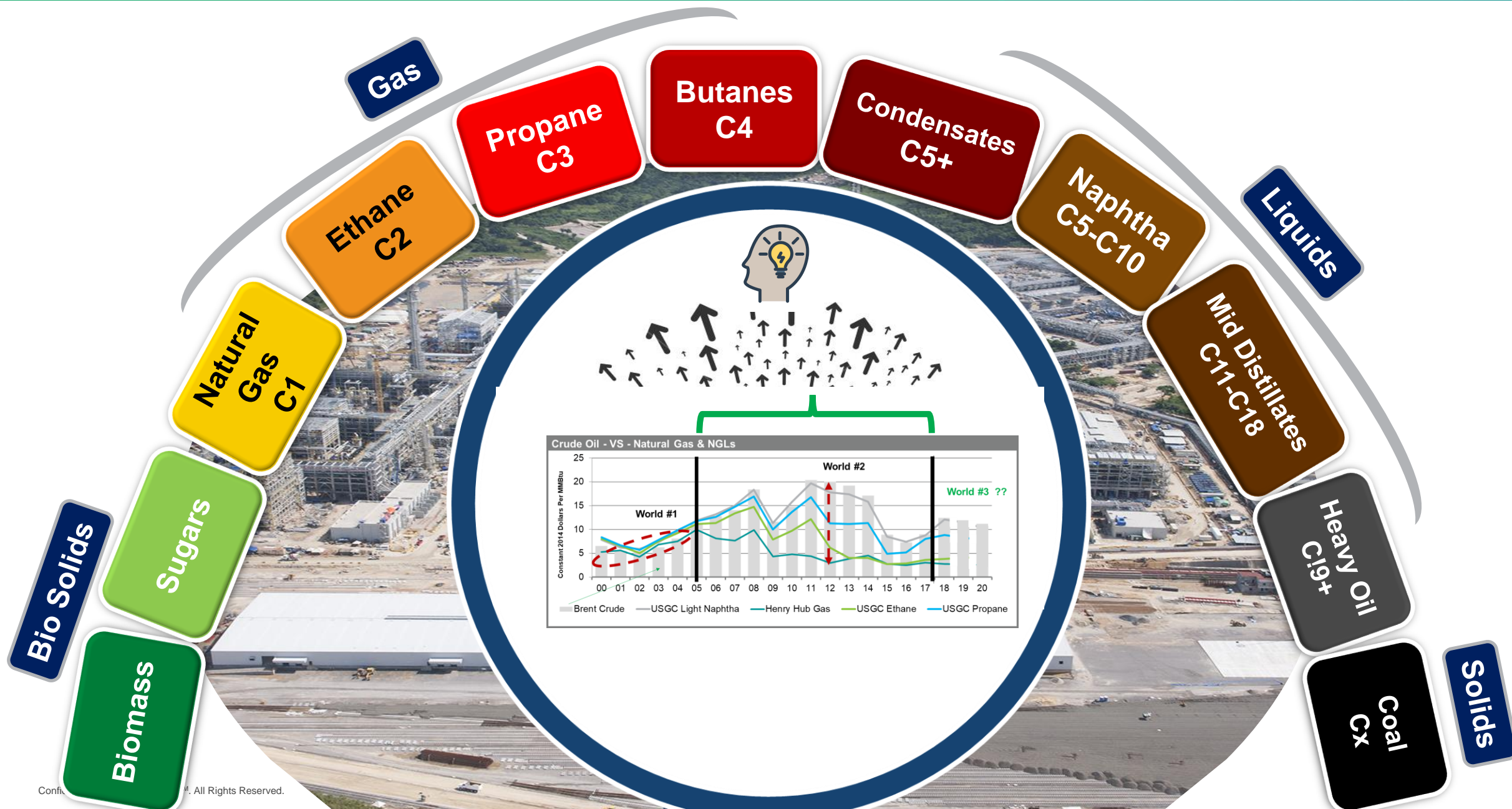
The desired competitive position takes on another global dimension



China investment location factor 0.57 vs. USGC, due to:

- Efficient construction methods
- High construction productivity
- Low skilled labor cost
- Extensive domestic equipment manufacturing capabilities

Market drivers are expected to close this advantage over time



Crude-Oil-Chemicals Driving Forces



Hengli Petrochemical, Zhejiang, Henyi and Shenghong: To back integrate their PET-PTA production by configuring refinery to produce maximum PX

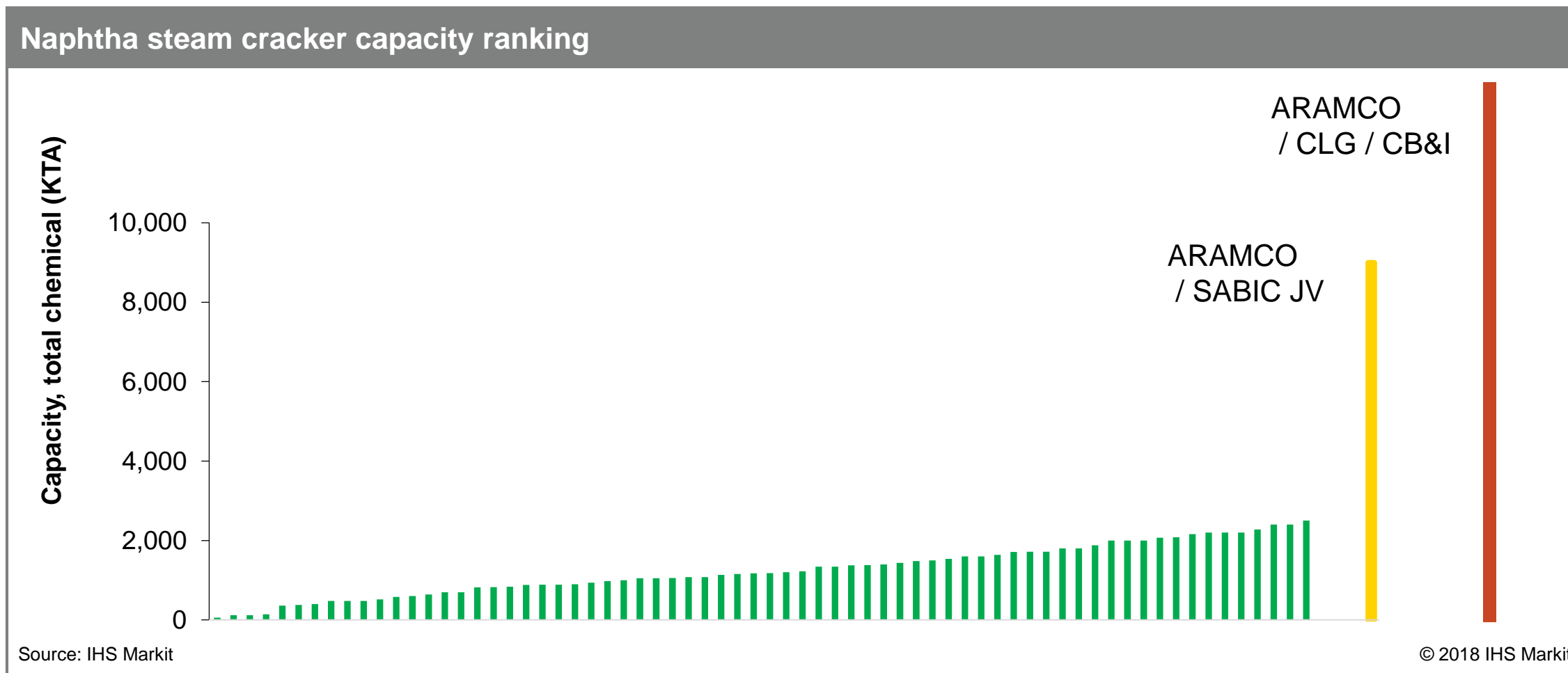
- ❖ Hengli's project aiming trial production at end of 2018
- ❖ Zhejiang project 1st phase is only a few months behind Hengli's



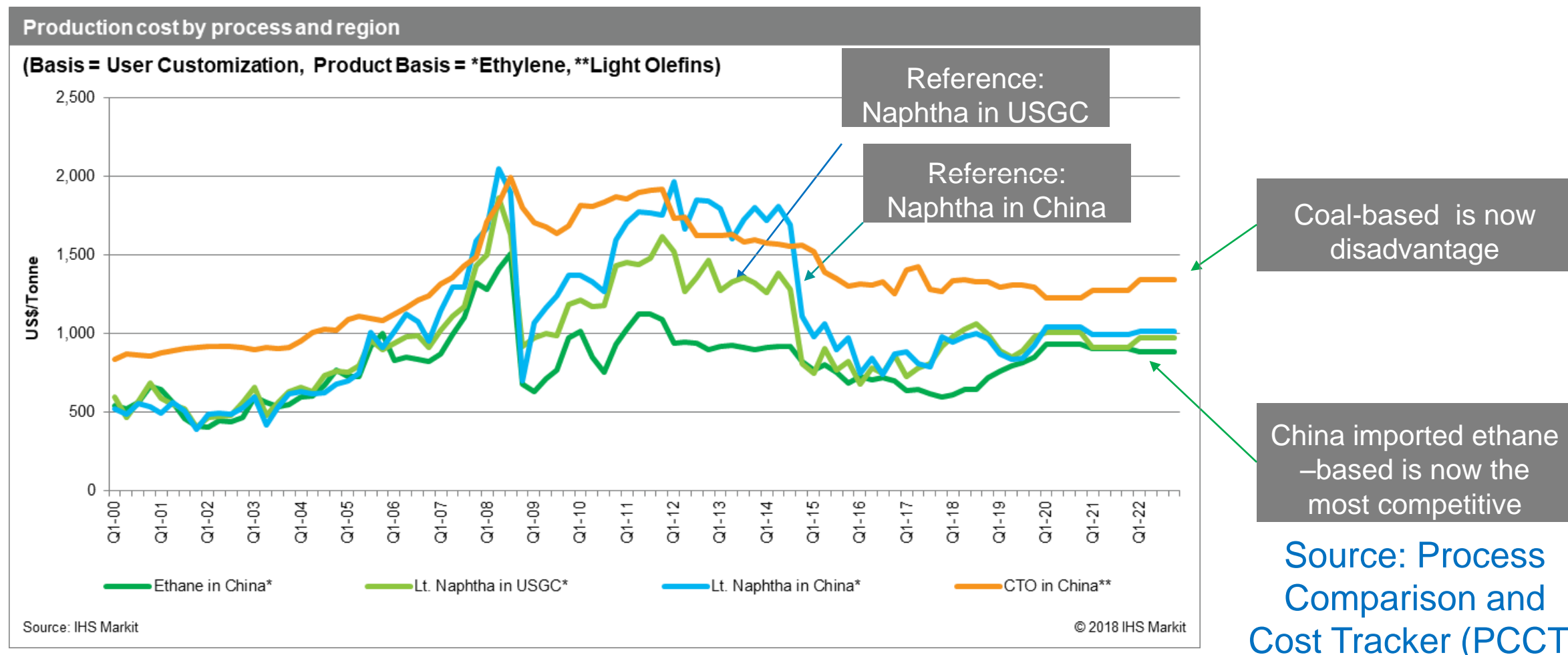
Saudi Aramco: To better monetize its oil assets to produce more chemicals which have higher value and growth than transportation fuels

Crude to “more” chemicals could be very significant industry “disruptor”

Global naphtha cracker chemical production capacity ranking



For example, you can see that imported ethane to China will change the competitive picture



Final Thoughts

- Chemical industry will likely carry strong profit momentum into the early 2020's.
- Strong demand and limited new supply are driving an extended upcycle to record length.
- Cautiousness is occurring for geo-political reasons
- Converting lowest cost molecules to high value products by leveraging technology developments – especially revolutionary ones
- Integrating physically, upstream and downstream
- Decreasing Capital Intensity: through scale, simplicity and location



AND...

Important sustainability issues focused on carbon, water and plastics remain top priorities for the industry.



Questions