



# Global Olefin Market Outlook

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# Agenda

Global Ethylene Outlook

Global Propylene Overview



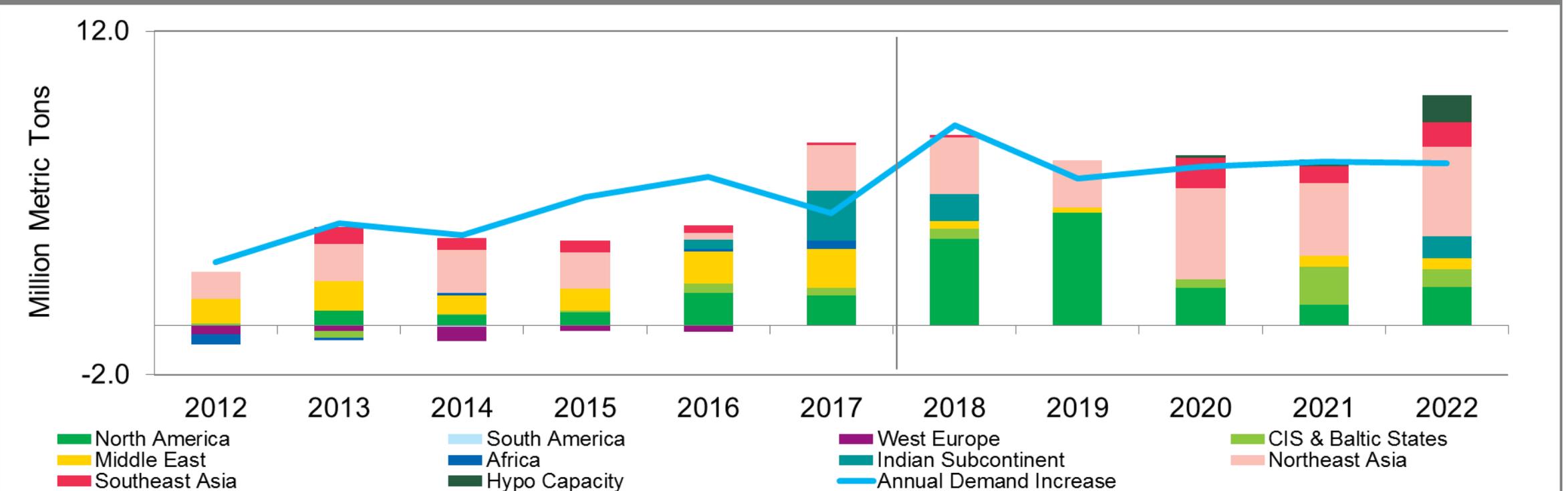
# Global Ethylene

**Braskem-Idesa Ethylene/PE Plant**  
Nanchital, Veracruz, Mexico  
Start-Up: June 2016



# Global ethylene: 2017-2022 both supply and demand are growing rapidly

Global Ethylene Capacity Additions V.S. Demand Growth

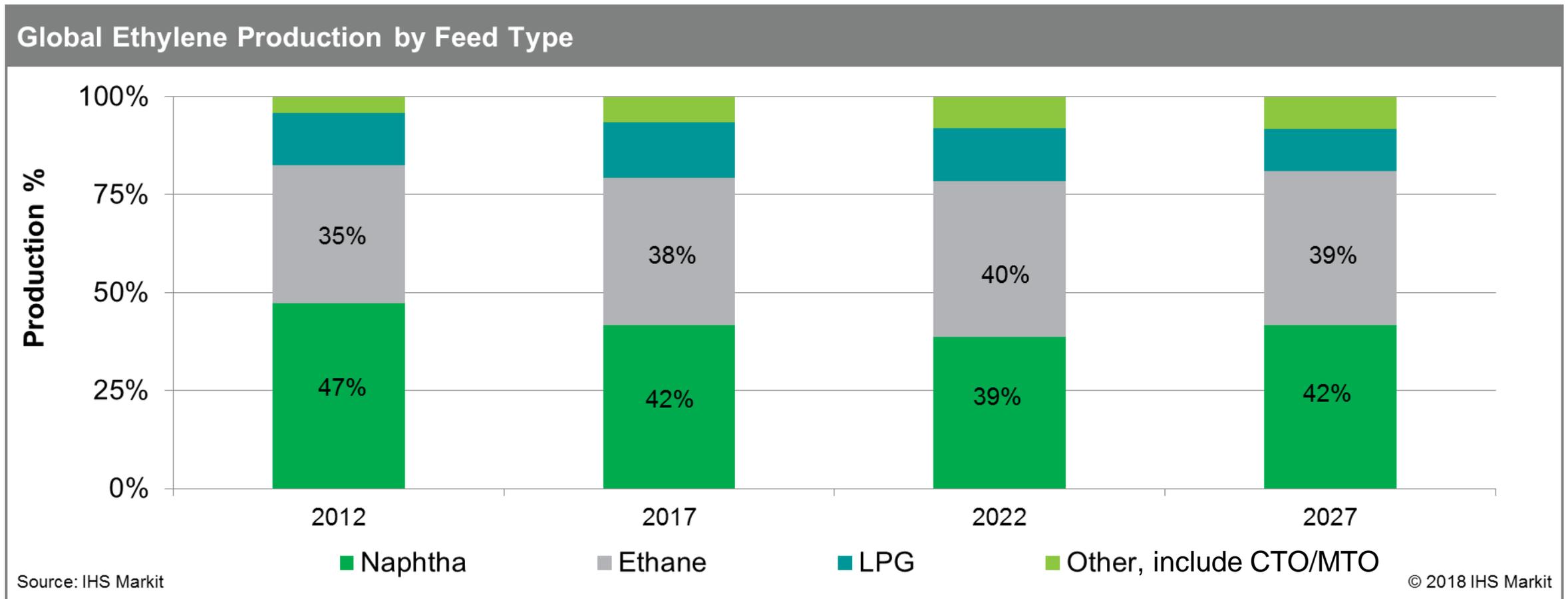


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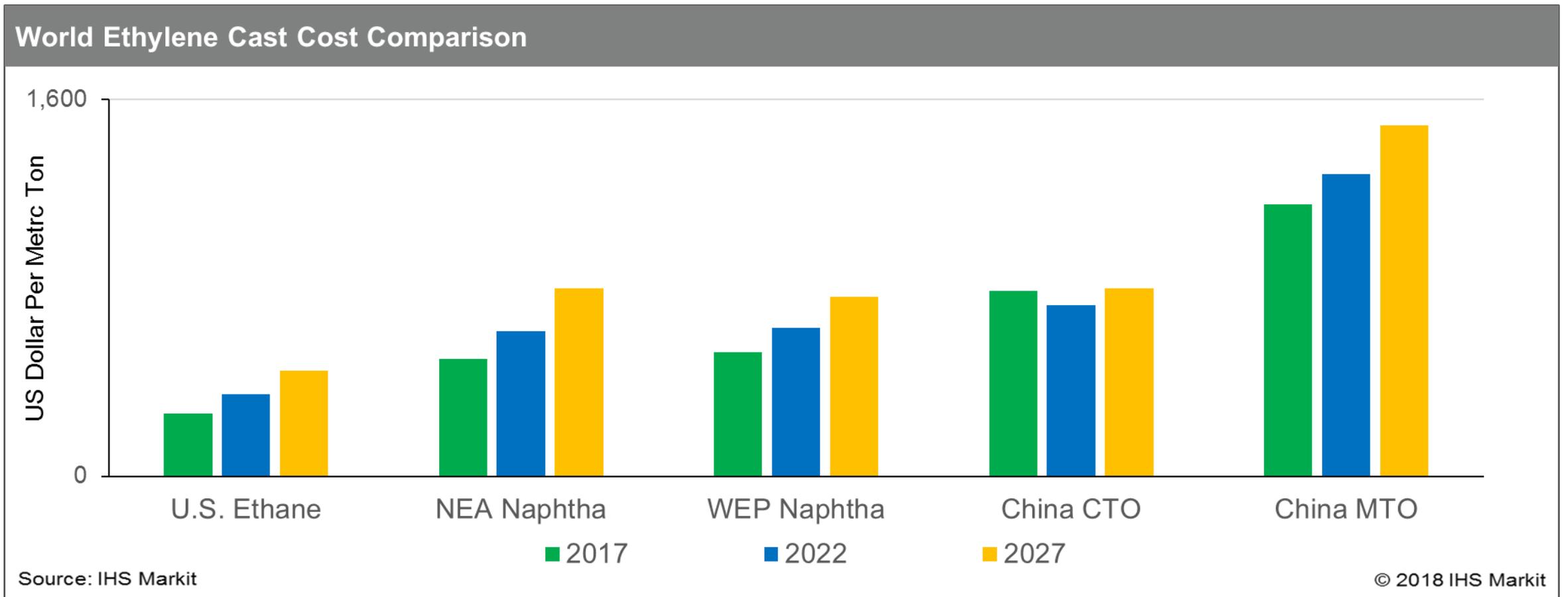


## World: ethylene feed type: a shift from Liquids – return to Naphtha





# Increased US ethane demand drives ethane price higher, reducing overall investment advantage



# North America ethylene capacity growth --- are there enough ethane?

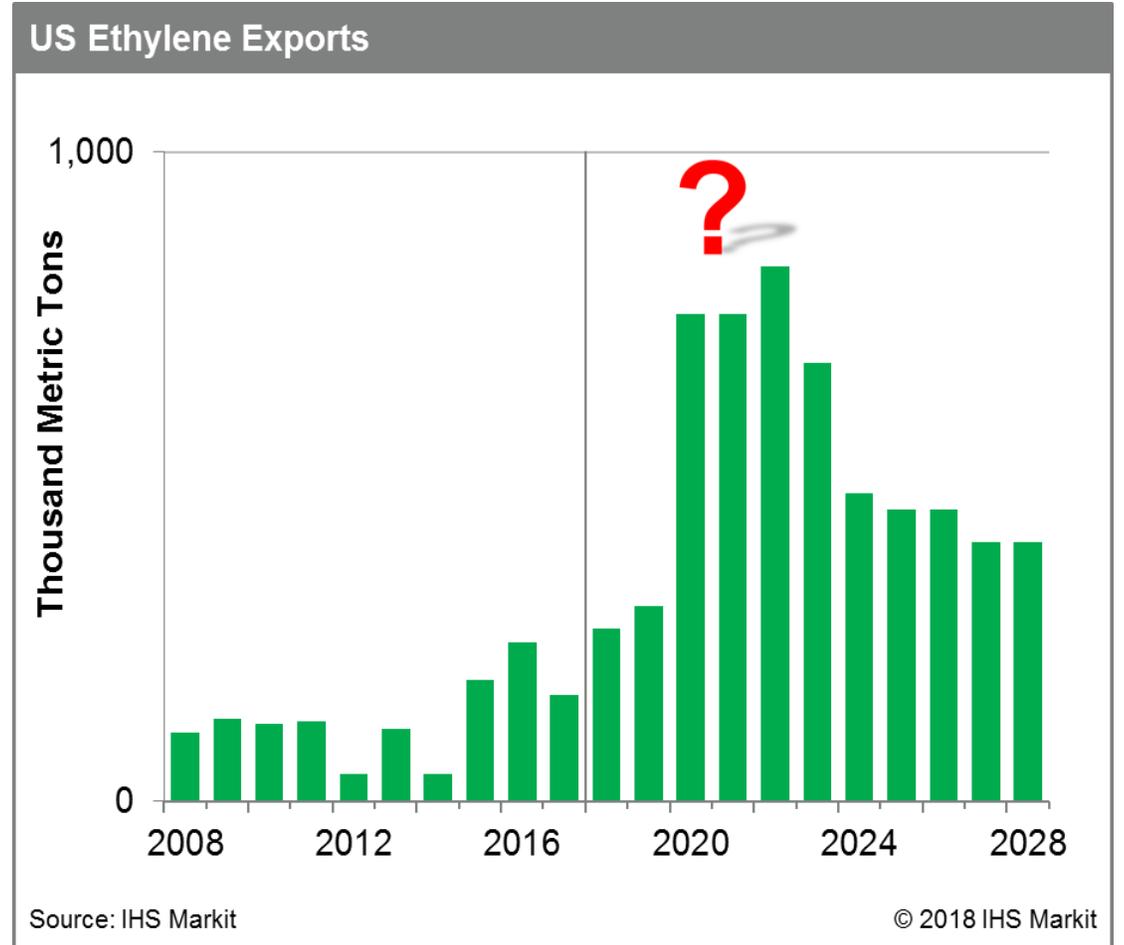
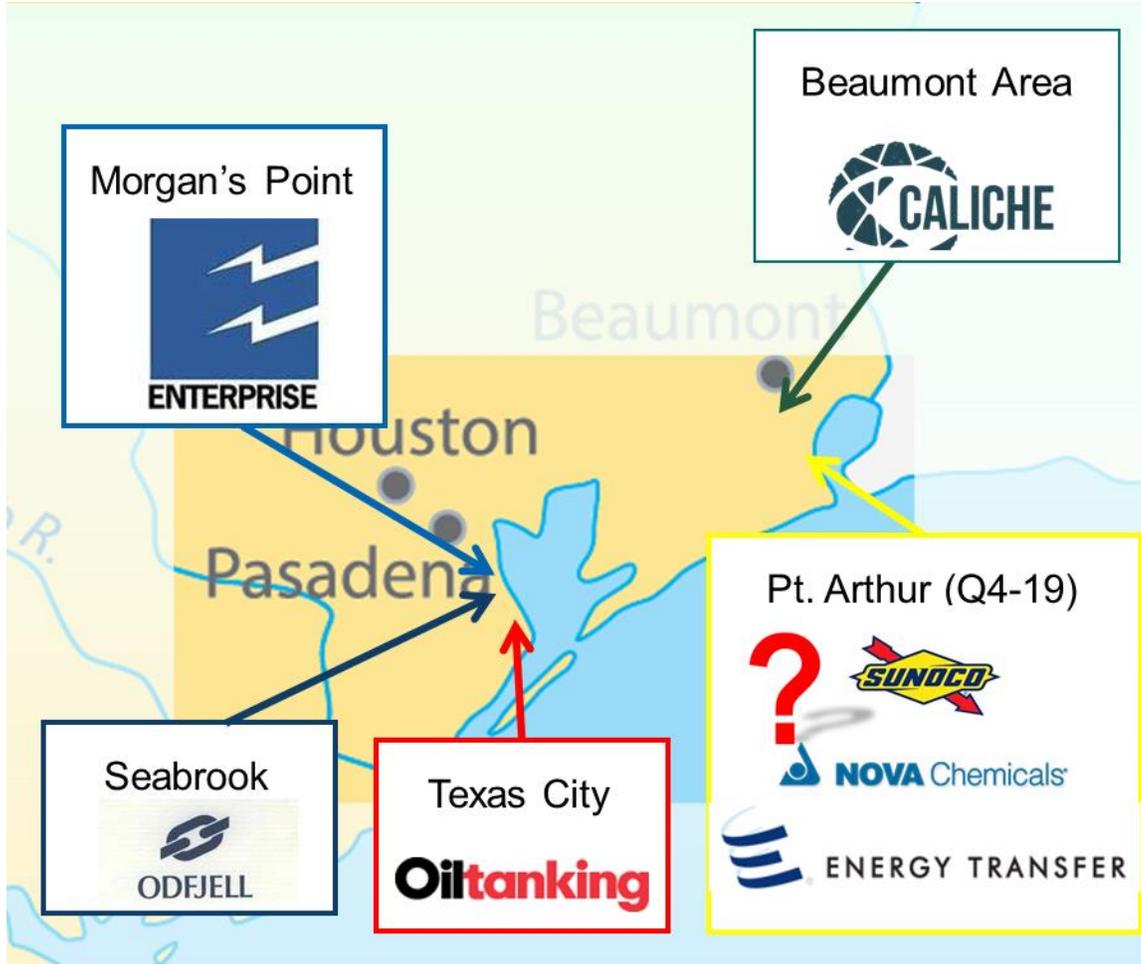


Starting	Company	Location	Capacity KTA
2016-17	5 projects	NAM	~4 million
Q2-18	ChevronPhillips	Cedar Bayou, TX	1,500
Q3-18	ExxonMobil	Baytown, TX	1,500
Q4-18	Indorama	Lake Charles, LA	420
Q1-19	Formosa	Point Comfort, TX	1,250
Q1-19	Shin-Etsu	Plaquemine, LA	500
Q1-19	Sasol	Lake Charles, LA	1,550
H1-19	LACC	Lake Charles, LA	1,000
H1-20	Total/Nova/Borealis	Port Arthur, TX	1,000
H2-21	Shell	Monaca, PA	1,500
2018-2022 Total Firmed Capacity			10,220
2021+ Planning Projects			14,700

2018-2030 Total ethane availability is for 20 - 22 million tons of ethylene

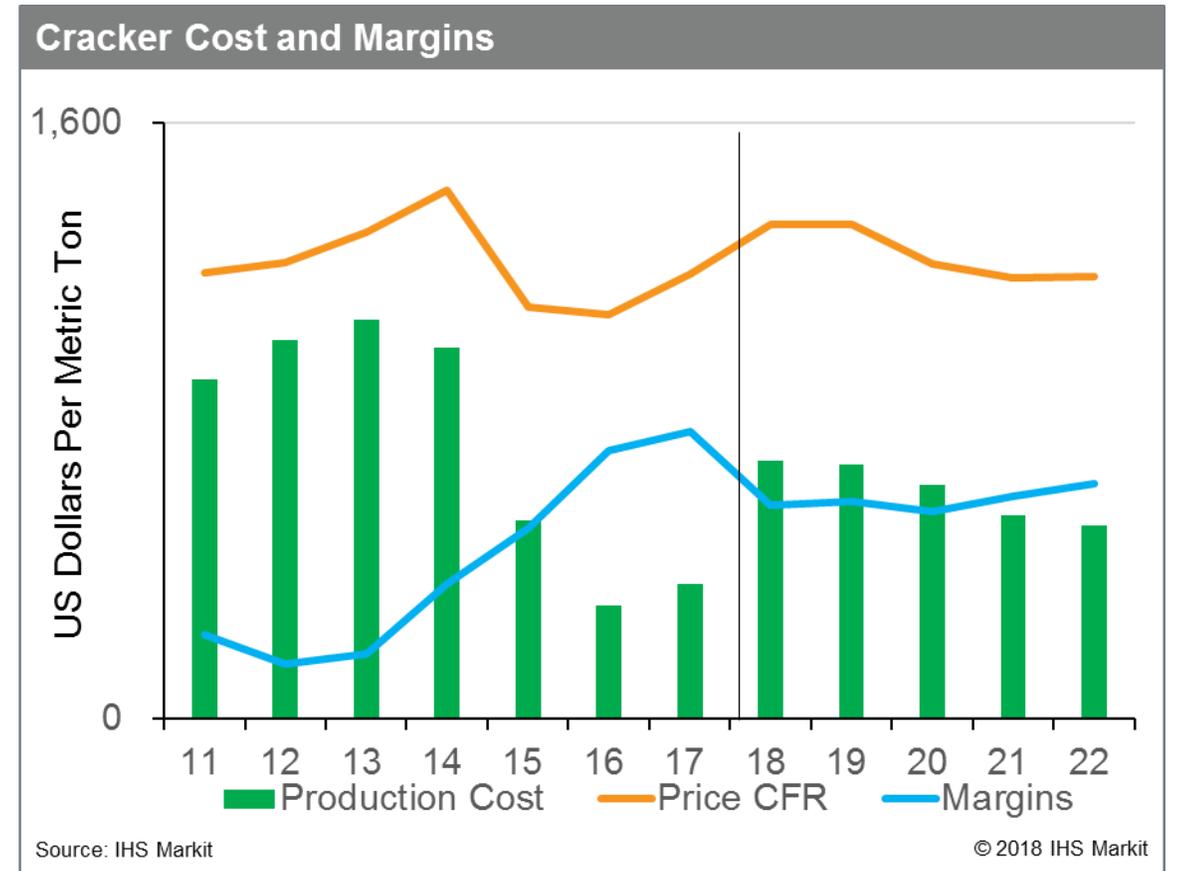
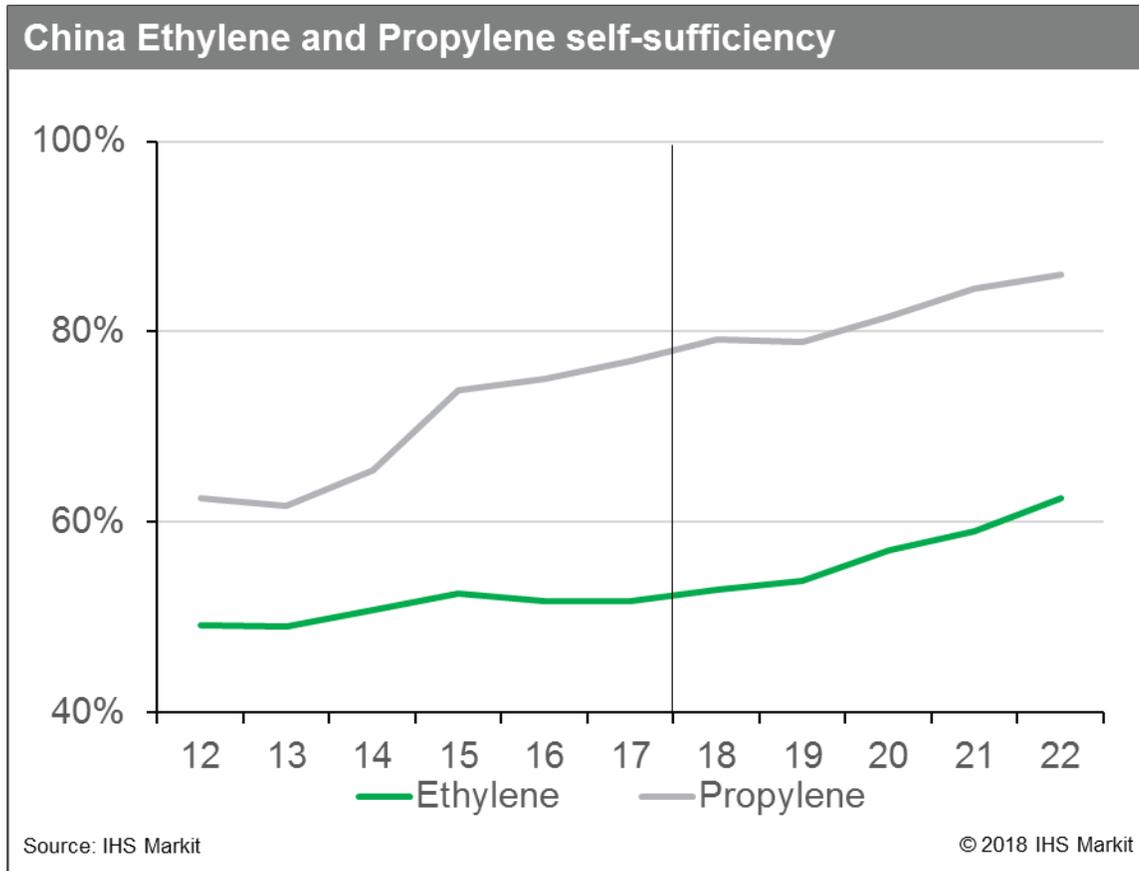


# New USGC ethylene logistics will add structural demand





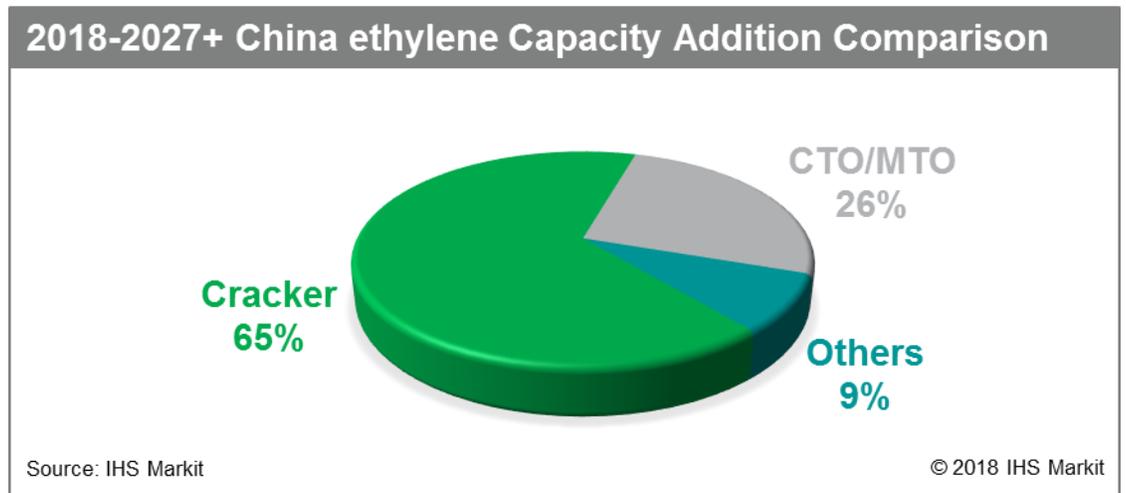
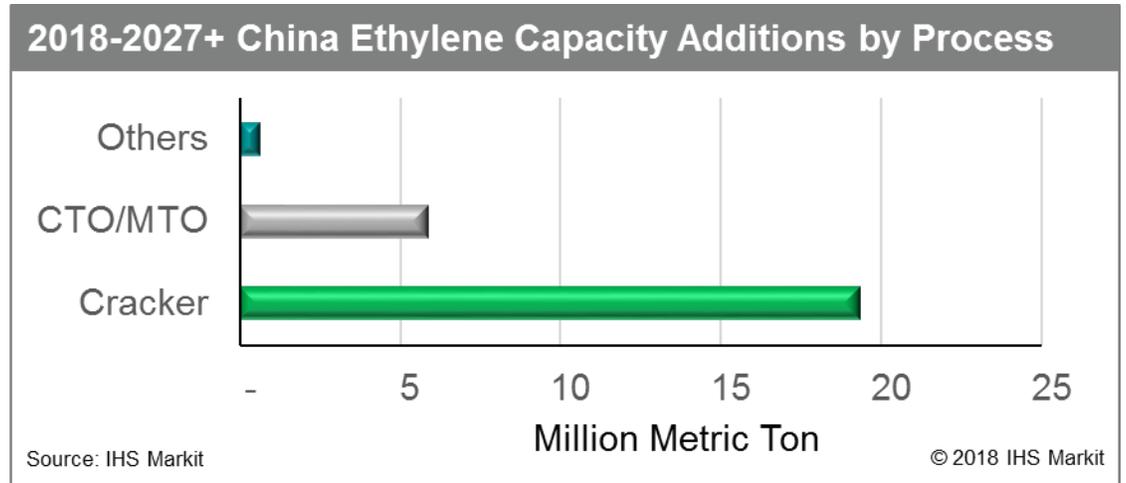
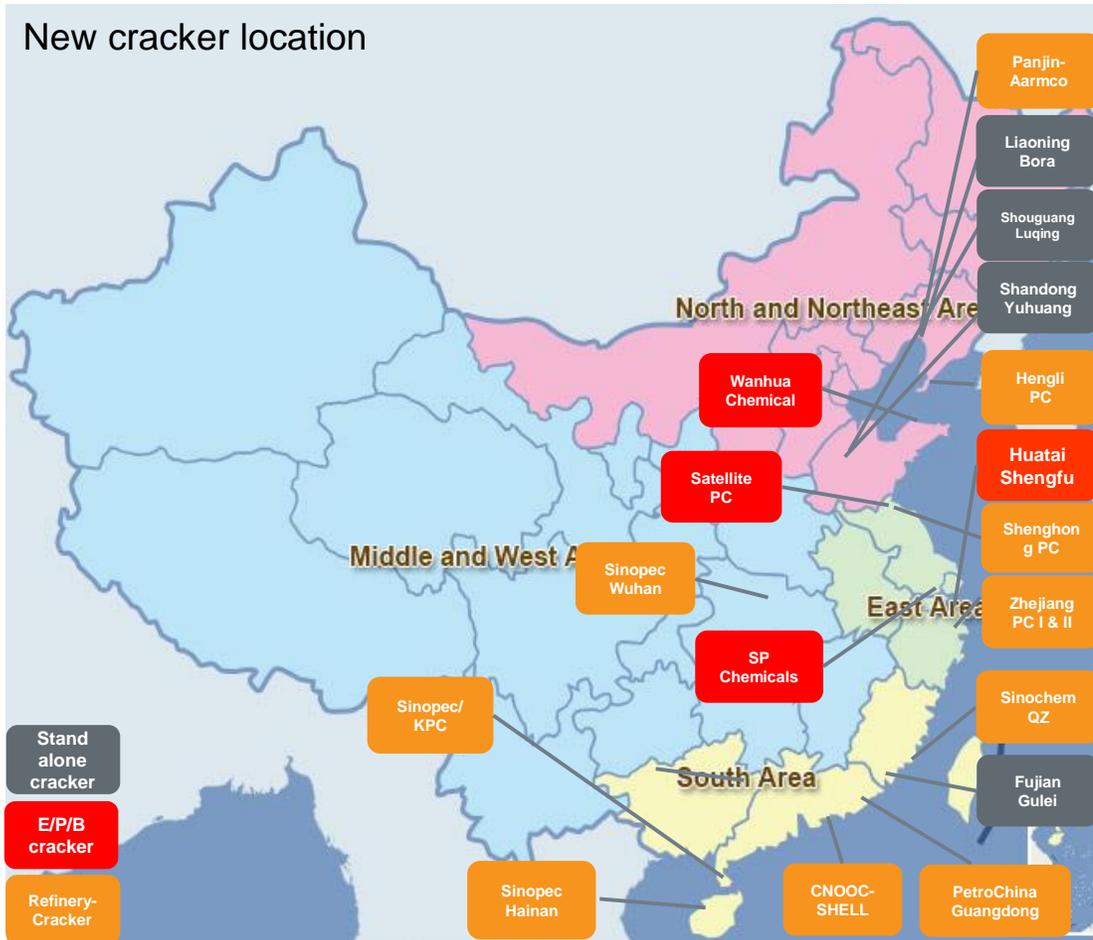
# China: low ethylene self-sufficiency with high cracker margins





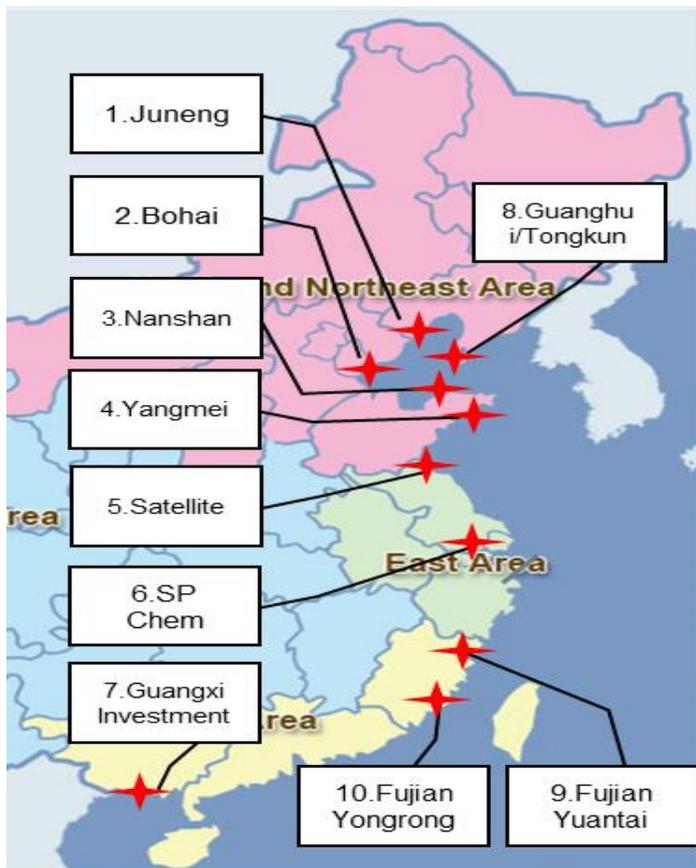
# Strong margins are driving more investment on crackers

2018-2027+, 19 mmt ethylene cracker and 6 mmt CTO/MTO ethylene are on the way





# Many ethane crackers with importing ethane are under planning



No.	Company	Ethylene/ KTA	Consume Ethane/KTA	Status
1	Juneng Heavy Industry	2,000	2,600	EIA
2	Bohai Chemical	1,000	1,300	FS
3	Nanshan Group	2,000	2,600	EIA
4	Yangmei Hengyuan	1,500	2,000	FS
5	Satellite PC	2,500	3,250	EIA
6	SP Chemicals	650	270	Constructing
7	Guangxi Invest./Huayi	1,000	1,300	FS
8	Guanghui/ Tongkun	2,000	2,600	FS
9	Fujian Yuantai	2,000	2,600	FS
10	Fujian Yongrong	1,500	1,950	FS
TOTAL		16,150	20,470	



# Ethane cracker in China could be competitive, but many risk factors

## Pro

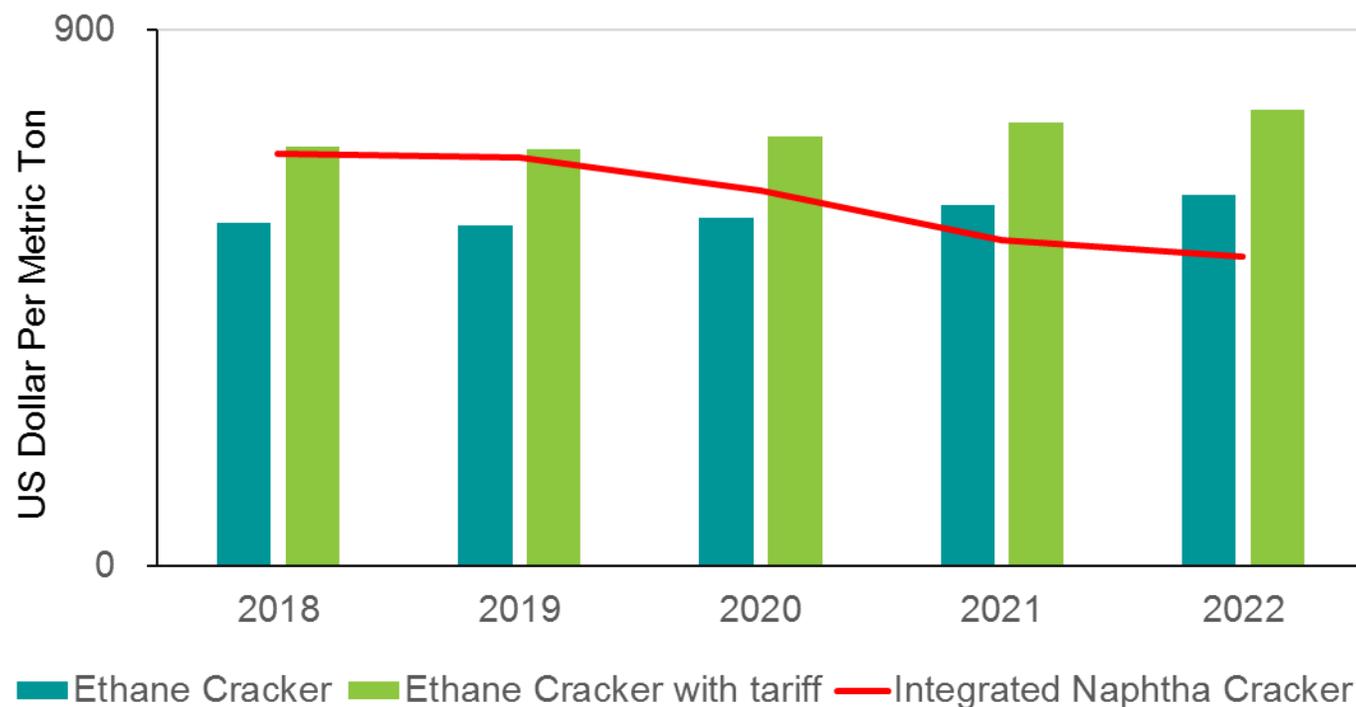
- ✓ Lower capital cost.
- ✓ Highly environmentally friendly.
- ✓ High ethylene yields.
- ✓ Strong ethylene margins.
- ✓ Mature process/technology.
- ✓ World largest scale.

## Con

- ✗ Highly rely on imports from US.
- ✗ Location limits in coastal area.
- ✗ Ethane prices will rise along with demand increase.
- ✗ Compete with Europe and India.
- ✗ Low crude oil prices and low cost on-purpose production competition.
- ✗ Infrastructure and logistics are key restrictions.

Export terminal, VLEC, Import terminal

China Ethane Cracker V.S. Naphtha Cracker

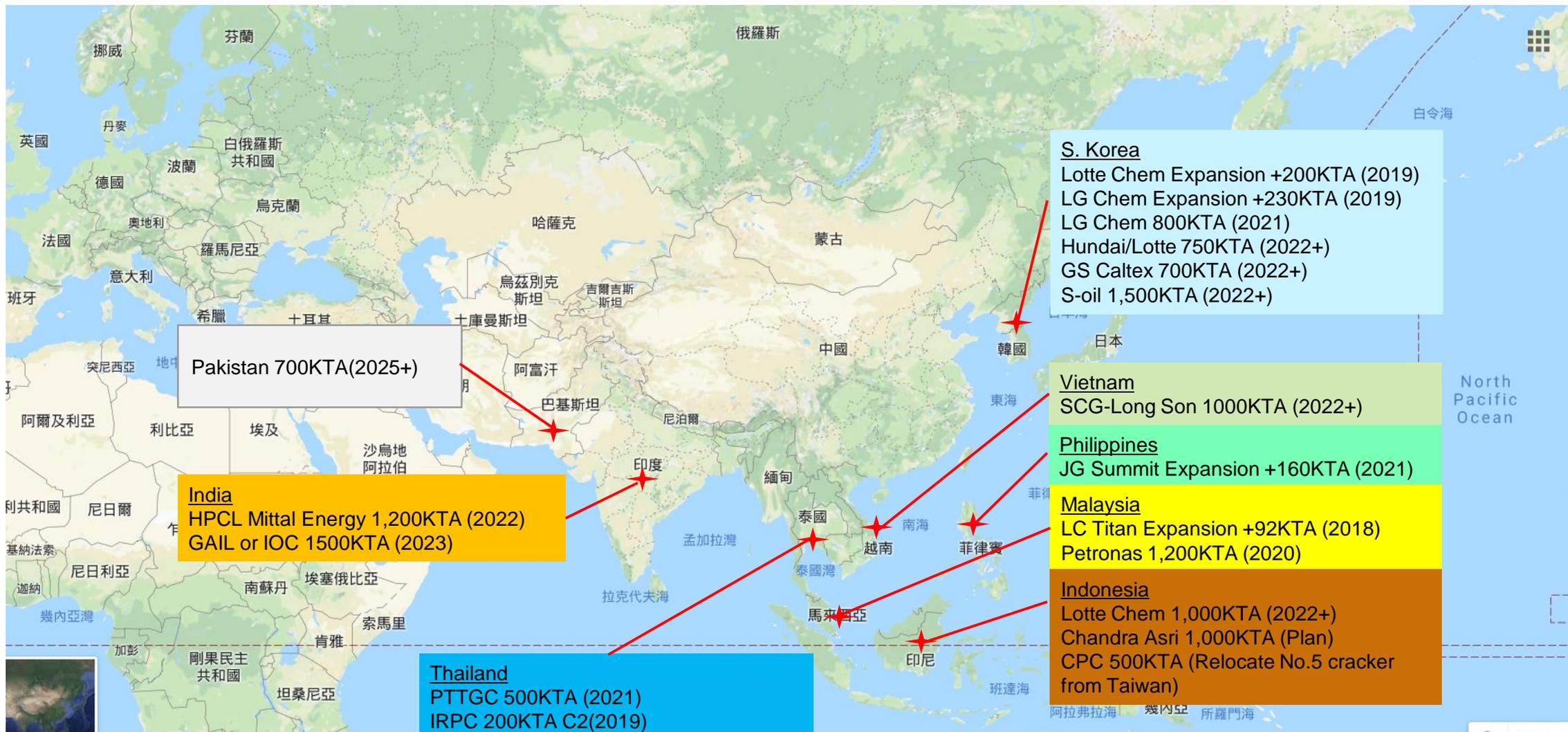


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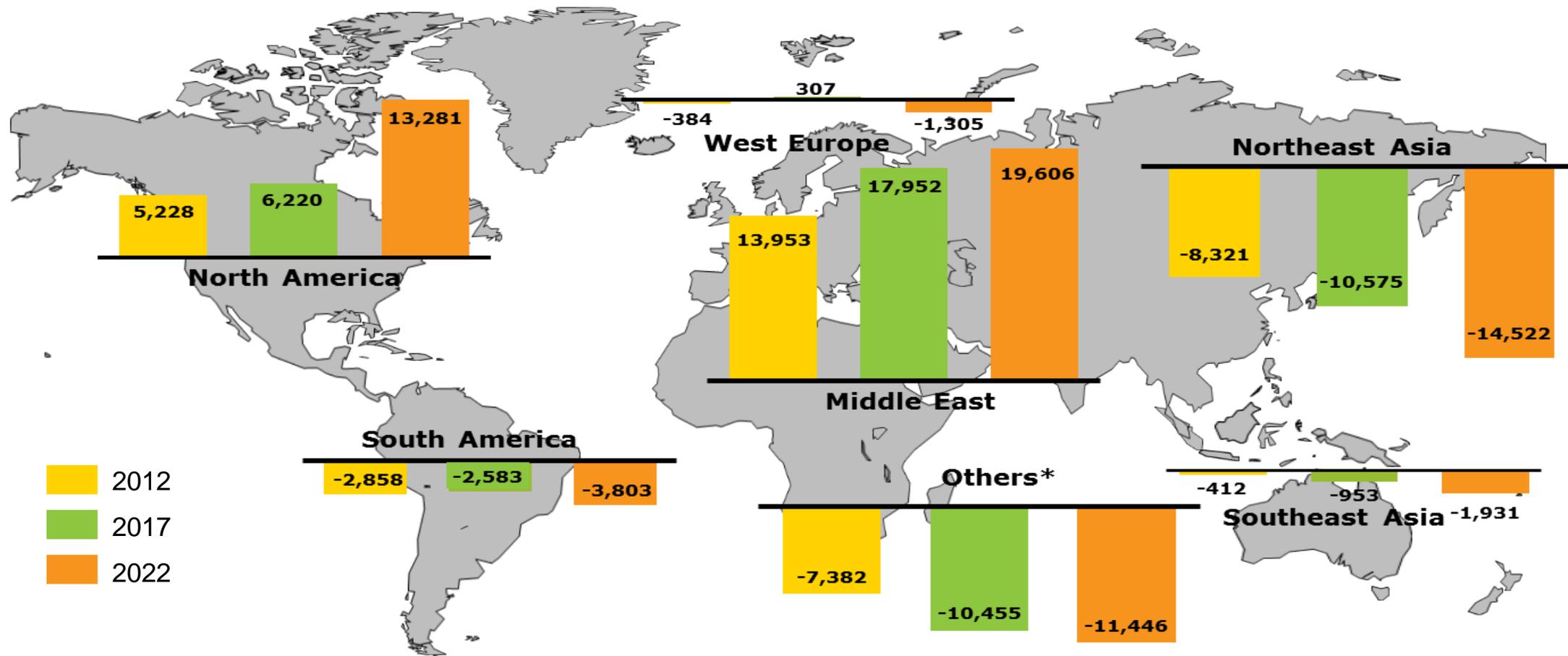


# Many new crackers in other Asia, with 13 mmt ethylene in 2018-2027





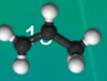
# Global ethylene net equivalent trade



\*Others: Africa, Indian Sub., CIS & Baltic, Central Europe

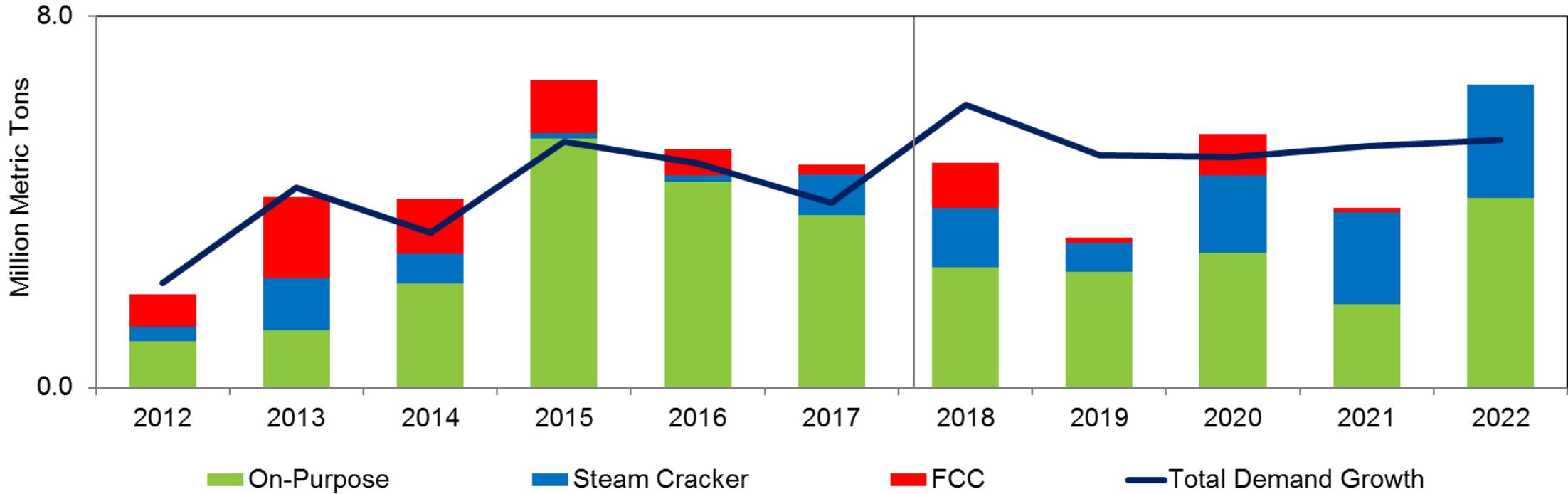
# Global Propylene





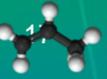
# Relatively long balance in global propylene market may tighten slightly

Global Propylene Capacity Additions V.S. Demand Growth

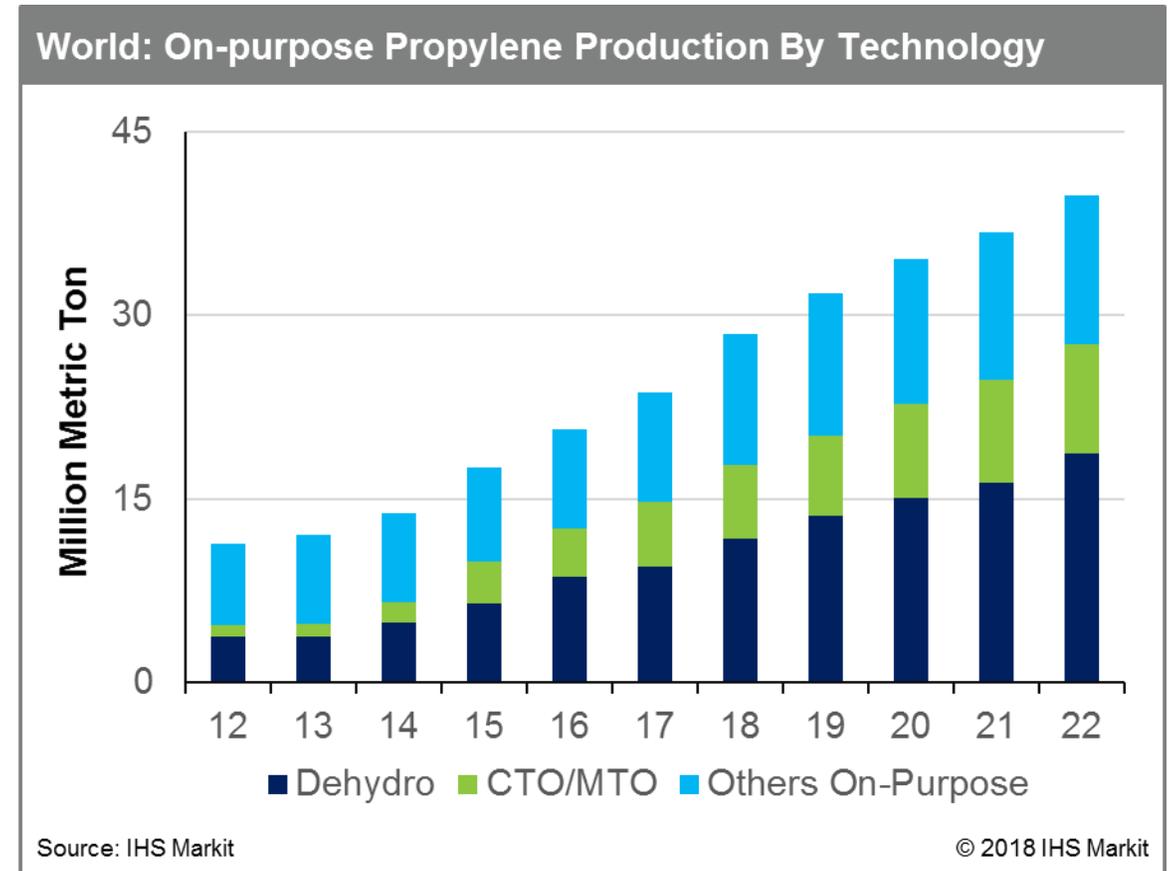
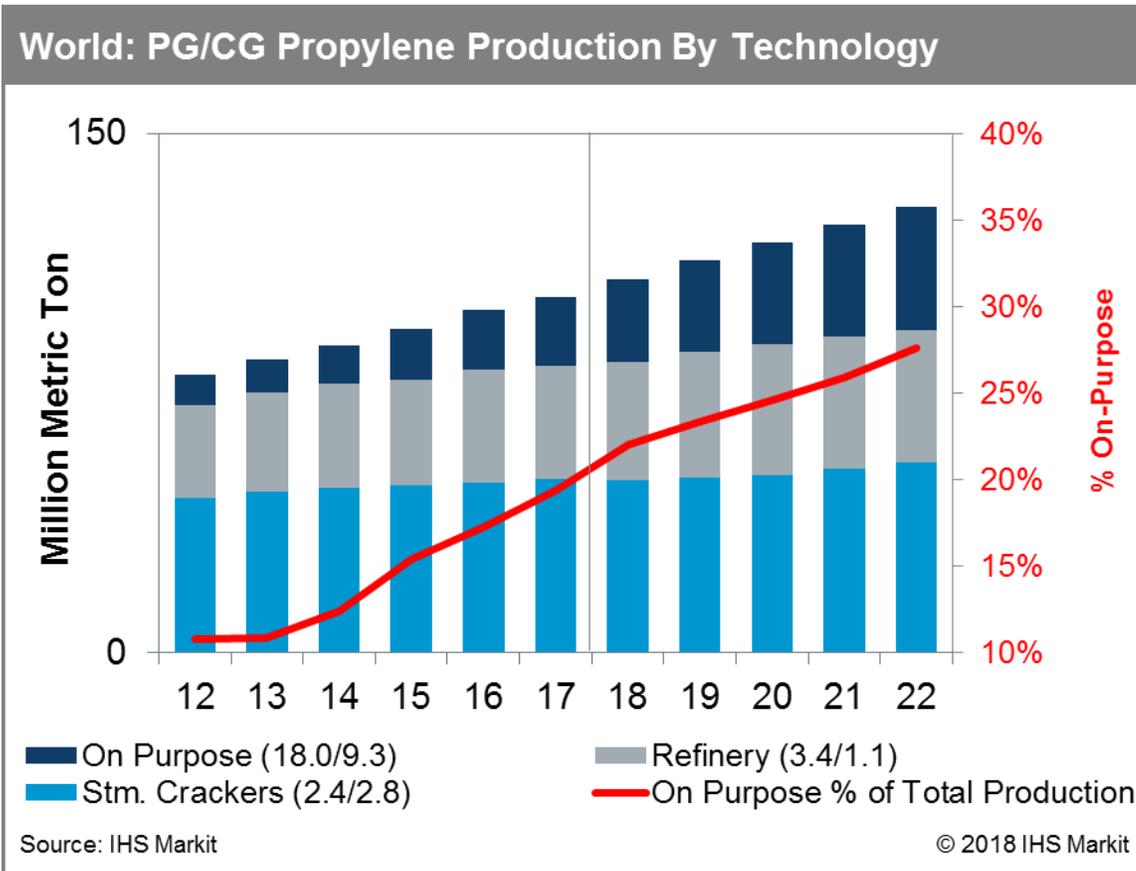


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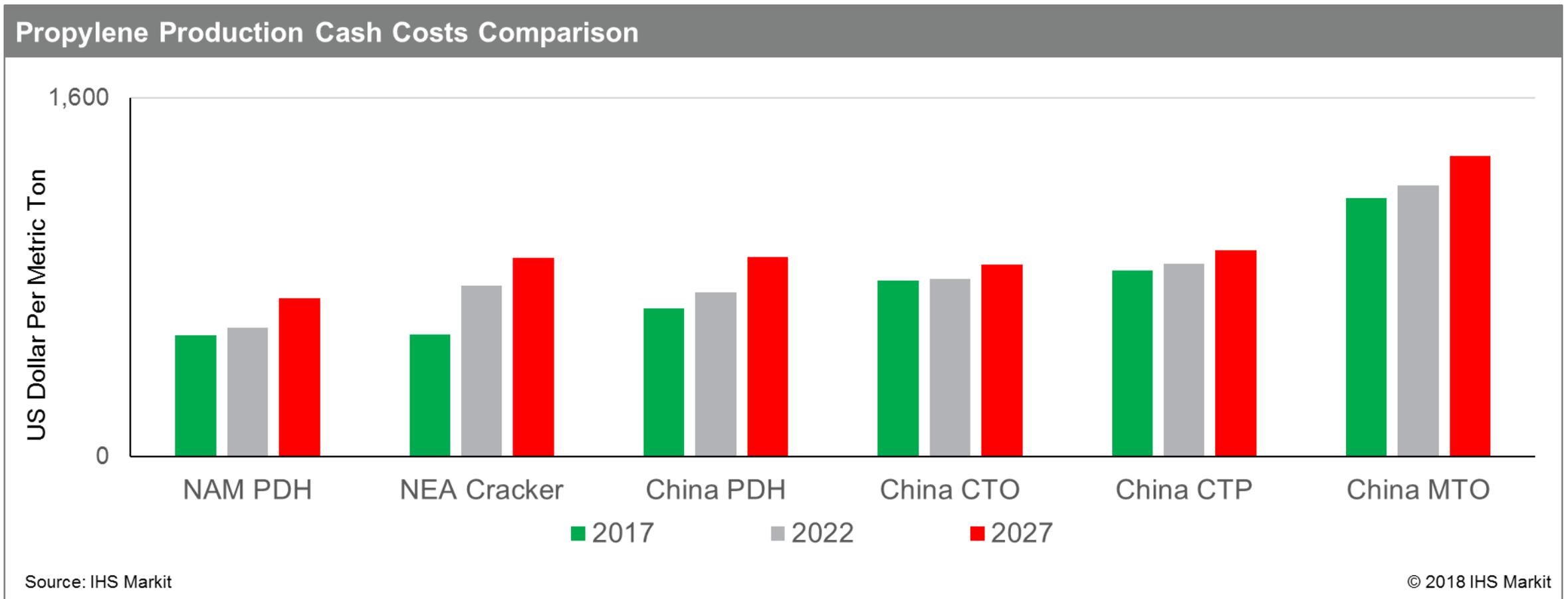


# On-purpose at critical mass; Ample propane drives PDH





# Propylene production cost comparison: PDH remain competitive



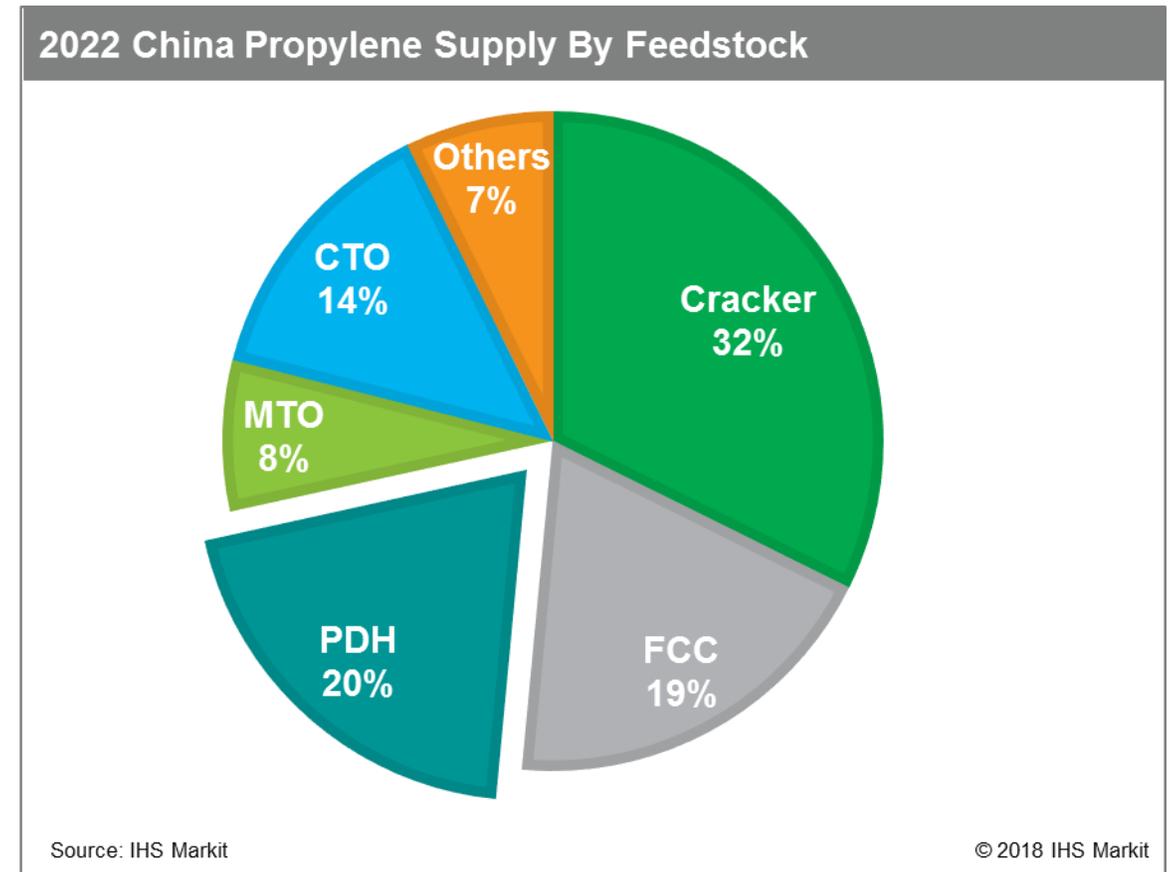
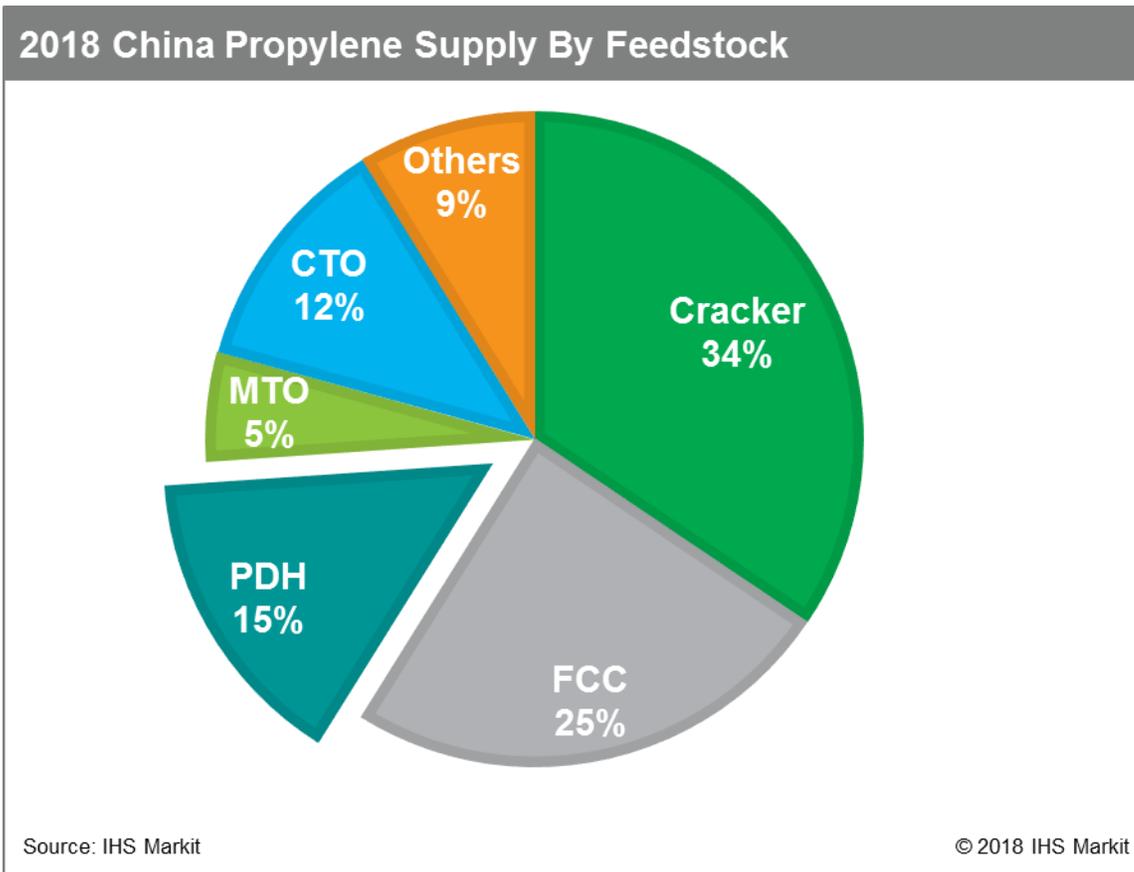
## More PDH are coming

No.	COMPANY	C3 Capacity (KTA)
12 projects In operation	2013-2017 8 PDH, 4 PDH/BDH	5,280
1	Fujian Meide PC I	660
2	Wantong PC	120
3	Zhejiang PC	600
4	Zhejiang Satellite PC II	450
5	Hengli PC	300
6	Dongguang Juzhengyuan	600
7	Ningbo Fuji II	660
8	Shaanxi Yanchang PC	100
	<b>Total constructing</b>	<b>3,490</b>
9	Zhejiang PC II	600
10	Yangzijiang Petchem	660
11	Satellite Lianyungang	750
12	Jinneng Qingdao	750
13	Haiding Pizhou	600
14	Oriental Energy Lianyungang	660
15	Henan Nanpu	200
16	Shandong Tianhong	450
17	Shandong Huifeng	250
	<b>Total planning</b>	<b>4,920</b>



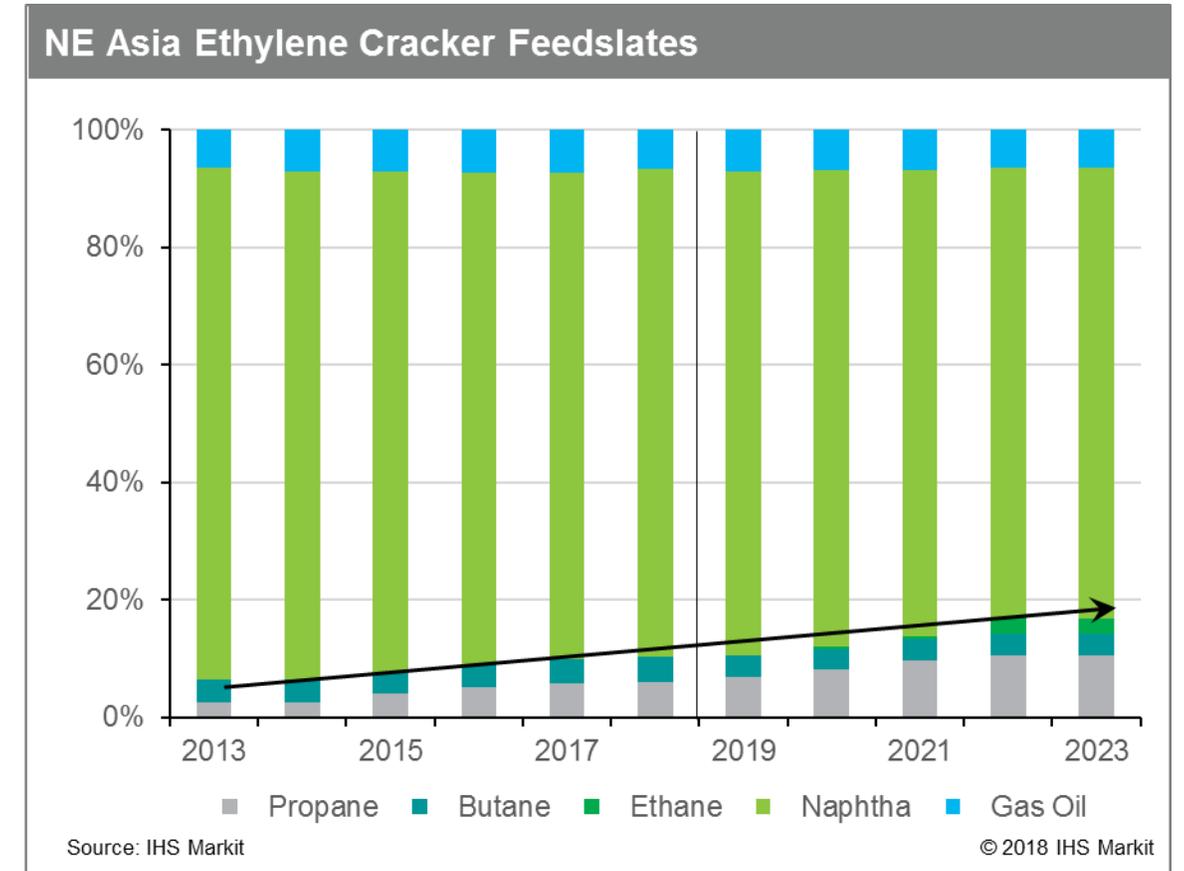
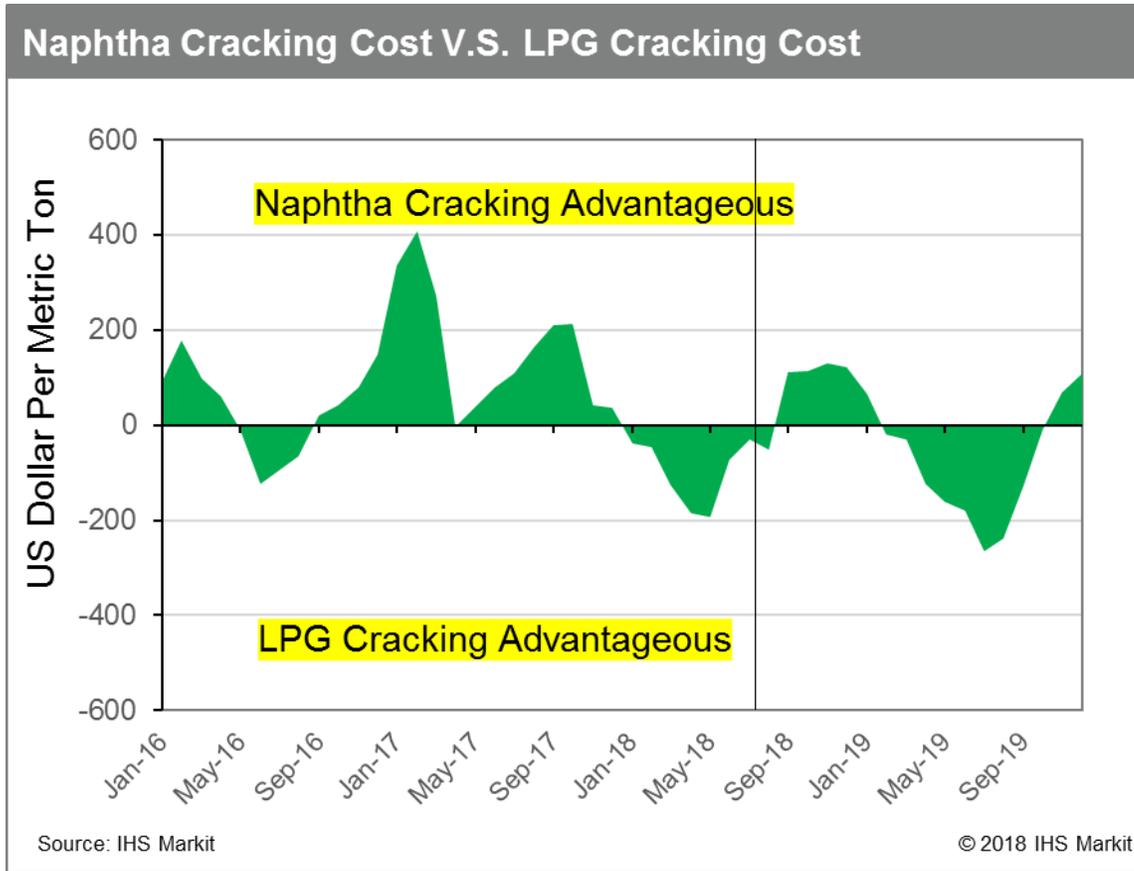


# China PDH propylene supply even growing faster than cracker

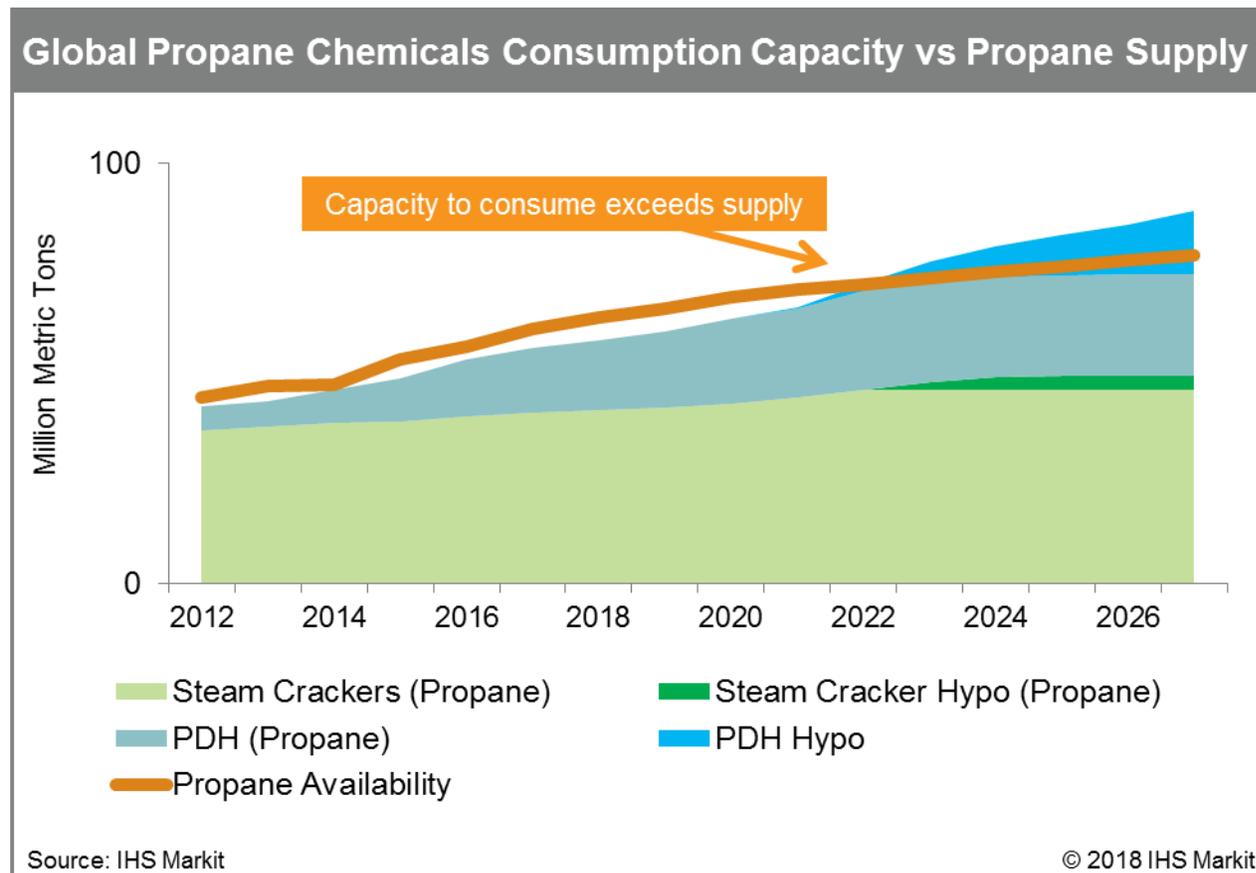
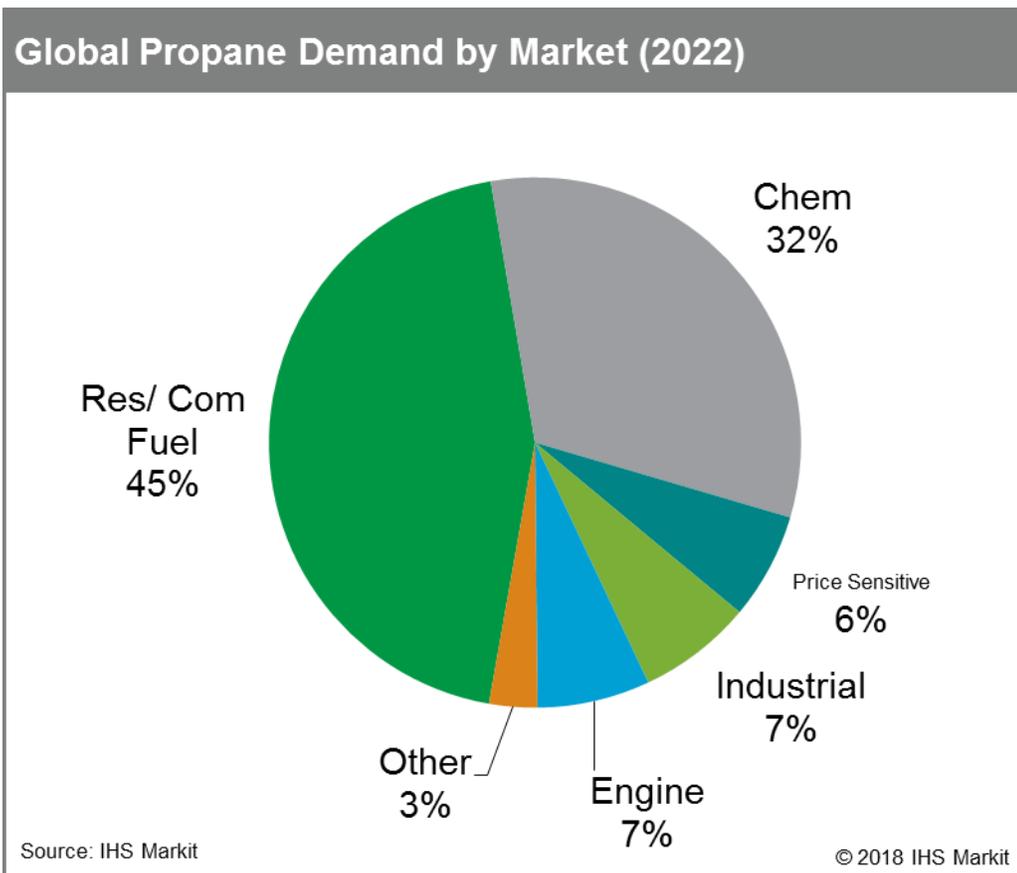




# Crackers in NE Asia are increasing propane use

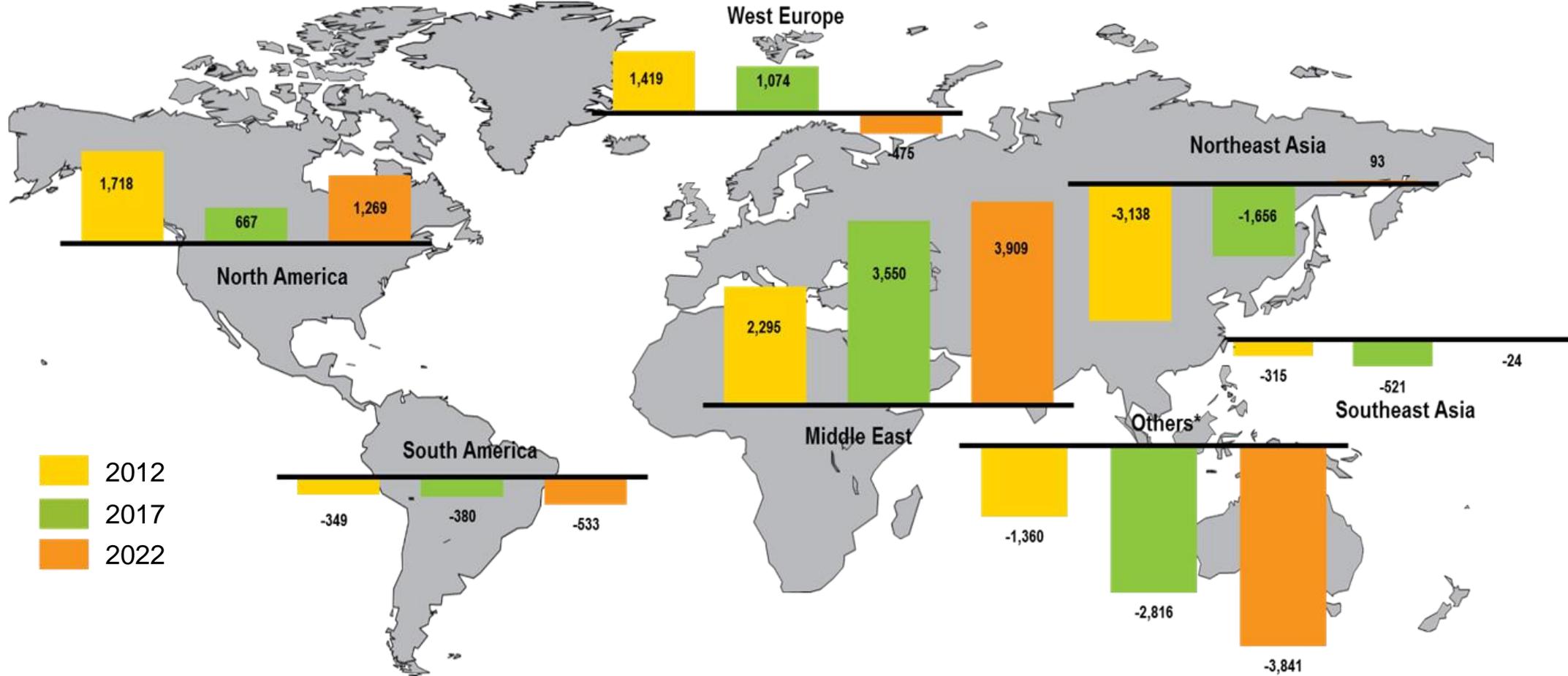


# Can propane supply meet chemical demand?



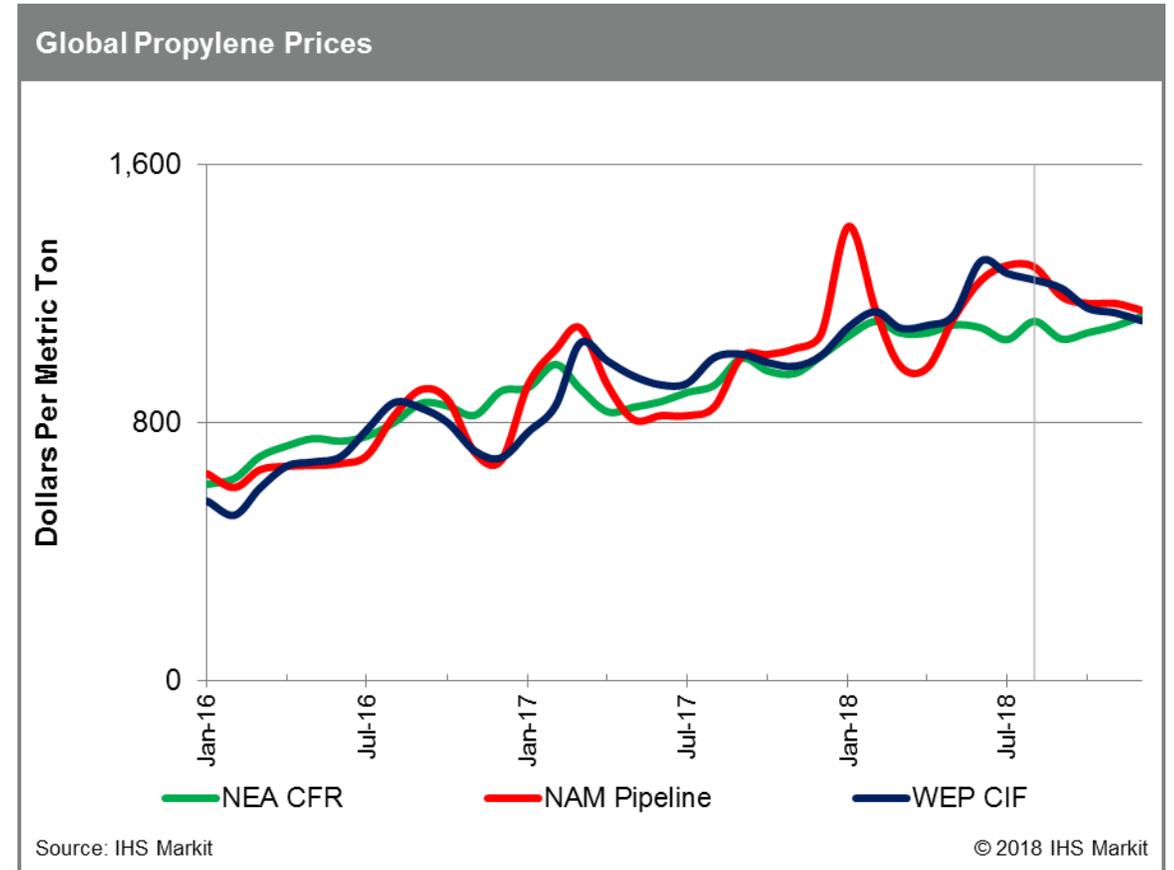
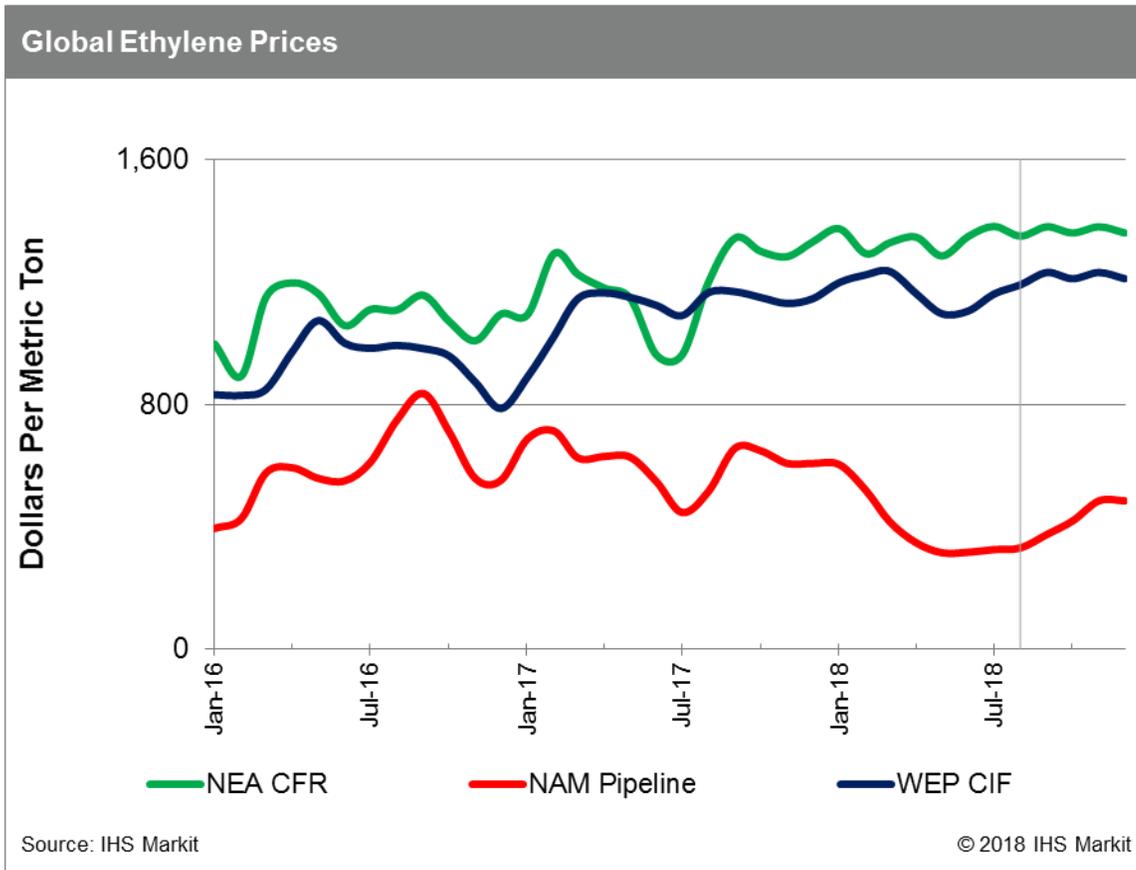


# Global propylene net equivalent trade

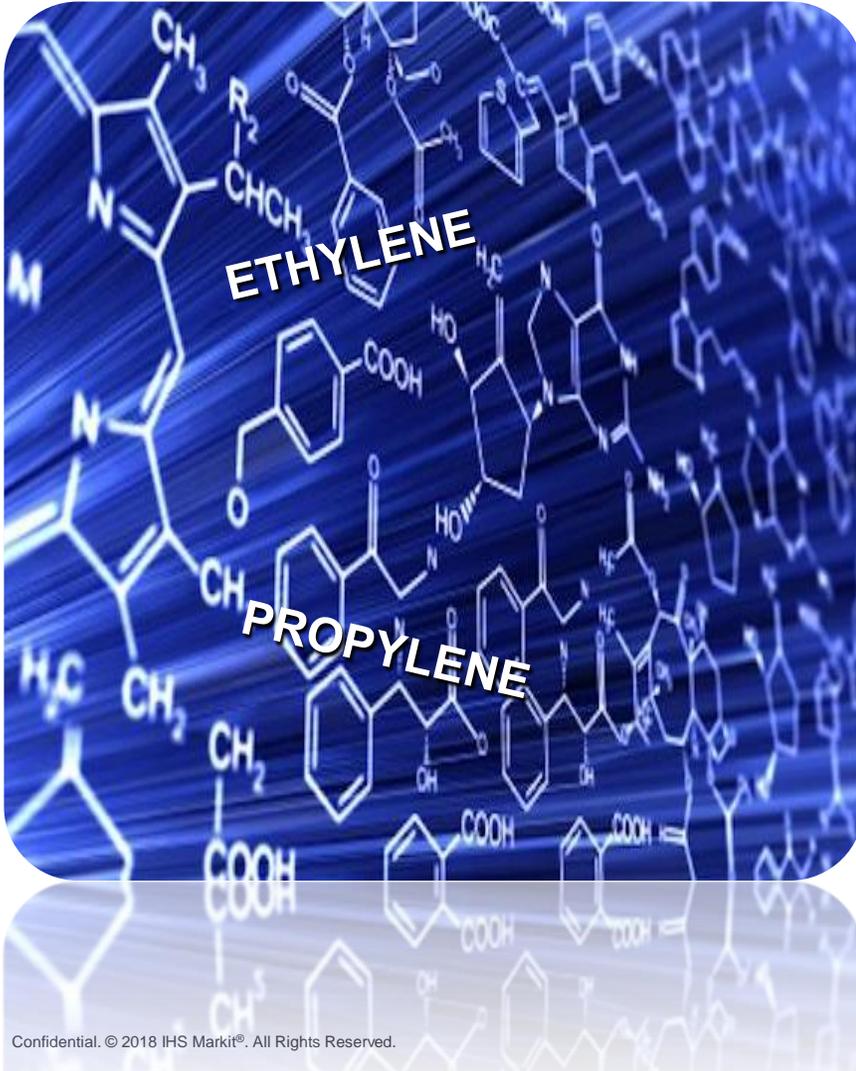


\*Others: Africa, Indian Sub., CIS & Baltic, Central Europe

# Global Olefin Price forecast



## Conclusion



- > Strong demand and margins drive more investments. Cracker and PDH lead capacity growth. Question is can ethane and propane supply meet strong chemical demand growth?
- > US is promoting ethylene monomer exports in addition to ethylene derivatives. However, the US-China tariff has put this business into high uncertainty.
- > China ethane cracker has many risk factors. Supply side is the key restraint though demand is there.
- > Strong investment in Asia olefin market will improve Asia sufficiency, but, China ethylene will remain short in the forecast period.
- > Long balance in propylene is easing down. But, aggressive PDH investment in China may weigh on global propylene market again.