

SECTOR IN-DEPTH

5 March 2020

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TABLE OF CONTENTS

Booming oil investment in petrochemicals will raise hazards for standalone producers	2
New technologies and increased integration between refinery and petrochemical assets will reduce costs in countries without access to low cost feedstocks	2
Increased size and greater upstream integration will increase margin volatility over time	2
Large international oil companies may seek to acquire independent petrochemical assets or companies with access to low cost feedstocks	3
Appendix: Capacity additions for integrated refinery and petrochemical projects	4
Moody's related publications	6

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Chemicals - Cross Region

Oil industry investment in petrochemicals poses risk for independent producers

- » **We expect that large oil companies will accelerate investment in new petrochemicals capacity over the next decade, increasing business and event risk for rated petrochemical companies.** Major oil companies are accelerating their investment in petrochemical capacity. Over the next decade, investments by major multinational oil producers will substantially outpace investments by independent petrochemical companies such as [LyondellBasell](#) (Baa1 stable), [Dow Chemical](#) (Baa2 stable), [Westlake Chemical](#) (Baa2 stable), [Ineos](#) (Ba2 stable) and [Trinseo](#) (Ba3 stable) in building new capacity.
- » **Major oil companies are investing in large integrated refinery and petrochemical complexes to lower the cost of producing petrochemicals in countries without access to low cost feedstocks. Many of these facilities will utilize new technologies to lower costs and convert a much larger share of the refinery output into petrochemicals.** New catalysts and processes are available that can convert a much larger share of a refinery's output into petrochemicals or petrochemical feedstocks. Given the size of these new facilities, we expect that independent petrochemical producers (LyondellBasell, Dow, Westlake, Ineos and Trinseo, among others, will experience lower and more volatile margins over time. Over the next decade, Independent petrochemical companies will lose market share, and may even have to shutter smaller facilities that lack access to low-cost feedstocks.
- » **Greater integration between refinery and downstream petrochemical production will lead to higher operating rates over the cycle, heightening price and margin volatility over time.** Oil companies are expected to focus on the profitability of their integrated assets, rather than solely petrochemical profits. While the integrated oil companies can tolerate relatively low petrochemical margins, independent petrochemical producers cannot do so as easily.
- » **Large international oil companies may seek to acquire independent petrochemical assets or companies with access to low cost feedstocks, leading to positive event risk for some companies. This is ironic, given that most of the rated petrochemical companies were formed from assets previously divested by large oil companies.** Oil companies like BP and Shell divested a large portion of their petrochemical assets in the mid-1980's through the early 2000's. While these same companies are unlikely to purchase independent petrochemical companies other international oil companies without access to low cost feedstock would likely be interested in these assets.

Booming oil investment in petrochemicals will raise hazards for standalone producers

As gasoline demand approaches a peak, we expect that major oil companies investment in petrochemicals capacity will accelerate over the next decade, increasing business and event risk within the chemicals sector. These major oil companies are accelerating their investment in petrochemical capacity through 2026 as shown in the Appendix. Over the next decade, major multinational oil producers will substantially outpace spending by independent petrochemical companies such as [LyondellBasell](#) (Baa1 stable), [Dow Chemical](#) (Baa2 stable), [Westlake Chemical](#) (Baa2 stable), [Ineos](#) (Ba2 stable) and [Trinseo](#) (Ba3 stable).

The International Energy Agency (IEA) and the oil industry both forecast that global demand for gasoline will peak during 2030-40. Over the next decade, an increase in electric vehicles and a number of social trends will slow growth in fuel demand. This change is causing major oil companies to [shift their investment strategies today](#). While gasoline demand is expected to decline over the next decade, petrochemical and plastics demand will continue to grow. This will force integrated oil companies and refiners to redirect a greater proportion of their light refinery streams from gasoline into petrochemicals.

This increase in investment by oil companies will overwhelm planned investments by independent petrochemical companies over the next decade. For example, Saudi Aramco's CEO Amin H. Nasser in 2019 pledged to invest \$100 billion in petrochemical assets over the next decade. Aramco has already announced several large projects and six joint ventures. The projects listed in the Appendix indicate an investment of over \$300 billion in the next seven years.

New technologies and increased integration between refinery and petrochemical assets will reduce costs in countries without access to low cost feedstocks

As shown in the Appendix, these new complexes are focusing on the integration between refinery and downstream petrochemical production. Greater integration will lead to higher operating rates over the cycle, as well as more price and margin volatility over time as oil companies focus on the profitability of their integrated assets rather than petrochemical profits. In addition, new technologies including direct crude cracking will substantially increase the quantity of petrochemicals and petrochemical feedstocks that are produced by these refineries and lower the cost of the petrochemicals produced. This will disadvantage independent petrochemical producers in regions without access to low-cost feedstocks (natural gas and natural gas liquids including ethane, propane and butane) such as Asia, Europe and South America.

Cost efficiencies due to new catalysts and processes, along with greater output due to the integration will pressure downstream petrochemical margins over more of the cycle, and independent producers without access to low-cost feedstocks will be challenged from lower returns on investment over the cycle. Independent petrochemical producers like LyondellBasell, Dow, and Ineos currently have the largest ethylene crackers in Europe, but they will face increasing margin pressure from lower cost imports from other regions over time. These imports will come from low cost petrochemical capacity in the Middle East and North America, as well as integrated refinery and petrochemical facilities in Asia. Hence, it will be very difficult for these independent petrochemical producers in Europe to justify any large investments that don't have a material impact on their cost position going forward.

Increased size and greater upstream integration will increase margin volatility over time

Most of the oil industry's petrochemical projects plan downstream facilities that are far larger than today's independent petrochemical facilities. Saudi Aramco's project in Yanbu, Saudi Arabia, would add an ethylene capacity of 3.0 million tonnes of annual capacity—more than twice the size of most world-scale ethylene crackers today, at about 1.0 million-1.5 million tonnes. And three projects in China would add almost 12.0 million tonnes of annual capacity, virtually eliminating China's need for para-xylene imports. Most world-scale para-xylene facilities today have annual capacities of less than 1.0 million tonnes. Three of the new facilities in China will use new catalyst technology from [Honeywell International's](#) (A2 stable) UOP subsidiary.

These new facilities are also increasing the proportion of petrochemicals produced from a barrel of crude, to cut overall costs for the combined facilities and reduce the quantity of low value refinery products produced, like asphalt, coke and residual fuel oil. As the petrochemical operations take a larger share of the refinery's output, it will be more important for them to remain on-stream so as not to impair the ability of the refinery to operate at capacity. Hence, these facilities will have less incentive to slow down production

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when petrochemical margins are low, as it would negatively impact the profitability of the refinery. Oil companies will focus on the profitability of the integrated site, rather than on petrochemical profits. These large integrated oil companies can also tolerate lower petrochemical margins in the trough of the cycle, the independent petrochemical producers cannot do so as easily. This will create greater margin volatility for independent producers over time.

Large international oil companies may seek to acquire independent petrochemical assets or companies with access to low cost feedstocks

Independent petrochemical companies with access to low cost feedstocks could experience positive event risk over the longer term. International oil companies that lack access to advantaged feedstocks, and that seek a global position in petrochemicals, would find US petrochemical assets with advantaged feedstocks as attractive targets. This would also be true for other petrochemical assets elsewhere around the globe with advantaged feedstocks (e.g., Dow's facility in Argentina, ethylene crackers in Western Canada, etc.). But we do not expect any transactions for until later this decade, until these oil companies have completed their initial projects and have demonstrated good profitability in this downstream industry.

This new petrochemical strategy represents an ironic about-face for some oil majors: except for Dow Chemical and [BASF](#) (A2 stable), most of the rated independent petrochemical companies today were formed from assets that the oil companies divested during the 1980s-early 2000s because of their lower returns on capital. LyondellBasell formed out of assets sold by Arco (now part of BP) and [Royal Dutch Shell](#) (Aa2 stable); Westlake initially acquired assets from Citi Services (Citgo, subsequently Petroleos de Venezuela, S.A.); and Ineos formed from assets that BP divested.

Appendix: Capacity additions for integrated refinery and petrochemical projects

Exhibit 1

Existing and oncoming capacity additions

Sponsors	Project	Location	Startup	Description	Capacity
Integrated Refinery & Petrochemical Projects					
China National Petroleum Corp (60%), PDVSA (40%)	Jeiyang Refinery & Petrochemicals Complex	Jeiyang (Guangdong Province), China	2019	\$9.5 billion project	Refinery: 400,000 bpd Ethylene: 1.2 million tpy Propylene: 800,000 tpy Paraxylene: 1.5 million tpy Benzene: 1.1 million tpy
Hengli Petrochemical, Saudi Aramco	Hengli Refinery & Chemicals Complex	Liaoning (Changxiang Island), China	2019	\$11 billion investment	Refinery: 400,000 bpd Ethylene: 1.5 million tpy Propylene: 800,000 tpy Paraxylene: 4.5 million tpy Benzene: 4.6 million tpy
Hengyi Group	Hengyi Refinery & Petrochemical Complex	Brunei	2020	\$20 billion project	Refinery: 150,000 bbl/day Propylene: 200,000 tpy Paraxylene: 1.6 million tpy Benzene: 1.4 million tpy
Ningxia Baota Petrochemical Group	Ningxia Baota Petrochemical Complex	Ningxia, China	2018	\$9 billion project	Gasoline: 520,000 tpy Paraxylene: 800,000 tpy Benzene: 200,000 tpy Purified Terathalic Acid: 1.2 million tpy
Rongsheng Group, Tongkun Group, Juhua Group, Saudi Aramco	Zhejiang Refinery & Petrochemical Complex	Zhoushan Island, Zhejiang, China	2020	\$25 billion project	Refinery: 400,000 bpd Ethylene & PE: 1.4 million tpy Propylene & PP: 600,000 tpy Paraxylene: 4 million tpy Benzene: 4.6 million tpy
Shenghong Eastern Group	Lianyungang Refinery & Petrochemical Complex	Lianyungang, China	2021	\$12 billion project	320,000 barrels/year Transport Fuels: 130,000 bpd Ethylene: 1.1 million tpy Benzene: 2.8 million tpy Styrene: 600,000 tpy
Sinochem	Quanzhou Petrochemical Complex	Fujian, China	Mid-2020	\$4.6 billion to add 60,000 bpd to an existing refinery & petrochemical units	Refinery: +60,000 bpd Ethylene: 1 million tpy Paraxylene: 800,000 tpy
Sinopec (50%), Kuwait Petroleum (50%)	Donghai Island Refinery & Petrochemical Complex	Zhanjiang, China	2Q20	\$5.7 billion project	Refinery: 300,000 bpd Ethylene: 1 million tpy Propylene & PP: 750,000 tpy Low Sulfur Fuel: 5.6 million tpy
Hindustan Petroleum Corporation Limited (74%), Government of Rajasthan (26%)	Barmer Refinery and Petrochemical Complex	Barmer District, Rajasthan, India	2022	\$6.8 billion project	Refinery: 180,000 bbl/day Ethylene & PE: 830,000 tpy Propylene & PP: 840,000 tpy Paraxylene: 500,000 tpy
Indian Oil Corp	Panipat Refinery & Petrochemical Complex	Paradip, India	Varios	Expanding refinery and adding petrochemicals	Refinery: +200,000 bbl/day in 2021 Propylene & PP: 680,000 tpy in 2019 Paraxylene & PTA: 1.2 million tpy in 2021
Indian Oil Corp, Bharat Petroleum Corp, & Hindustan Petroleum (50%) Saudi Aramco & Abu Dhabi National Oil Company (50%)	Ratnagiri Refinery & Petrochemicals Ltd (RRPCL)	Roha, India	2025	\$60 billion project	Refinery: 1.2 million bpd 18 million tpy of various petrochemical derivatives in 50 downstream units
Reliance Industries (80%), Saudi Aramco (20%)	Jamnagar Refining & Petrochemical Complex	Jamnagar, India	Various	Multiple projects to convert the refinery to just petrochemicals (70%) & jet fuel (30%)	Refinery: 1.729 million bpd; adding new coke gasifier & refinery off-gas cracker 30 million tpy of various petrochemical derivatives and plastics including PE, PP, paraxylene, PTA, benzene and styrene. Start-up 2019 - 2025
Petronas (50%), Saudi Aramco (50%)	Refinery & Petrochemicals Integrated Development (RAPID) Project	Johor, Malaysia	2020	\$27 billion	Refinery: 300,000 bbl/day Ethylene: 1.2 million tpy Propylene & PP: 900,000 tpy
Dangote Industries Nigerian National Petroleum Corporation (NNPC)	DIL Refinery & Petrochemical Complex	Lekki, Nigeria	2022	\$12 billion project	650,000-bpd refinery 750,000 tpy of polypropylene (PP) 2.8 million tpy of ammonia and urea.
Oman Oil Co. Kuwait Petroleum Corp.	Duqm Refinery & Petrochemical Complex	Duqm, Oman	2022	\$5.75 billion	Refinery: 230,000 bbl/day by 2022 Ethylene: 800,000 tpy by 2024 Propylene: 200,000 tpy by 2024

Abbreviations: bpd-Barrels per day; tpy - metric tons per year; PE - polyethylene; PP - polypropylene

Source: Trade Publications

Exhibit 2

Existing and oncoming capacity additions (cont.)

Sponsors	Project	Location	Startup	Description	Capacity
Integrated Refinery & Petrochemical Projects					
Saudi Aramco	Jazan Petrochemicals Project	Jazan, Saudi Arabia	Various	\$30 billion	Refinery: 400,000 bbl/day in 2019 Propylene & PP: 330,000 tpy in 2020 Benzene: 400,000 tpy in 2019 Paraxylene: 600,000 tpy in 2019
Saudi Aramco (62.5%) Total (37.5%)	Jubail Refinery & Petrochemical Complex	Jubail, Saudi Arabia	2024	Refinery completed in 2014 adding a new petrochemical facility fed by ethane (50%) and refinery off-gases (50%)	Existing refinery: 440,000 bpd Paraxylene: 700,000 tpy Benzene: 150,000 tpy Propylene: 200,000 tpy Ultra-low-sulfur diesel: 250,000 bpd Benzene: 850 million tpy Paraxylene: 40 million tpy
Saudi Aramco, SABIC	Yanbu Petrochemical Complex	Yanbu, Saudi Arabia	2025	\$30 billion project	Refinery: 400,000 bpd Ethylene: 3 million tpy Polyethylene: 1.5 million tpy Propylene & PP: 600,000 tpy
Abu Dhabi National Oil Company (65%), Eni (20%), OMV (15%)	Ruwais Refinery & Petrochemical Project	Ruwais, UAE	2025	\$18 billion Investment	Refinery: 600,000 bbl/day Ethylene: 1.8 million tpy plus downstream units
Kuwait Petroleum Int'l (35%) Idemitsu Kosan Co., Ltd (35%) Vietnam Oil and Gas Corp (25%) Mitsui Chemicals (5%)	Nghi Son Refinery and Petrochemical Project	Thanh Hoa Province, Vietnam	Various	\$9 billion project	Refinery: 200,000 bbl/day in 2018 Propylene & PP: 330,000 tpy in 2020 Benzene: 400,000 tpy in 2019 Paraxylene: 600,000 tpy in 2019
Silbur, Rosneft	Zapsibneftekhim Petrochemical Complex	Tobolsk, Russia	2021	Will process byproducts of oil and gas extracted from Western Siberian operations	Ethylene: 1.5 million tpy Propylene: 500,000 tpy Benzofluoranthene: 100,000 tpy Polyethylene: 1.5 million tpy Polypropylene: 500,000 tpy
Oil Companies Investing in Petrochemical Projects with access to Low-Cost Feedstocks					
Sinopec Fujian Petrochemical (50%), Dynamic Ever Investment (50%)	Gulei Petrochemical Complex	Zhangzhou, China	2025	Existing refinery; adding another refinery and ethylene cracker by 2025	Refinery: 200,000 bpd Ethylene: 800,000 tpy Gasoline: 550,000 tpy Aromatics extraction: 350,000 tpy Butadiene: 130,000 tpy Styrene: 600,000 tpy Polypropylene: 350,000 tpy
Sinopec (50%), Lyondellbasell (50%)	50-50 JV to build a new propylene oxide and styrene monomer unit	Ningbo, China	2022	\$2.5 billion	Propylene Oxide: 300,000 tpy Styrene: 600,000 tpy
ExxonMobil	Guandong Petrochemical Project	Huizhou, China	2023	Proprietary crude oil steam cracking technology	Ethylene & PE: 1.2 million tpy Propylene & PP: 800,000 tpy
Oman Oil Refineries and Petroleum Industries (ORPIC)	LIWA Plastics Industries Complex	Suhar, Oman	2020	\$6.7 billion investment	Ethylene & PE: 800,000-tpy Propylene & PP: 600,000 tpy MTBE 500,000 tpy
Saudi Aramco (65%), Dow (35%)	Sadara	Al Jubail, Saudi Arabia	2019	\$12 billion petrochemical plant next to a refinery started up in 2014	Ethylene: 1.5 million tpy Polyethylene: 400,000 tpy Propylene: 400,000 tpy Ethylene glycol: 575,000 tpy plus 15 other downstream units.
Total (50%), Borealis (50%)	Bayport Polymers	Port Arthur, TX	2020	\$2.5 billion project	Ethylene: 1 million tpy in 2020 Polyethylene: 1 million tpy in 2021
ExxonMobil (50%), SABIC (50%)	Exxon/SABIC Cracker	San Patricio, TX	2023	\$6 billion	Ethylene: 1.8 million tpy Polyethylene: 1.2 million tpy Ethylene oxide & Derivatives: 800,000 tpy
Royal Dutch Shell	Marcellus Cracker Project	Monaco, PA	2022	\$3.9 billion	Ethylene: 1.6 million tpy Polyethylene: 1.6 million tpy

Abbreviations: bpd-Barrels per day; tpy - metric tons per year; PE - polyethylene; PP - polypropylene

Source: Trade Publications

Moody's related publications

Outlooks:

- » [Chemicals – North America & EMEA: 2020 outlook negative on trade war, weak industrial economy \(Slides\), 13 December 2019](#)

Sector in-depth reports:

- » [Integrated Oil & Gas – Global: Majors pursue energy-transition strategies with shifts in product offerings, investment, 24 September 2019](#)
- » [Chemicals – Global: Frequently asked questions about industrial gas sector's evolving competitive landscape, 6 September 2019](#)
- » [Oil and Gas – Global: Natural gas and efficiencies feature strongly in national energy transition strategies, 4 June 2019](#)
- » [Podcast: LNG export options, carbon awareness push natural gas toward global marketplace, 4 April 2019](#)
- » [Oil and Gas – North America: Natural gas going global amid rising demand, nimble supply, carbon transition, 21 March 2019](#)

Sector comment:

- » [Chemicals – North America: Early reports point to weak earnings for 2020; ESG issues moving to forefront](#)

Rating methodology:

- » [Chemical Industry, March 2019](#)

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