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December 2023

Argus Polyethylene Analytics

A global supply/demand analysis for 2018 through 2032



Commodity Markets Intelligence

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Events

illuminating the markets®

Associated data and analysis

Argus Polyethylene Analytics Service

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- This presentation is the initial publication of the *Argus* Polyethylene Analytics 10-year supply/demand forecast. This annual study provides a comprehensive overview of global supply and demand fundamentals, trade patterns and balances on a regional basis.
- *Argus* consultants analyze the global market for polyethylene and its primary grades to derive supply / demand estimates
- It is a commercially orientated consulting service whose aim is to provide the most accurate and timely analysis of industry trends and events, including supply and demand, and cost drivers for polyethylene including LDPE, LLDPE, and HDPE.
- *Argus* also offers a short-term rolling 24-months price forecast (*Argus* Polyethylene Outlook) backed by an analysis of future market trends.
- Detailed data downloads of the supply/demand, capacity files and company balances are available:
 - [Supply / Demand Balance](#)
 - [Capacity](#)



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Executive Summary

US Polyethylene Analytics

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- Feedstock price volatility will continue as a competitive advantage for polyethylene producers in the US as shale gas production has significantly stabilized ethylene prices vs. alternative feedstocks such as propylene. Since 2016, the price of ethylene (Ethylene pipeline USGC NTP) has averaged \$753t +/- 40pc whereas over this same time period PGP prices averaged \$1,063/t + 100pc / - 55pc. However, volatility may increase as ethane exports are likely to increase and other regions in the world are developing shale gas exploration as well. The US competitive cost advantage for ethylene will continue but likely decrease in the next 10 years.
- World scale PE plant investments will continue at an average rate of 5000ktpa through 2032, but investments in China will dominate, despite US shale gas / ethane / ethylene cost advantages. China's drive for self-sufficiency for PE supply will mimic the drive China has achieved for polypropylene (90pc+ self-sufficient).
- Rationalization of PE assets is likely in regions with high feedstock and energy costs, but these smaller / non-competitive plants are not expected to impact operating rates significantly, particularly given all of the new capacity coming online in China. China's self-sufficiency rate for PE is forecasted to increase from 70pc to 80pc with imports holding steady at around 15,000 kta, thus keeping China as the major demand sink for PE exports globally.
- Environmental concerns will continue to impact plastics in general, including polyethylene. Regulations will drive the growth of the various technologies including chemical / pyrolysis technology, but the impact will be moderate at best and not expected to impact demand through 2030. The food packaging and post-consumer segments will be the most vulnerable to recycling growth.

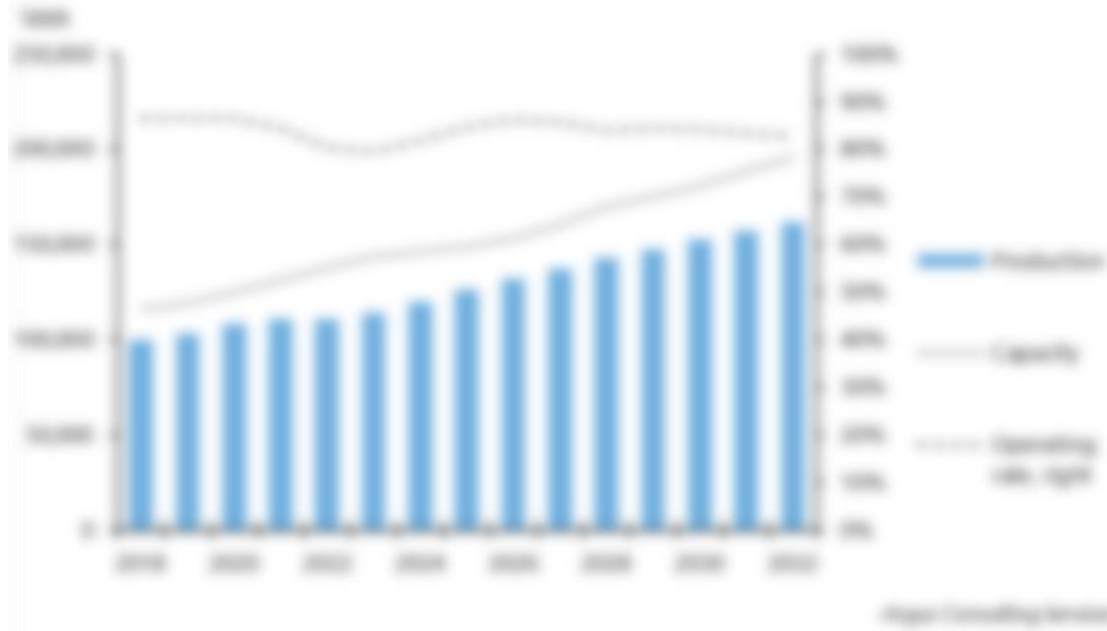


Polyethylene additions globally

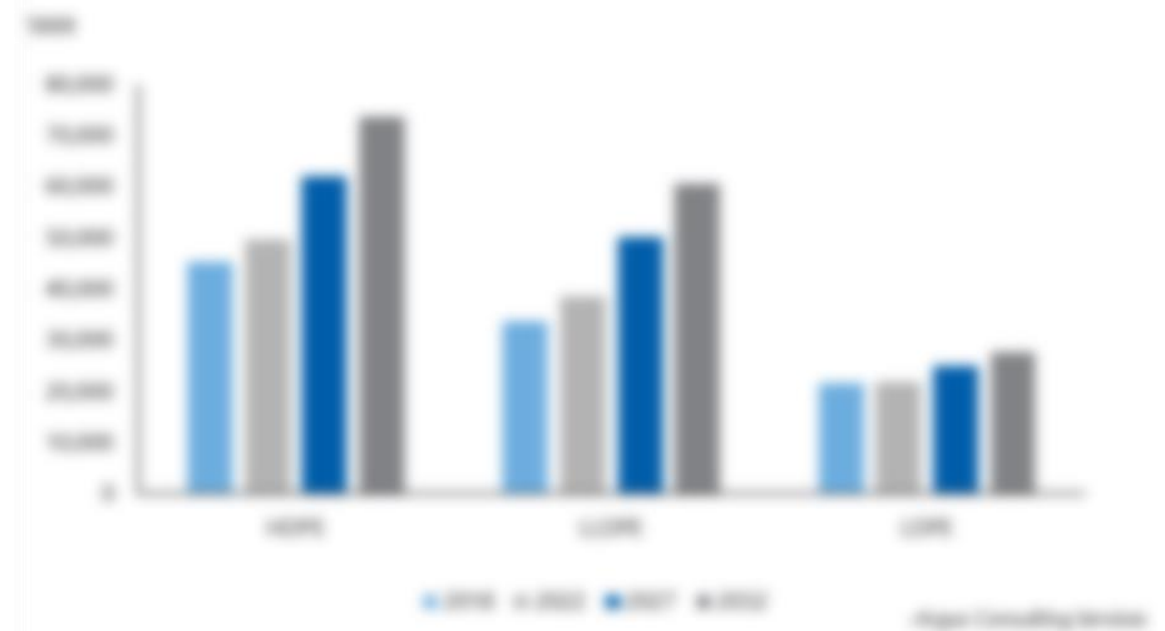
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New capacities hold operating rates below 85pc through 2032.

Production Statistics



Demand Growth by PE Family Type



- 2023 PE capacity increased by 5,000 kt (4pc).
- An average 5800 kt of additional capacity to come online each year through 2032.
 - A total of 52,200 kt is estimated to come online by 2032.
 - Around 43pc of these PE additions are based in China.

Global: Supply

China will continue to lead in new capacity additions.

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Capacity by Region



Capacity Year-on-Year Changes



- Cost advantaged and high demand growth regions will continue to lead industry capacity additions.
- Asia Pacific producers to narrow cost difference with North America and Middle East by importing ethane/LPGs and investing in large integrated refinery/petrochemical complexes to gain cost and efficiency benefits.
- The drive to decarbonize production could delay some projects as costs escalate or lead to the rationalization of older units. Neither of these scenarios are reflected in our current outlook.
- Western Europe expansions are included in the 2023 – 2028 range based on debottlenecking. This assumes a shift of ethane imports to help competitiveness against imports.
- Producers will eventually need to manage the timing of new capacity additions as inflation and other macro-economic conditions remain a risk for demand growth.

PE global capacity

Operating rates adjust to new norms.

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Global Polyethylene Production, Capacity, Operating Rate



- PE plant capacity increases from 2005 to forecast 2027 is estimated at 150% with major investments in NEA and NA
- Average five year capacity increase estimated at 5000 kta
- Operating rates of 82 to 84% in 2023 and 2024 expected, 80% operating rates expected by 2027
- 2005 – 2021 saw a total number of 60 PE plant shutdowns globally with half of these in the European regions. These 60 PE plants represents only 8% of 2005 PE capacity
- Automation not likely to impact operating rates in the near future

North America: Economy

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Economic growth to reach a bottom in 2024 before returning to a growth rate of 2pc by 2025.

North America GDP



- North America GDP is dominated by US demand with the impact in 2022. Canada and Mexico contributed 1% and 1% respectively, with Canada showing a stronger GDP in the years 2021-2023.
- Growth in the US for the past 10 years has hovered around an average of 2% with 2021 and 2022 being an exception. Covid-19 drove the GDP down to -4.8% in 2020 but bounced back with a strong growth recovery in 2021. Growth in 2022 returned to an 10-year historical average. GDP growth in 2024 is forecast to fall below minimal growth at 0.5%, and to improve from 2025 onwards.
- Canada and Mexico's growth rates have moved in the same general trend as the US. Mexico is forecast to have minimal growth (0.5%) in 2023 while Canada is forecast to have negative growth in 2024 before improving in 2025 onwards.
- The regional inflation is falling but will remain high. The US treasury 10-year to three-month spread has been the most inverted in decades. Historically this has been used as a good leading signal of a recession.
- The July 2023 rate hike will be the last in this cycle, but risks remain that toward another rate hike if progress on inflation and labor market conditions remains weak. In his speech, Powell committed to bringing down inflation to 2%.



North America: Key updates

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Regional operating rates reached a bottom in 2023. Market condition to stabilize in 2024 before gradually improving by 2026. As higher demand returns, operating rates increase further, before peaking in 2027.

Key Market Changes		
Supply	Demand	Trade
Supply remains ample as production used operating in 10 2023 vs 40 2022. Current rates lower than prior year.	Demand has improved in 2023 but remains depressed versus historical norms. Anticipated recovery from China in spring has not been fully realized.	US exports according to US manufacturers with target increases in shipments to Asia. US exports expected to exceed 40% of domestic production going forward.

Production Statistics



% Production Share by Country

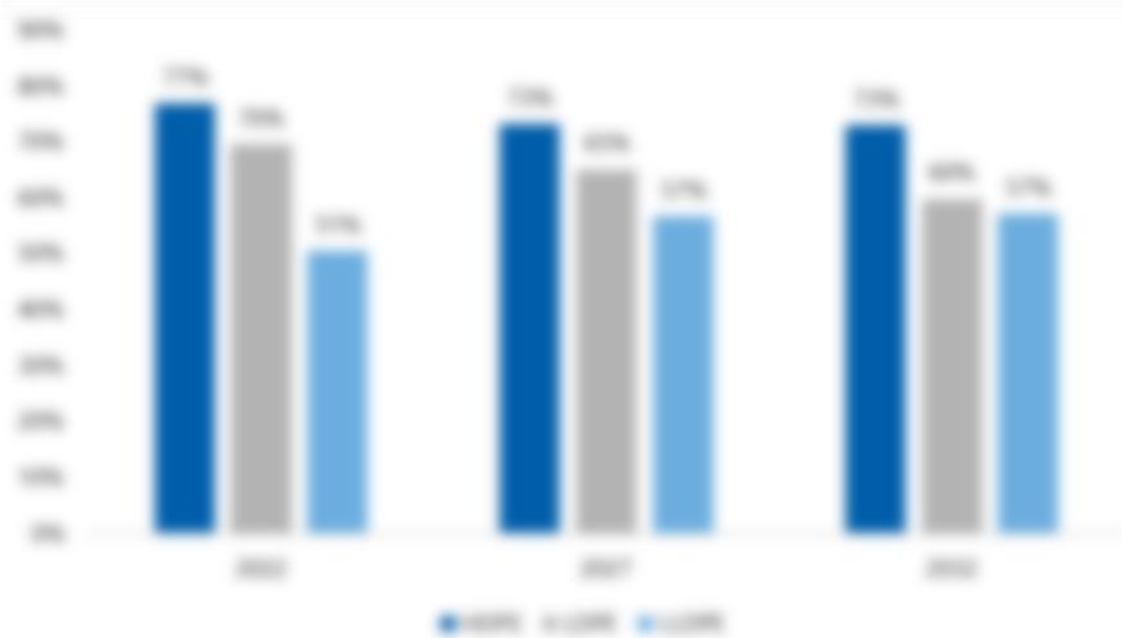


North America: Demand versus supply

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Regional operating rates reached a bottom in 2023. Market condition to stabilize in 2024 before gradually improving by 2026. As higher demand returns, operating rates increase further, before peaking in 2027.

Regional Demand as a Percent of Production



Annual Capacity Additions by Grade



- Domestic demand is expected to grow 1.5 - 2pc versus capacity growth of 1pc per annum through 2032.
- Plant rationalizations are not expected as feedstock/ethylene costs are strongly advantaged versus rest of the world.
- All types of domestic production will be exported going forward, resulting in a shift in the domestic market to more spot trading and less "stable" volumes.
- Polyethylene, alpha olefins and MEG are the primary North America ethylene derivatives that will be exported into global markets.

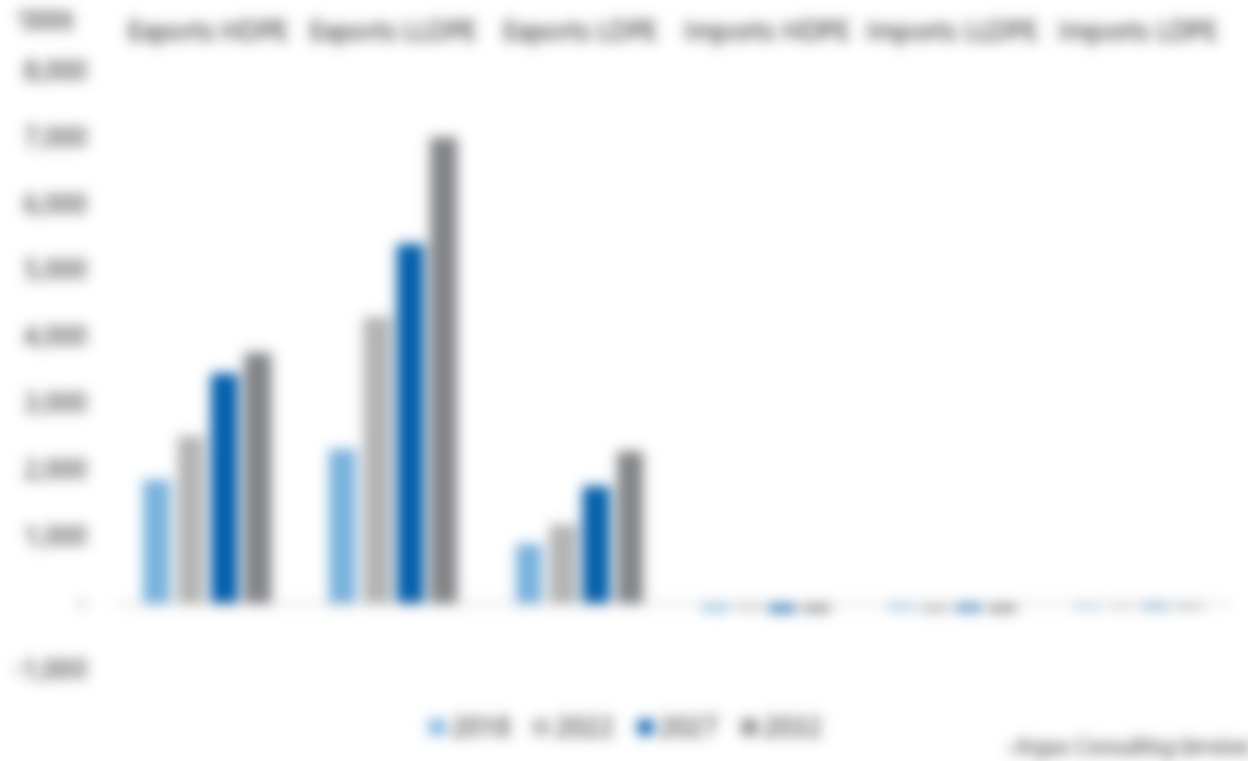


North America: Trading activity

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Regional operating rates reached a bottom in 2023. Market condition to stabilize in 2024 before gradually improving by 2026. As higher demand returns, operating rates increase further, before peaking in 2027.

Import / Export Trade Activity



- US exports will challenge domestic producer margins as the spot market activities continue to grow and exports will need to be competitive with the global markets.
- Buyers are shifting contract to more spot purchases as supply security becomes less of an issue with all the additional plant capacities in Alberta and Pennsylvania.
- China growth will dictate the export opportunities not just for North America but the Middle East and southeast Asia, as well.
- Exports into Mexico (currently dominated by US producers) will look to the global markets to source supply and control costs.
- Financial markets will need to see improved economic conditions in Latin and Mexico, otherwise US producers may look to Europe and southeast Asia for opportunities.
- Basin producers likely to continue service support to buyers based on contracts with limited support for the spot markets.
- Large basin producers (Baker, CNR, Duct) will manage exports via direct sales whereas non-global producers will need the support of traders and distribution.



Appendix: Argus polyethylene experts

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Terry Glass
Vice President,
Polymers

Terry is responsible for the expansion of Polymer Report services in strategic regions. He has over 40 years' experience relating to the plastics industry, working with converters, brand owners, and resin producers. Terry delivers an integrated view across the polymer value chain and analyses on a global basis including European, Americas and Asian markets. He is currently supporting polymer related growth initiatives, including domestic and export markets, recycling and sustainability initiatives. Before joining Argus, Terry worked at Dow Chemical, Braskem, and Sasol. He holds a Chemistry degree from the University of Houston and 26 patents across a variety of market applications.



Cassidy Staggers
Polymers Analyst

Cassidy is the lead analyst for Argus polymers portfolio, including launching the new Polyethylene Outlook. She also works with the Methanol team on Outlook publications, data maintenance and projects. Prior to joining the Chemicals team, she held various administration and operation roles at Argus and McKinsey. Cassidy holds a degree from the University of Michigan and an MBA from University of Houston.



Josie Jang
Business Analyst

Josie is a business analyst in the chemicals sector. She works closely with Asia olefins and polyolefins experts, providing Asia price outlooks and insights. Josie has also worked for a gas ship owner as a market analyst in, focusing on ethane, LPG, LNG, and financial markets. She is a chartered financial analyst and holds a master's degree in Finance and Investment from the University of Bristol plus a degree in Economics.



Sarah Rae
Vice President,
Olefins &
Derivatives

Sarah has decades of industry experience, including 17 years in senior strategic purchasing management positions. She was responsible for a wide range of materials including olefins, fertilizers and commodity raw materials, as well as management and project roles covering chemicals business management, sales, planning and logistics. Sarah began her career working for BP in oil exploration and has worked for DeWitt, Ineos, Tessenderlo Chemie (LVM) and Rhodia. She has a degree in geology from Leicester University.



Craig Barry
Lead Consultant,
Ethylene

Craig leads the global ethylene team focusing primarily on Outlooks and Analytics Services. He has over 30 years' experience in the olefins industry. Throughout his career Craig has worked across the world, with major olefins and derivative producers. His experience also includes olefins feedstocks and refinery integration with petrochemical industry. Craig delivers an integrated view across the ethylene value chain and analyses on a global basis including Americas, Asian and European markets. He is currently supporting Thought Leadership initiatives, including blogs, podcasts, and white papers. Before joining Argus, Craig worked at Dow Chemical, and ExxonMobil. He holds a Chemical Engineering degree from The Ohio State University and an MBA from Rice University.

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