

**S&P Global**

Commodity Insights

# Canada Petrochemical Feedstocks

Prepared for:



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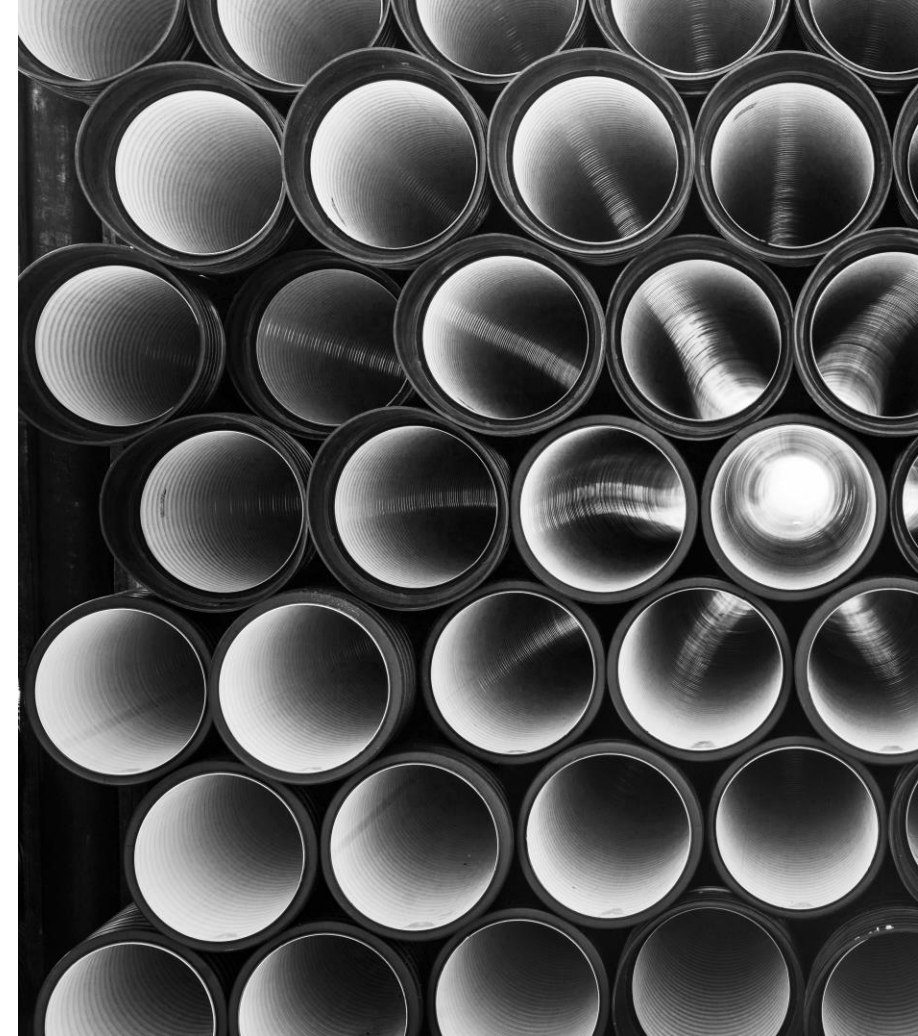
June 2023

**MIDSTREAM NGL MARKETS / GLOBAL GAS**



# Agenda

- North American Natural Gas Market Outlook
- NGL Market Overview
  - Global NGL Market Outlook
  - Canada NGL Market Outlook



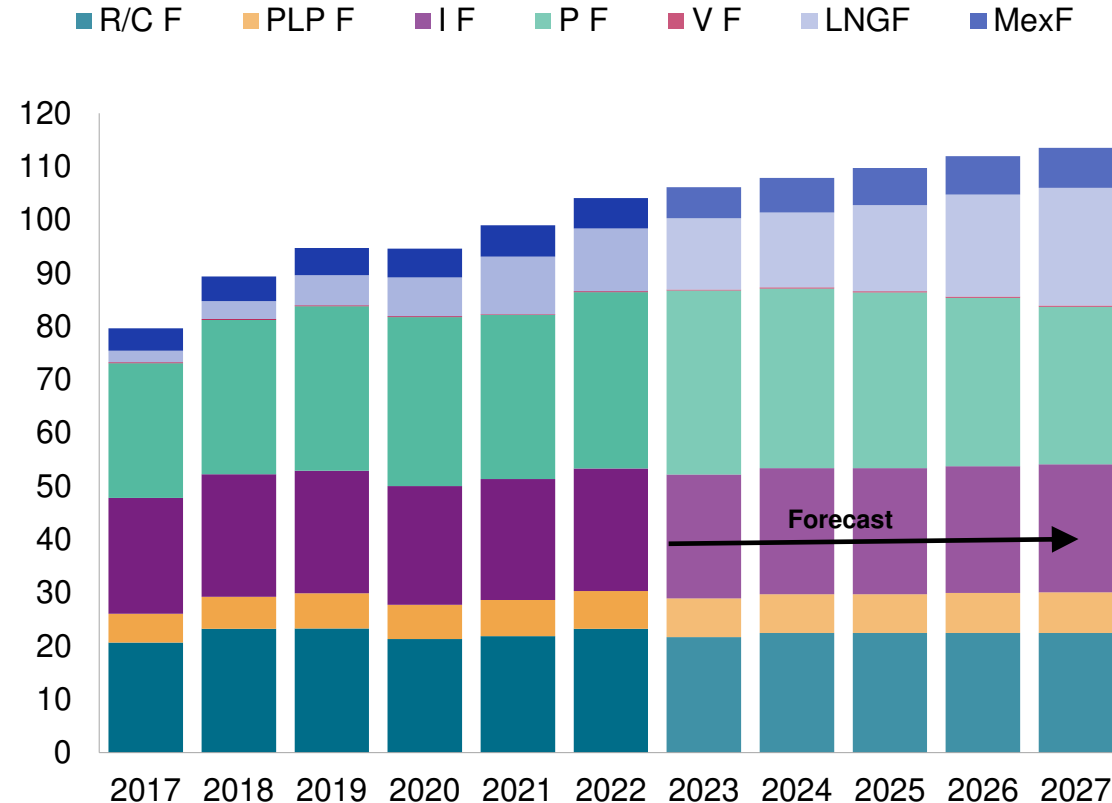
# North American Natural Gas Market Outlook

Ian Archer / Commodity Insights / Director



# Export gas demand expected to drive growth through 2027

## US Lower 48 natural gas domestic demand and exports (Bcf/d)



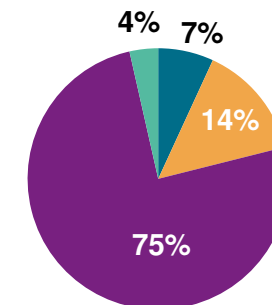
Data compiled May 11, 2023.

Sources: S&P Global Commodity Insights; EIA.

- **US Lower 48 natural gas demand is expected to grow through 2027**, with total demand (including exports) reaching 113.5 Bcf/d in 2027, driven by higher expectations for LNG feedgas offsetting lower power demand.
- **Power sector gas demand is expected to peak in 2023 before declining through 2027.** However, gas prices were revised lower in the short term and higher toward the end of the outlook, prompting expectations for annual gas power demand to increase for 2023–24 and then decrease steadily.
- **We continue to expect the majority of demand growth to come from exports through 2027.** US LNG feedgas demand is forecast to reach an annual average of 22.1 Bcf/d in 2027.

## US Lower 48 natural gas demand growth, 2023–27 (percent)

Industrial Net US pipeline exports to Mexico LNG feedgas Other

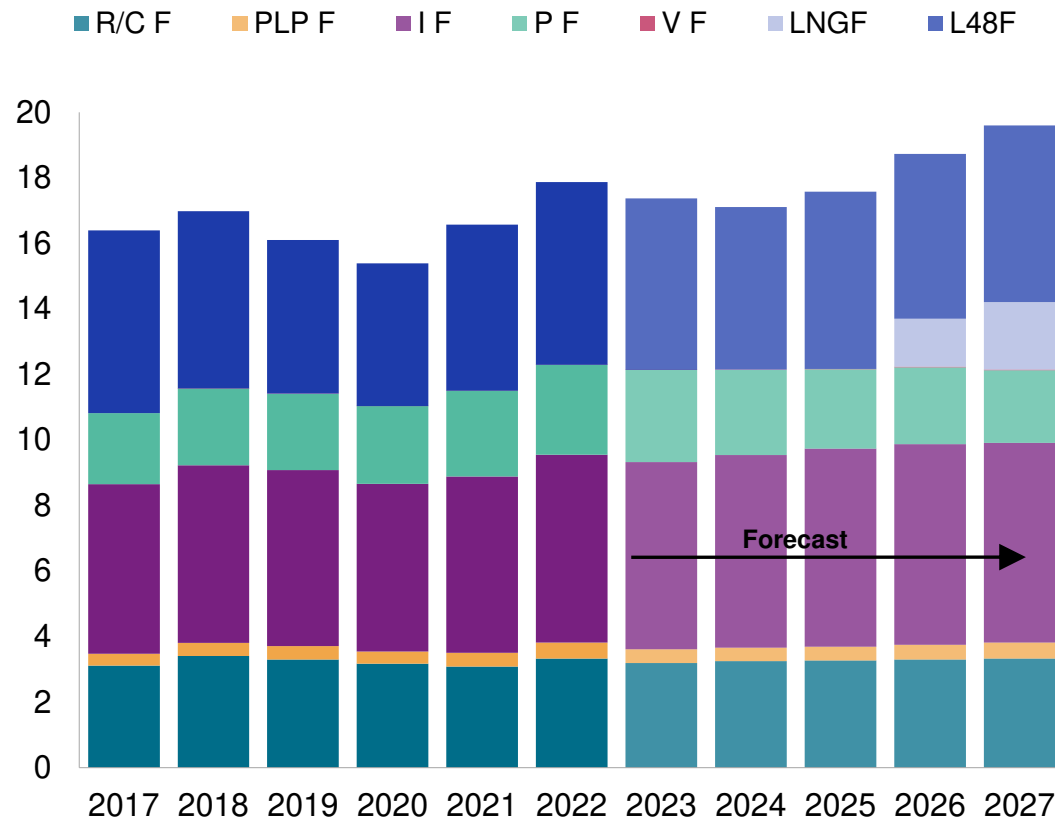


Excludes residential/commercial and power that are in aggregate decline.



# Canadian demand in 2027 will be up an estimated 2.3 Bcf/d from 2022, supported by the expected start-up of Canadian LNG export projects

## Canadian natural gas domestic demand and exports (Bcf/d)



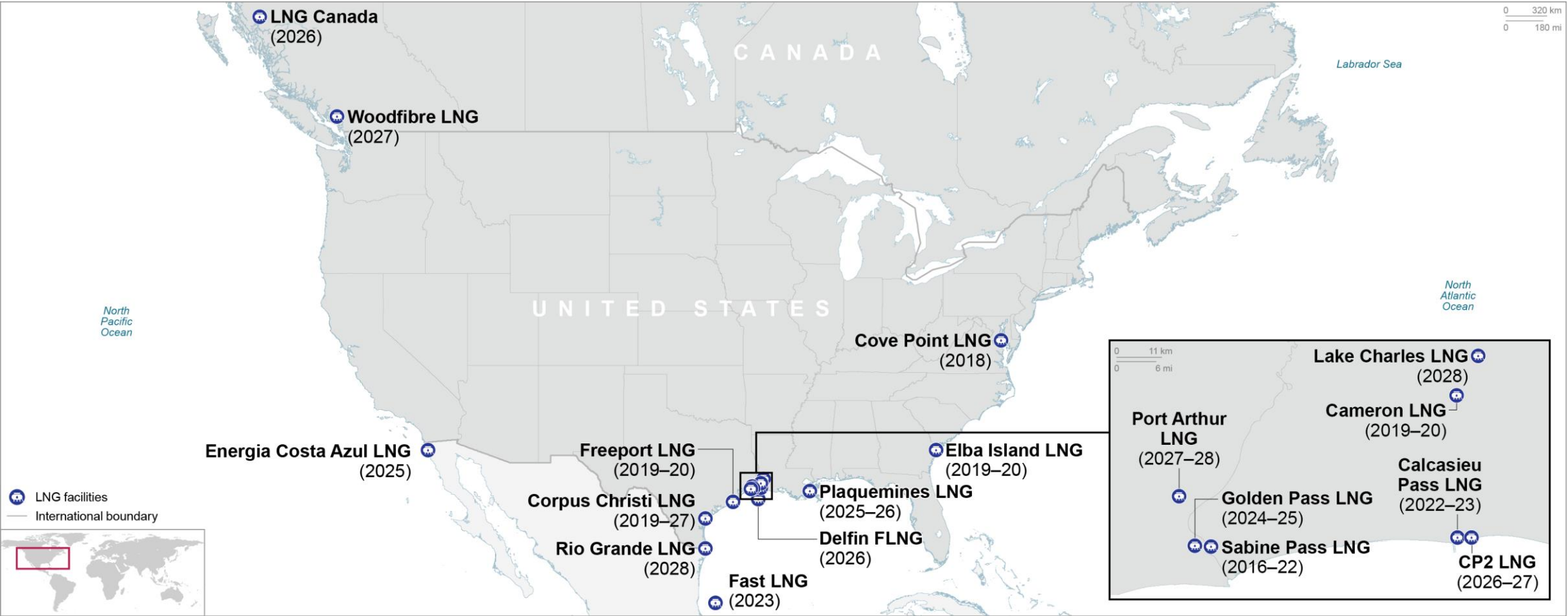
- **Practically all growth in our outlook is now expected from exports.**
- **Domestic demand in 2027 is forecast to decline slightly (0.1 Bcf/d) from the 2022 level.**
  - **Industrial growth roughly counterbalances power declines** and should come largely from oil sands development, with support from the petrochemicals sector.
  - **Power sector demand is now forecast to peak in 2023 and then begin a long, slow decline**, as renewables increasingly replace natural gas (falling 0.5 Bcf/d from 2022-2027).
- **Canadian exports to the US Lower 48 remain relatively flat**, with some uptick as production precedes LNG exports.
- **LNG Canada Phase 1 is now expected to start in January 2026 and is joined by the smaller Woodfibre LNG facility in August 2027.**

Data compiled May 11, 2023.

Sources: S&P Global Commodity Insights; Statistics Canada.

# North American LNG export facilities in this outlook

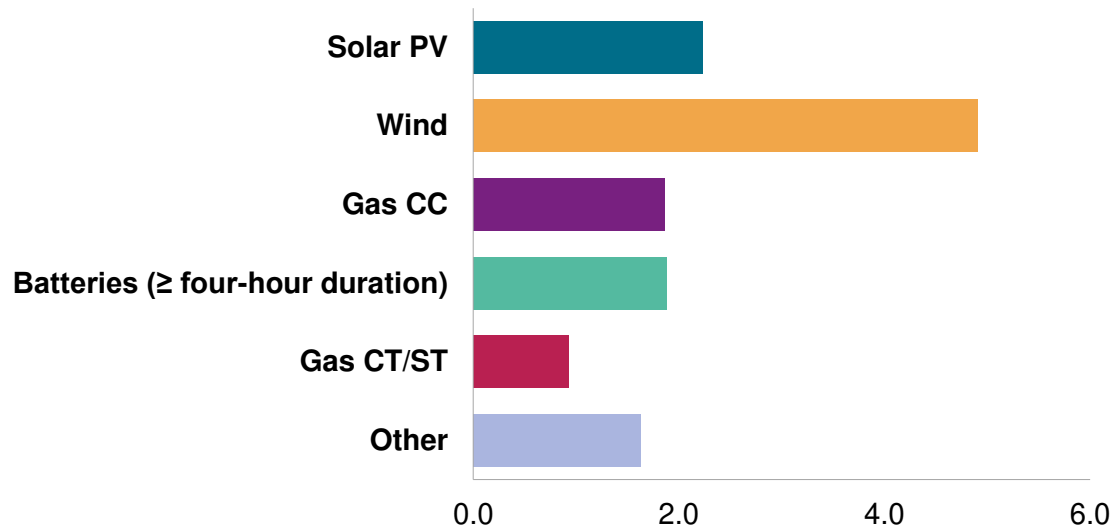
## North American LNG export facilities in the short-term outlook



Data compiled May 19, 2023.  
Source: S&P Global Commodity Insights: 2009613.  
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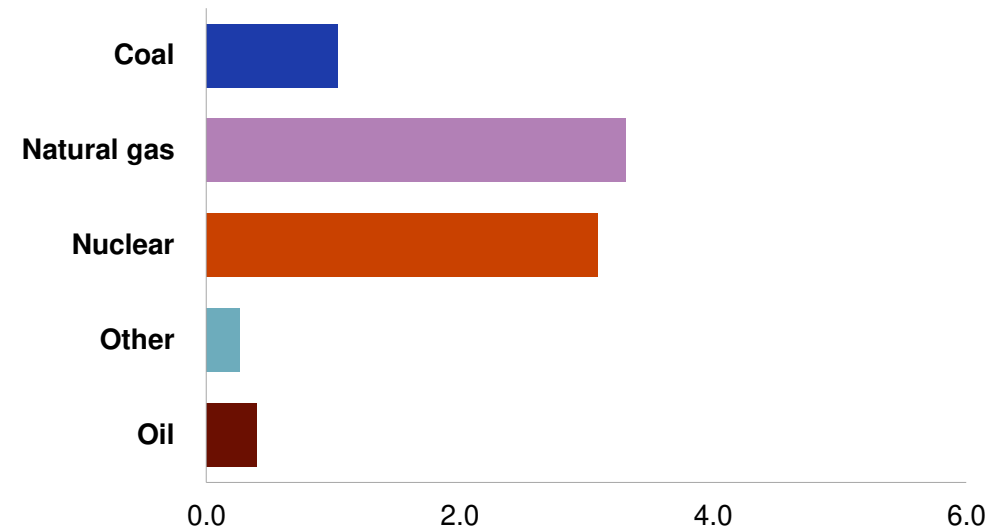
# Canadian wind additions total 4.9 GW from 2023 to 2027, accounting for 36% of total power capacity additions

Canadian power capacity additions, 2023–27 (GW)



- **Wind additions are forecast to remain strong**, with nearly 4.9 GW assumed to be completed during 2023–27 and the provinces of Alberta and Ontario leading this effort. Solar capacity is again expected to grow by 2.3 GW.

Canadian power capacity retirements, 2023–27 (GW)



- **For 2023–27, we continue expect nearly 8.1 GW of capacity to be retired across Canada.** Nuclear plants are forecast to account for 38% of the retiring capacity during this period as the Pickering nuclear power plant in Ontario is expected to end commercial operations in 2025/26.

Data compiled May 11, 2023.

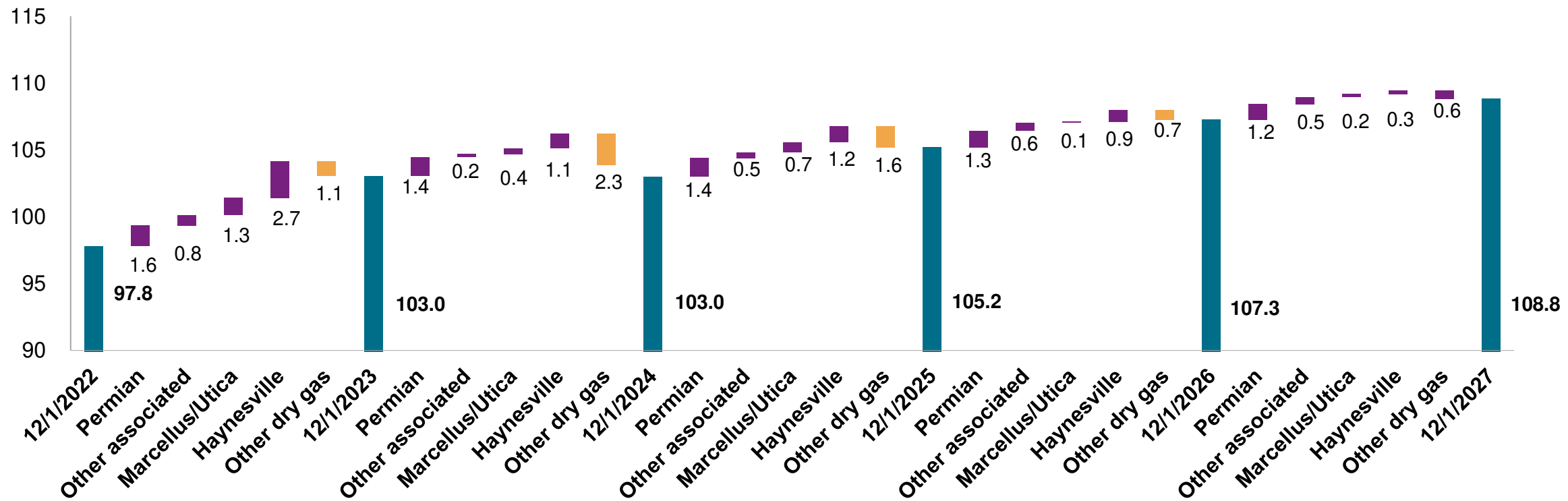
CC = combined cycle; CT = combustion turbine; ST = steam turbine; CSP = concentrating solar power; PV = photovoltaic.

Source: S&P Global Commodity Insights.

# Supply stagnates in 2024 before accelerating in 2025 as LNG demand rises; no slowdown in sight for the Permian and the Haynesville plays

Demand growth will dictate the call on nonassociated gas plays

US Lower 48 natural gas production forecast by play (Bcf/d)

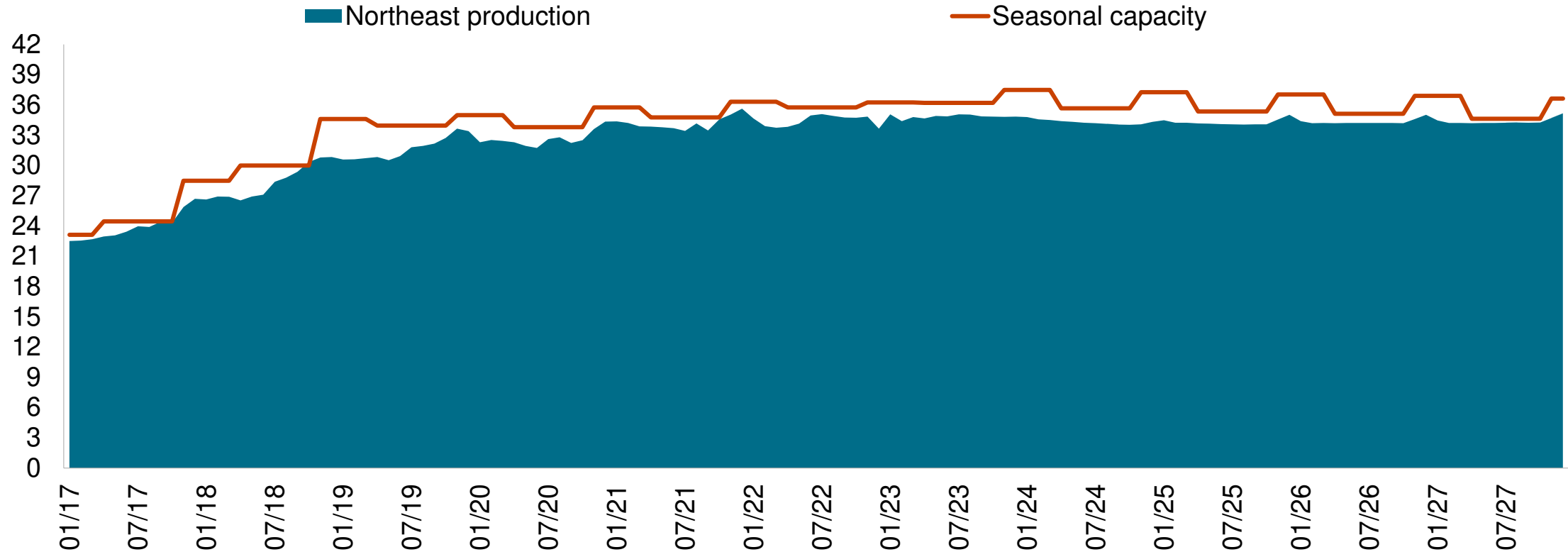


Data compiled May 15, 2023.  
Sources: S&P Global Commodity Insights; EIA.



# Infrastructure constraints in Appalachia pivot producers' focus to Haynesville and Permian Basin

## Northeast production ceiling (Bcf/d)

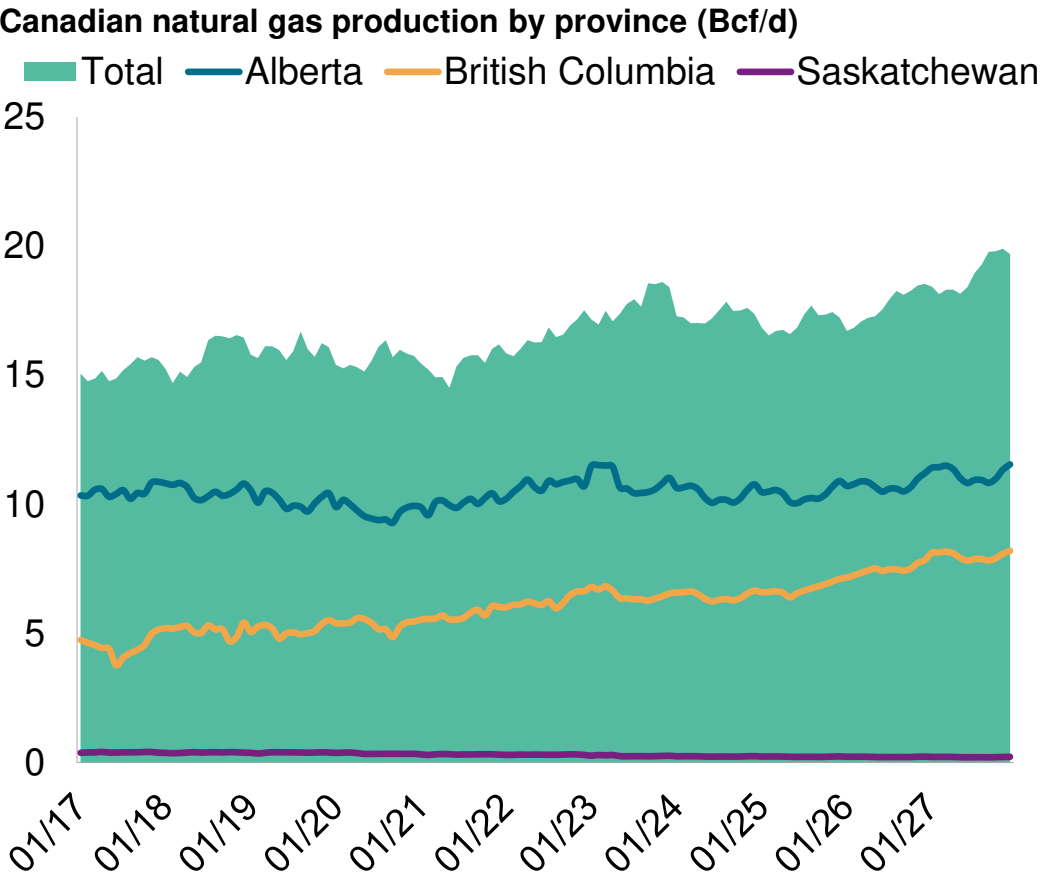
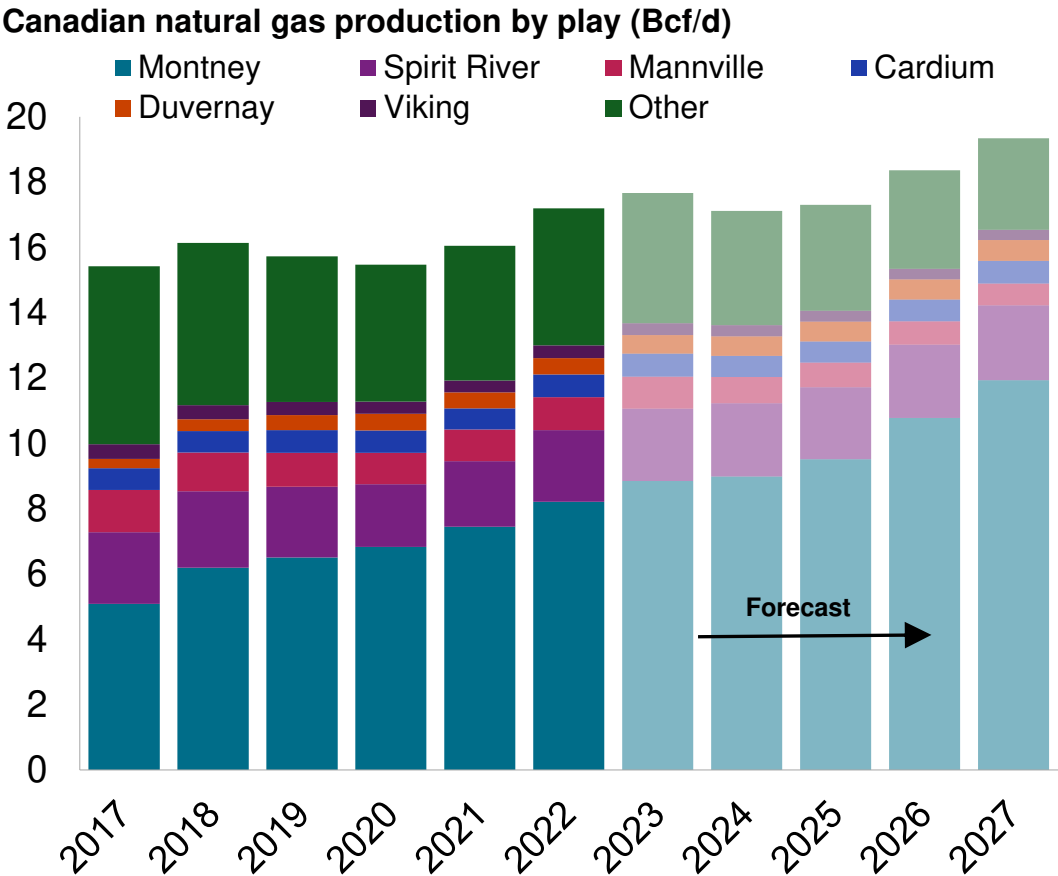


**Appalachian production growth is expected to remain muted and rangebound during the outlook period — averaging between 34.6 Bcf/d and 34.9 Bcf/d in 2023–27.**

Data compiled May 15, 2023.

Sources: S&P Global Commodity Insights; EIA.

# Canadian annual production to exit 2023 at 17.7 Bcf/d and grow to 19.4 Bcf/d in 2027

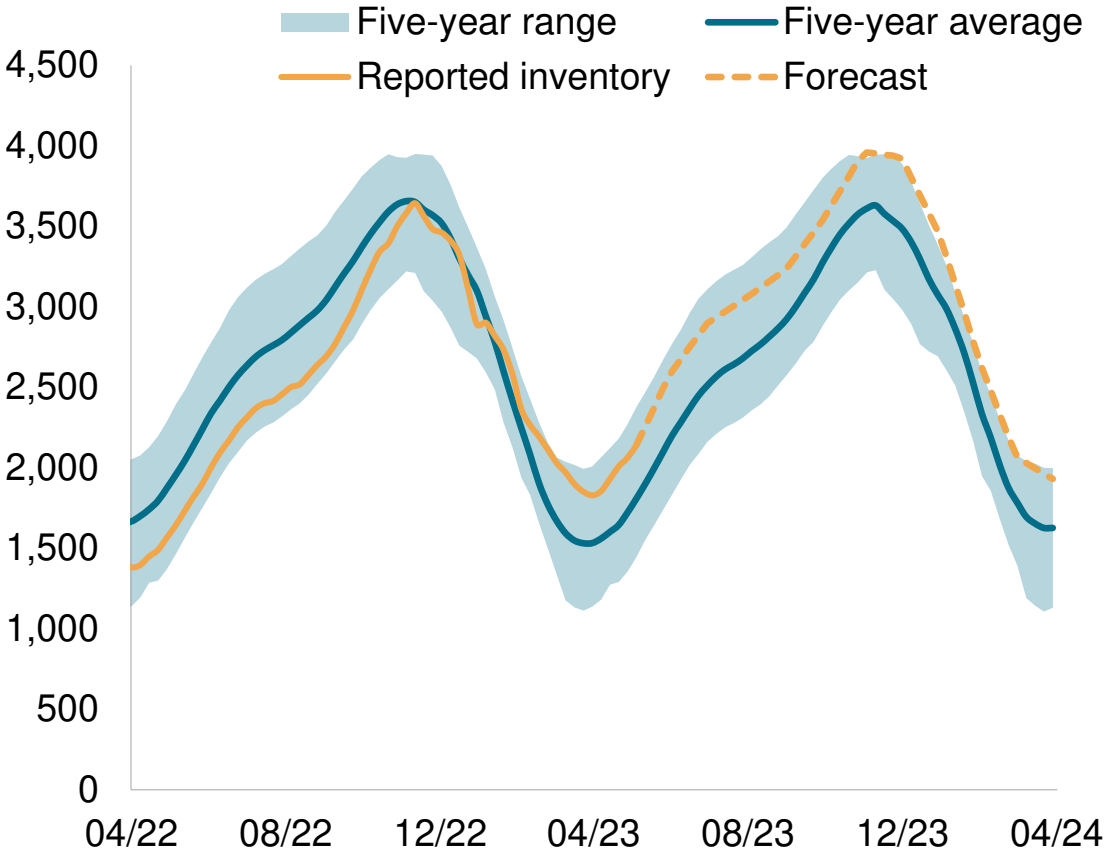


Data compiled May 12, 2023.  
Sources: CER; S&P Global Commodity Insights, Canada Energy Regulator (CER), .

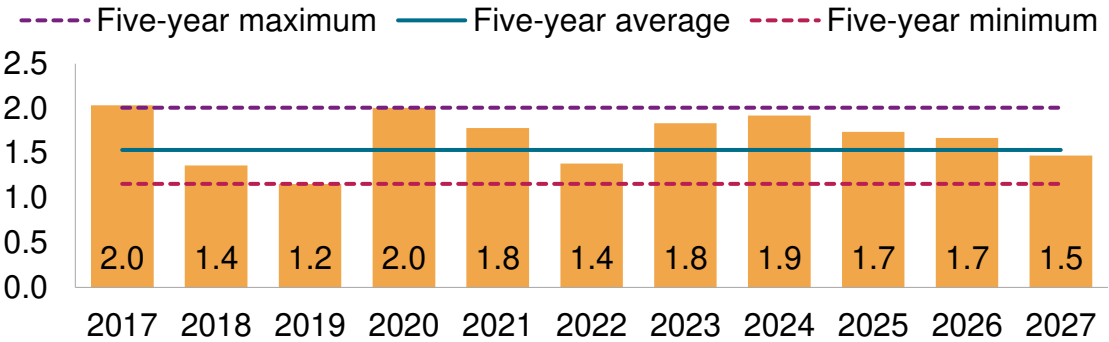
# US Lower 48 storage inventory expected to remain above five-year average

Absent above-normal temperatures this summer, storage could easily surpass 4 Tcf

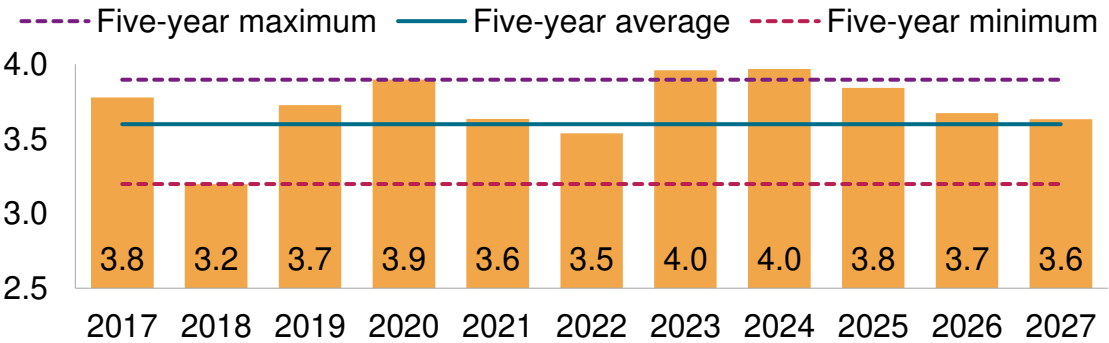
US Lower 48 storage inventory (Bcf)



US Lower 48 March inventories (Tcf)



US Lower 48 October inventories (Tcf)

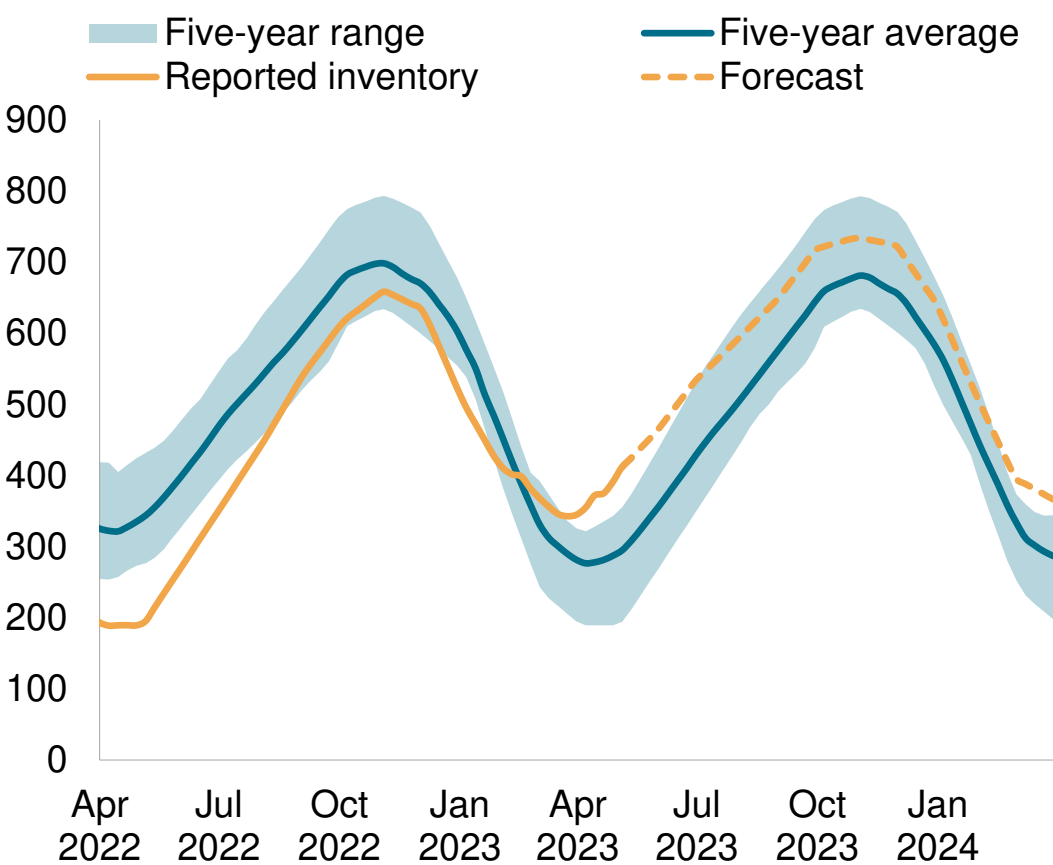


Data compiled May 12, 2023.  
Sources: S&P Global Commodity Insights; EIA.

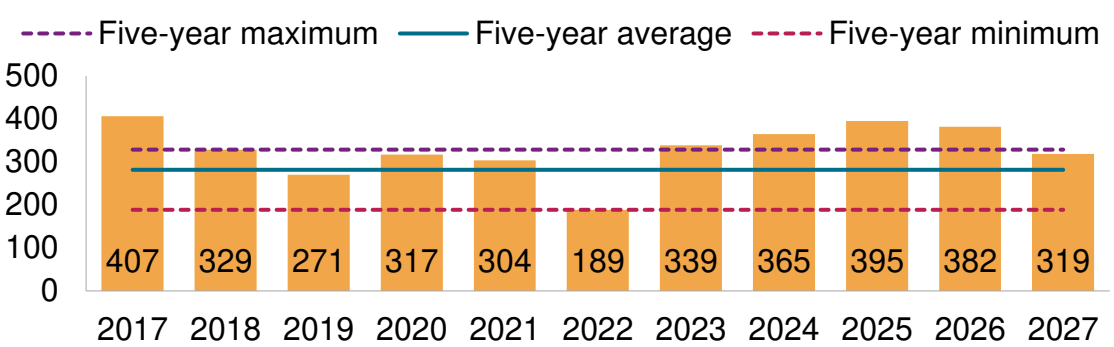
# Mild weather and strong production have led to higher Canadian inventories

Canada inventories look healthy throughout the short-term outlook

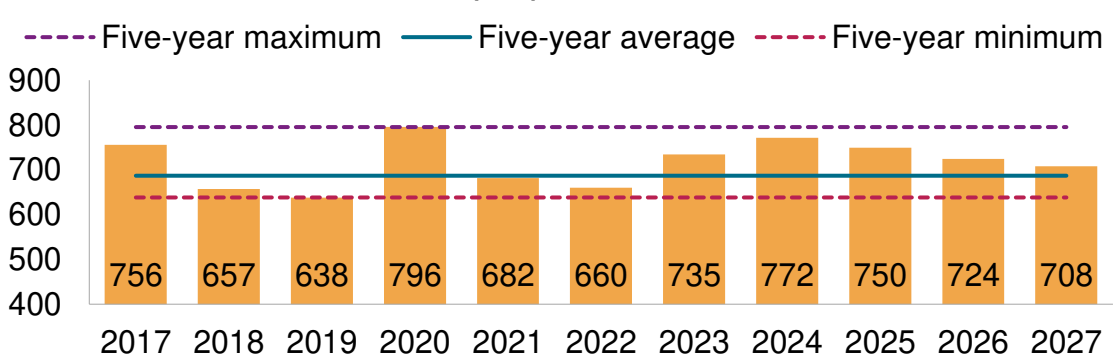
Canadian storage inventory (Bcf)



Canadian March inventories (Bcf)

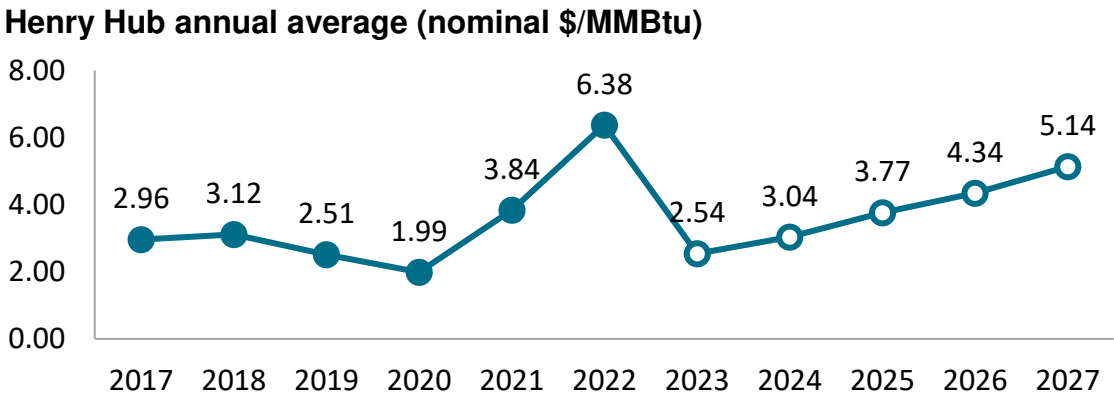
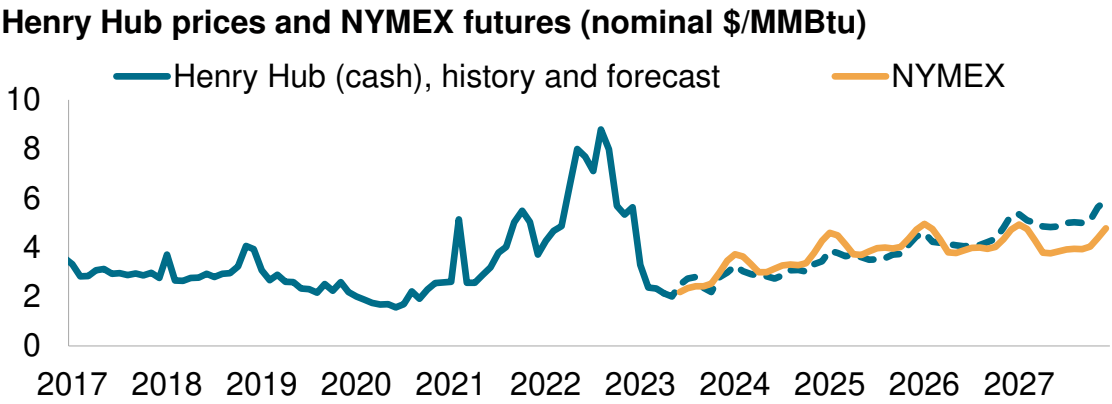


Canadian October inventories (Bcf)



Data compiled May 18, 2023.  
Sources: S&P Global Commodity Insights; Statistics Canada.

# Henry Hub expected to average \$2.54/MMBtu in 2023, as bearish fundamentals have taken hold of the market



Henry Hub outlook and NYMEX comparison (nominal \$/MMBtu)

	Summer 2022	Summer 2023	Summer 2024	Winter 2021–22	Winter 2022–23	Winter 2023–24	2021	2022	2023	2024	2025	2026	2027
Henry Hub	7.39	2.39	2.92	4.51	3.79	3.00	3.84	6.38	2.54	3.04	3.77	4.34	5.14
NYMEX	7.57	2.29	3.19	5.30	4.43	3.42	3.84	6.64	2.73	3.42	4.13	4.21	4.20

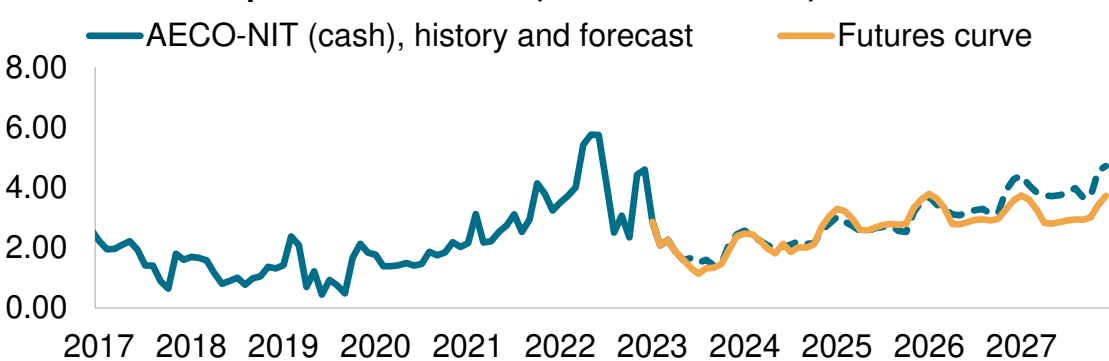
The market gets very loose as demand and export growth slow in 2023–24, while production, namely associated gas production, maintains pace, bringing storage inventories toward the five-year maximum and prices lower. Thereafter, export growth resumes, placing upward pressure on Henry Hub in 2025 and beyond.

Data compiled May 12, 2023.  
New York Mercantile Exchange history is monthly settlement and futures as of May 11, 2023.  
Source: S&P Global Commodity Insights.

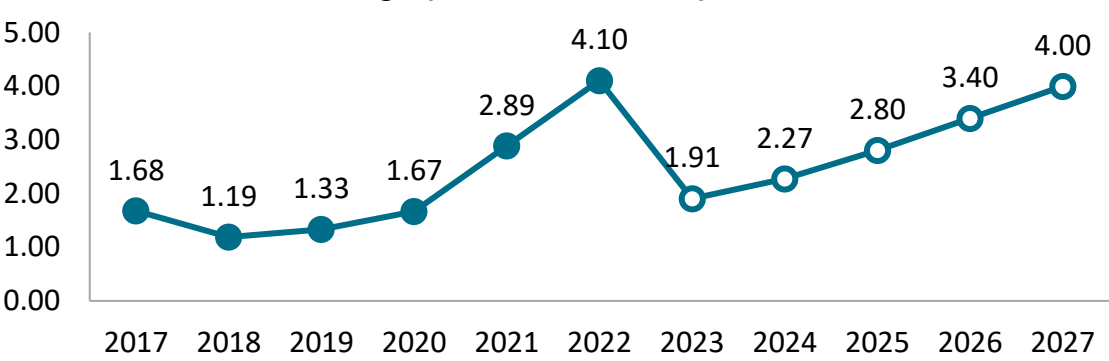


# AECO-NIT falls below \$2 in 2023, but increases through the forecast as LNG exports begin

AECO-NIT cash prices and futures (nominal \$/MMBtu)



AECO-NIT annual average (nominal \$/MMBtu)



The revised short-term price path is now slightly lower in 2024 but rebounds to higher annual averages from 2025 through 2027. The gas market remains well supplied through 2024 with high storage inventories and little incremental demand. An acceleration of LNG projects in the US Gulf, along with the start of Canadian LNG lifts prices in the outer years.

AECO-NIT outlook and futures comparison (nominal \$/MMBtu)

	Summer 2022	Summer 2023	Summer 2024	Winter 2021/22	Winter 2022/23	Winter 2023/24	2021	2022	2023	2024	2025	2026	2027
AECO-NIT	4.14	1.59	2.10	3.65	2.40	2.35	2.89	4.10	1.91	2.27	2.80	3.40	4.00
Basis to HH	-3.25	-0.80	-0.82	-0.86	-1.39	-0.65	-0.95	-2.28	-0.63	-0.77	-0.97	-0.94	-1.14
Futures curve	4.72	1.44	1.98	3.56	2.82	2.30	2.78	4.32	1.80	2.23	2.95	3.14	3.16

Data compiled May 15, 2023.  
History is monthly settlement and futures as of May 11, 2023.  
Sources: S&P Global Commodity Insights; CME Group.

**Natural  
Gas**

# Key takeaways

Domestic demand is relatively flat in as growth in industrial demand is counterbalanced by declines in power demand.

The current wave of LNG development is nearly done. The next wave is not until late-2024, causing a lull in export growth.

LNG Canada start date is now Jan. 2026 but ramps up faster.



Production grows with demand, but Appalachian gas is constrained by infrastructure.

In Canada, Montney will be the main source of growth but access in BC is evolving.

The outlook does not include any impact from the proposed Federal 2030 Emissions Reduction Plan.

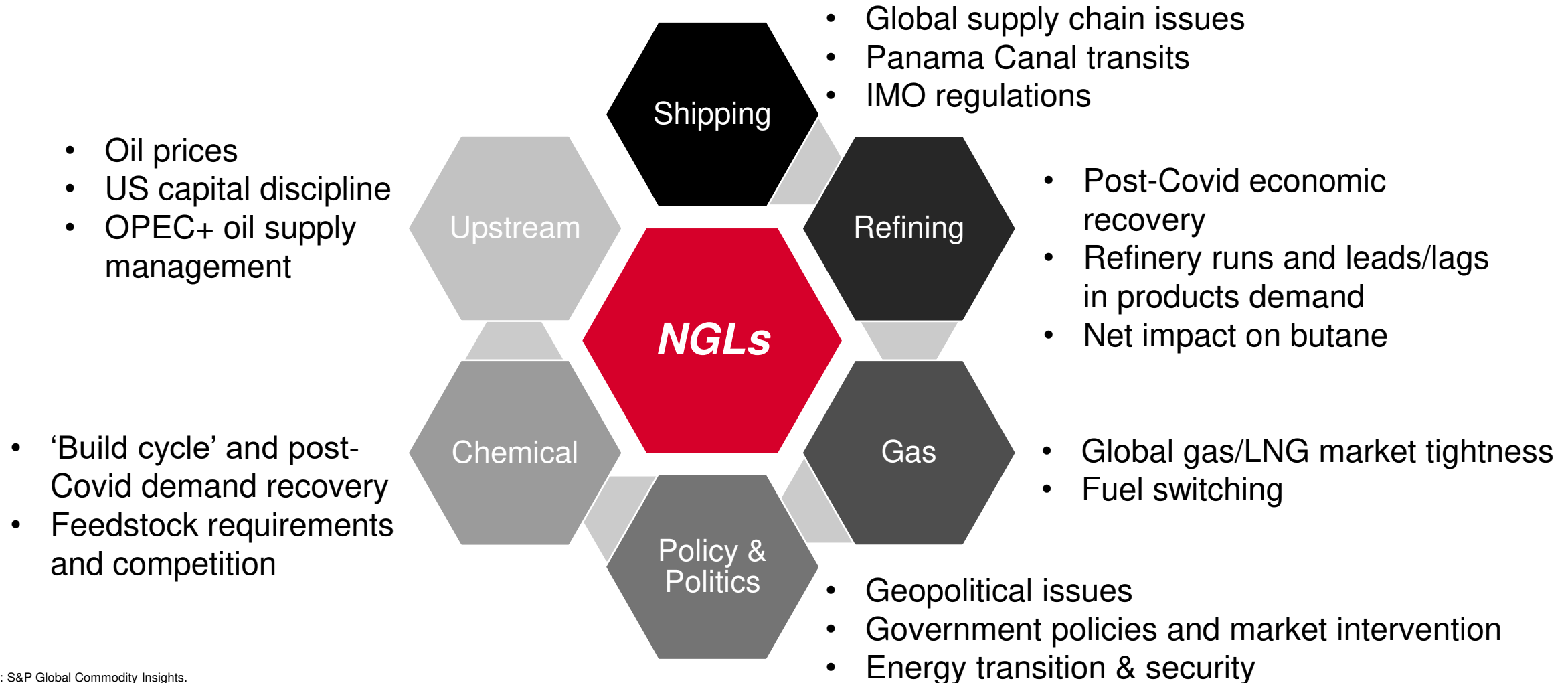
**Low prices into 2024, before the next wave of LNG spurs a recovery**

# NGL Market Overview: Global NGL Market Outlook

Jordan Woloschuk / Commodity Insights / Associate Director



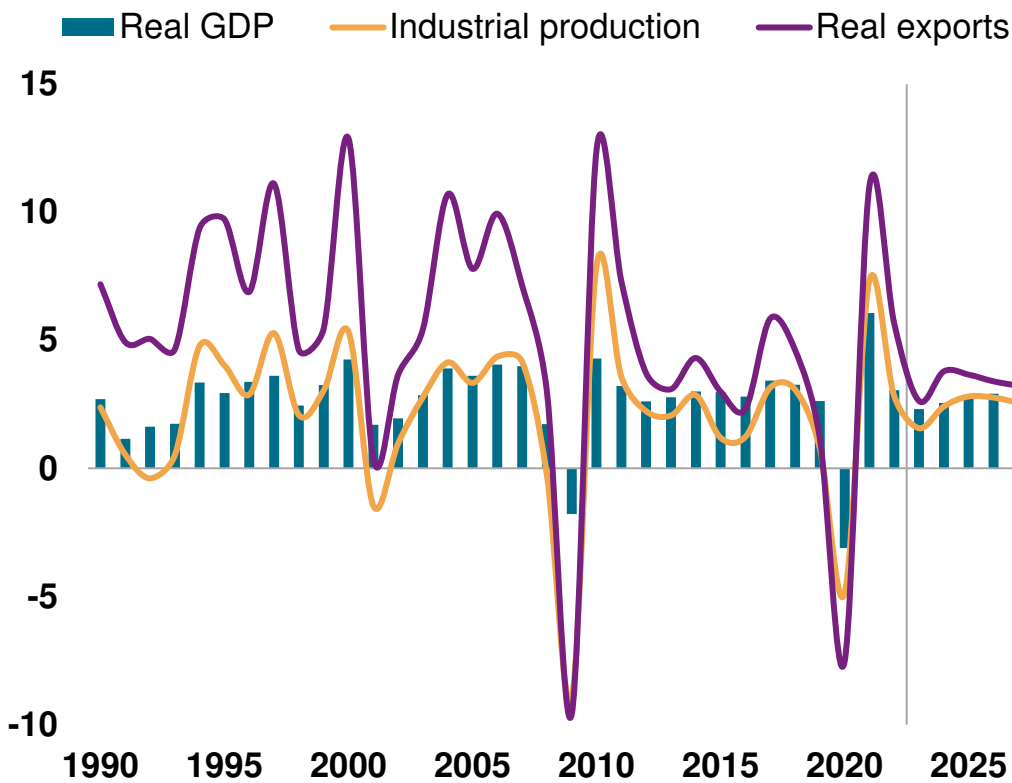
# NGL markets are shaped by and constantly reacting to the ebbs and flows in adjacent market developments



Source: S&P Global Commodity Insights.

# Global economic expansion continues at a slower pace in 2023 vs 2022; growth appears to be cooling as interest rates rise and market uncertainties rise

Global real GDP, industrial production, and real exports of goods and services (% change)



Data compiled May 15, 2023.  
Source: S&P Global Market Intelligence.

Real GDP (% change)

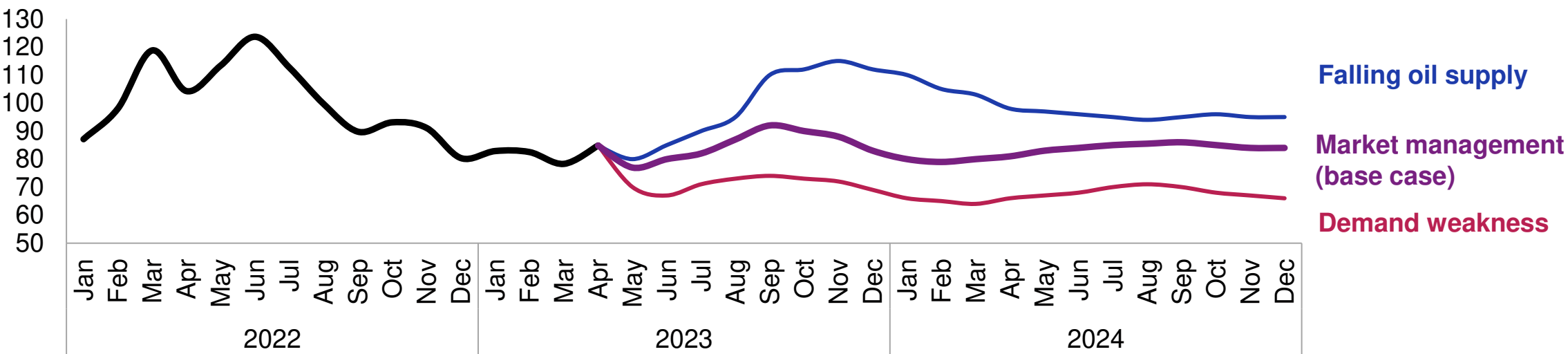
	2022	2023	2024	2025
World	3.1	2.3	2.6	2.9
United States	2.1	1.2	0.9	1.6
Canada	3.4	1.4	1.6	1.9
Eurozone	3.6	0.9	1.1	1.7
United Kingdom	4.1	0.2	0.6	1.2
Mainland China	3.0	5.5	5.3	5.0
Japan	1.0	1.0	1.2	1.0
India*	6.7	5.2	6.1	6.0
Brazil	3.0	1.6	2.2	3.1
Russia	-2.1	-0.6	1.5	1.6

Data compiled May 15, 2023.  
\*Fiscal year starting Apr. 1, 2023  
Source: S&P Global Market Intelligence.



# The base-case oil price scenario assumes strong Chinese demand growth amid gains in non-OPEC supply, while Russian output shows resiliency

Dated Brent price scenarios (\$US/bbl)



Dated Brent annual average price (\$US/bbl)

	2022	2023	2024
Historical	\$101	-	-
Market management (base case)	-	\$84	\$83

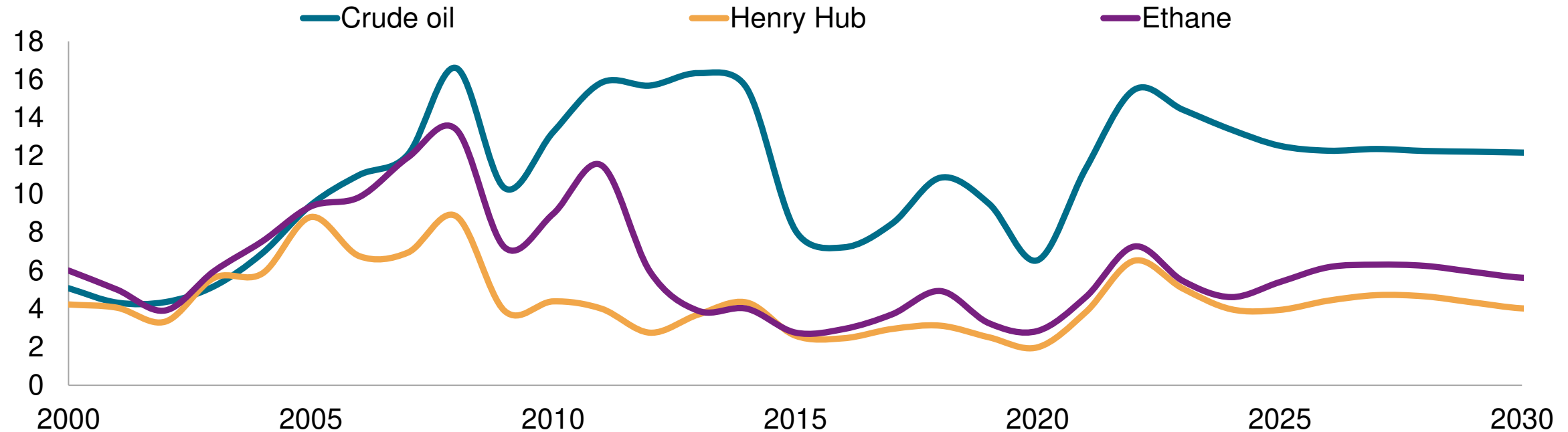
Data compiled May 15, 2023.  
Prices shown are indicative monthly price averages and not intended to project daily/weekly high and low prices.  
Sources: S&P Global Commodity Insights; Argus Media Limited (historical prices).

- **Market management (base case):**
  - Mainland China boosts demand growth. OPEC+ manages supply to maintain price floor. Russian oil exports are resilient. The US debt issue is resolved, at least temporarily.
- **Falling oil supply:**
  - Up to 2 MMb/d of Russian oil exports are lost. Spare capacity shrinks to 1 MMb/d or less.
- **Demand weakness:**
  - Global inventories swell and world demand growth is 1 MMb/d or less in 2023.

# Ethane remains at an average ~\$1/MMBtu premium to natural gas through 2030

Post 2030 premium increases as marginal ethane barrel shifts from Permian to farther regions to meet demand

## United States oil, gas and ethane price (\$/MMBtu)



**Spread between crude oil and natural gas makes ethane a competitive feedstock for ethylene production**

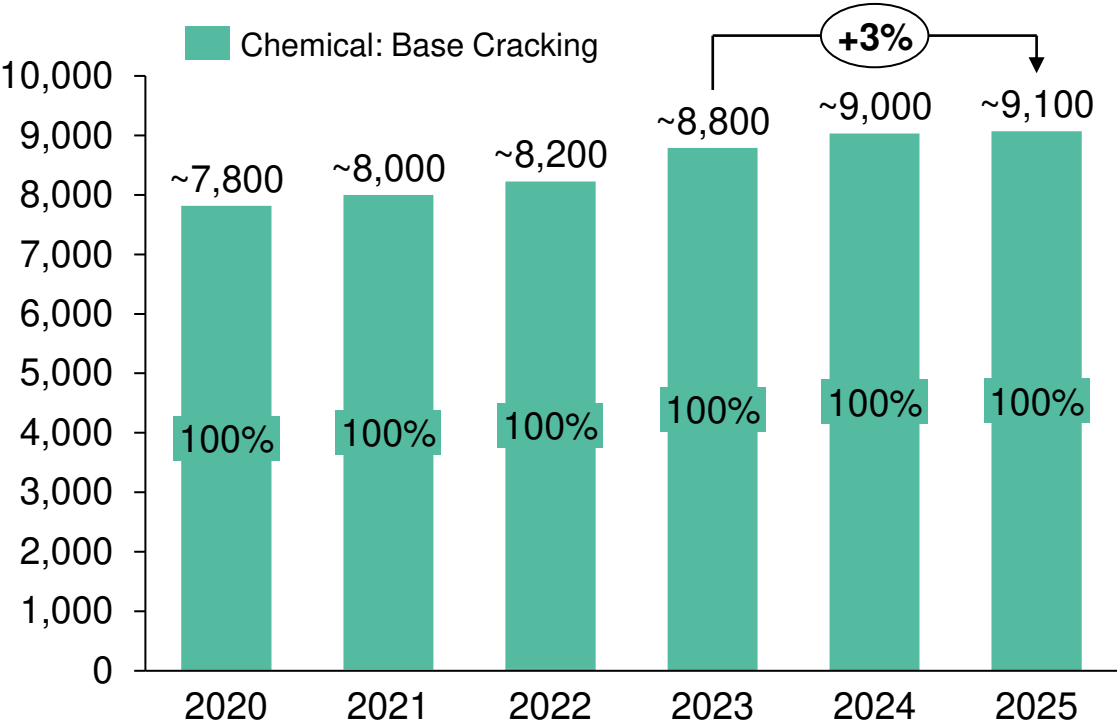
Data compiled March 2023.

Sources: S&P Global Commodity Insights; Argus Media Limited; OPIS, a Dow Jones Company; Intelligence Press.

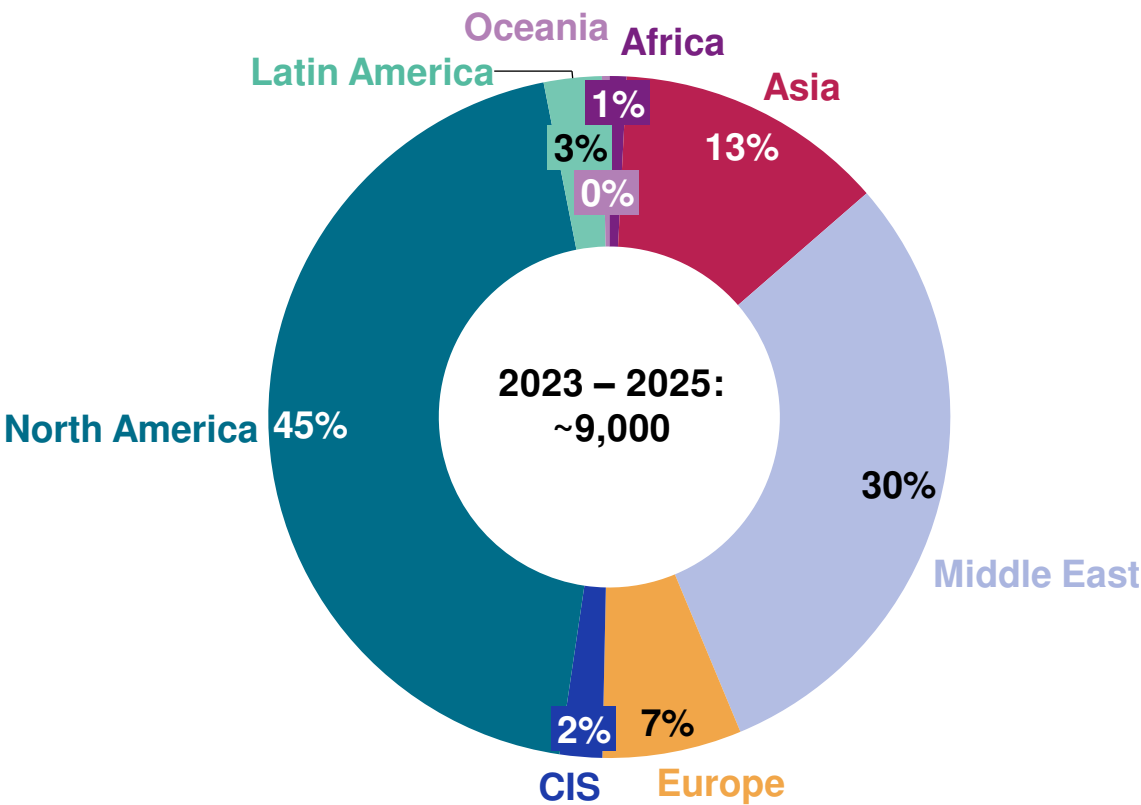
Ethane

Ethane market primary driven by North America and the Middle East; demand is effectively driven entirely by base chemical cracking

Global Ethane Demand by Source  
(Thousand Metric Tons per month)



Global Ethane Demand by Region  
(Thousand Metric Tons per month)

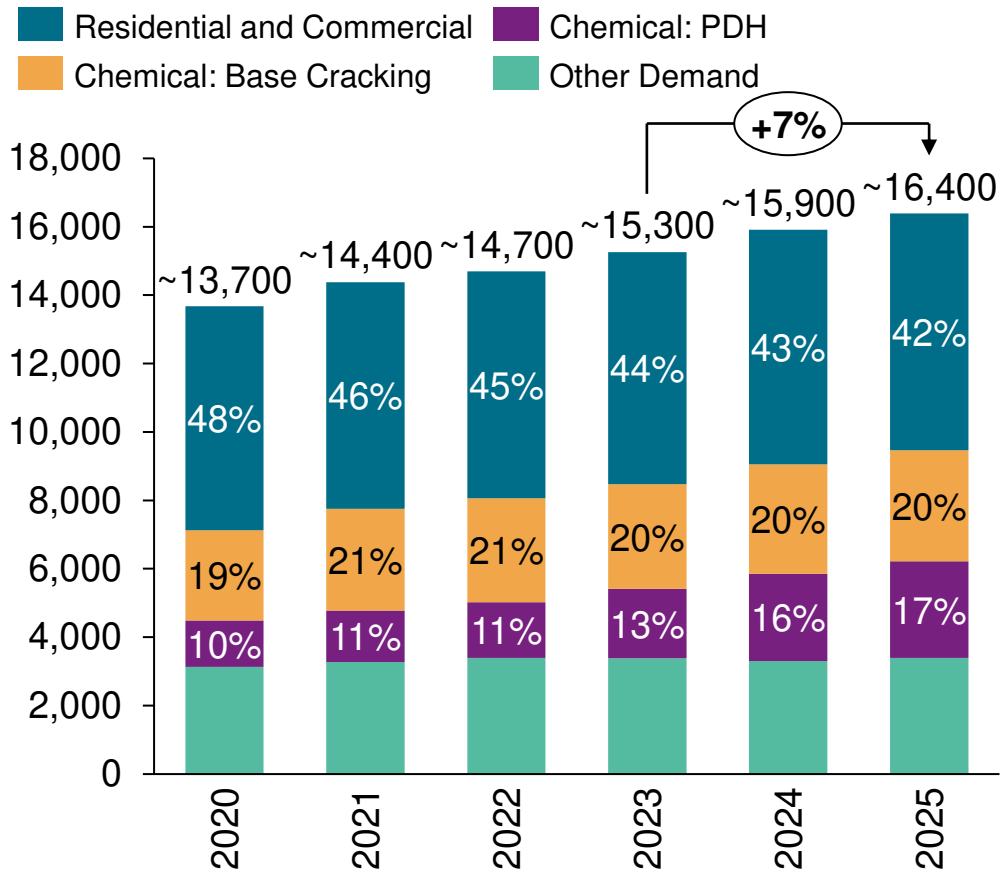


Data compiled May 2023.  
Notes: Global demand/supply estimates based on monthly STO and ASW reports (May 2022). Global demand/supply balance based off prior month regional outlooks. Monthly ethane data is only available for select countries in North America, Latin America, Europe and Africa. For all other regions, a monthly average has been assumed based on the annual figure. One metric ton of ethane equals ~17.6 barrels.  
Source: S&P Global Commodity Insights

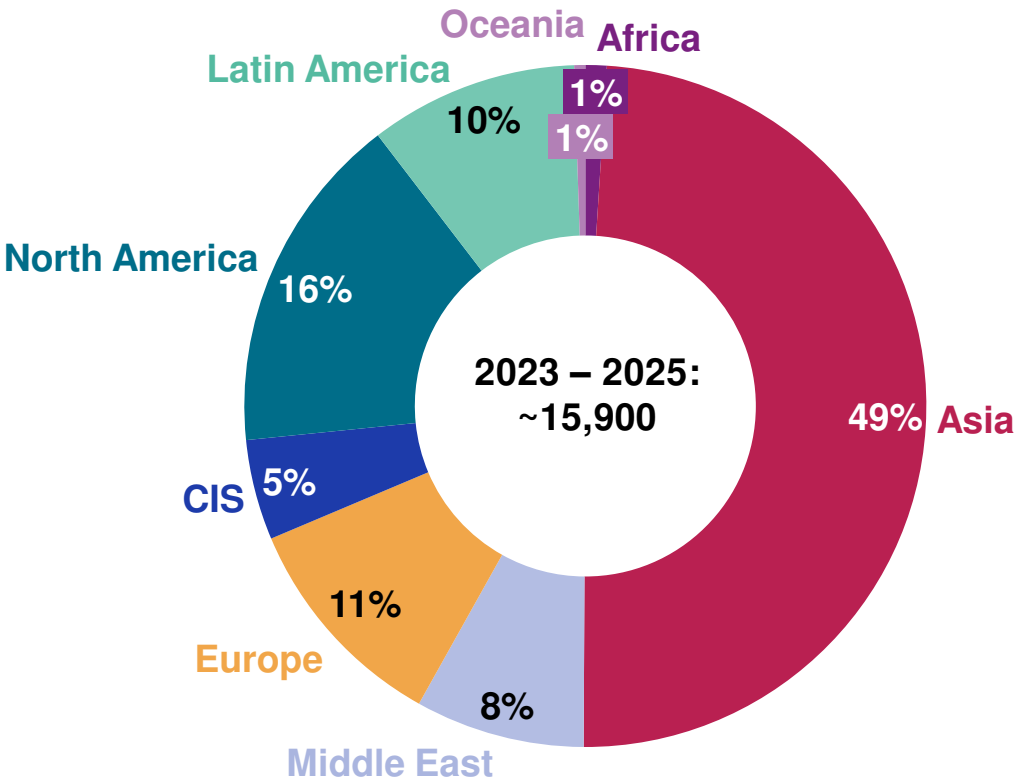
Propane

Base chemical cracking and PDH demand expected to increase in outlook; Asia expected to account for nearly 50% of propane demand

Global Propane Demand by Source  
(Thousand Metric Tons per month)



Global Propane Demand by Region  
(Thousand Metric Tons per month)



Data compiled May 2023.

Notes: Global demand/supply estimates based of monthly STO and ASW reports (May 2022). Global demand/supply balance based off prior month regional outlooks. Supply includes net storage withdrawals. One metric ton of ethane equals ~12.4 barrels.

Source: S&P Global Commodity Insights

**LPG**

# Key LPG markets to watch globally: How will global waterborne LPG trade flows change across key export and import markets in 2023?

Global waterborne LPG trade (Million Metric Tons)



- Will North America upstream and midstream investment be sufficient to meet increasing global waterborne LPG demand?
- Will OPEC+ production target cuts hamper Middle East LPG volumes available for export?

**LPG is a globally traded commodity, with the United States and Middle East dominating supply growth and balancing between the evolving regional demand markets.**

Data compiled January 2023.

\*Illustrative 2023 waterborne import and export volumes. Other export regions include the Mediterranean, North Sea, and West Africa. Other import regions include India, Southeast Asia, Northwestern Europe, Latin American and the Mediterranean. One metric ton of LPG equals ~11.6 barrels.

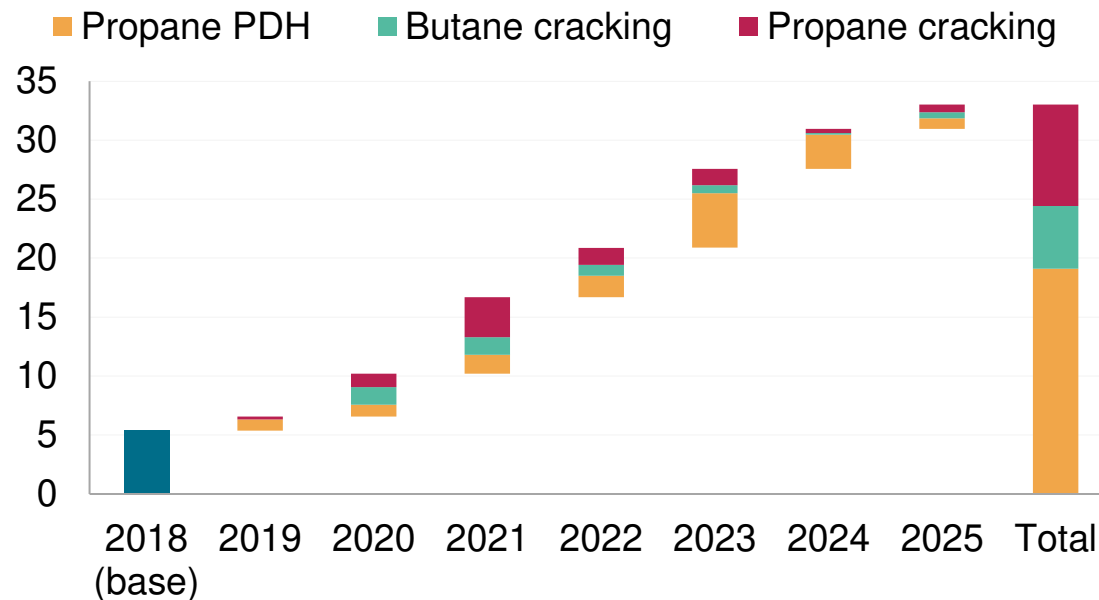
Source: S&P Global Commodity Insights.



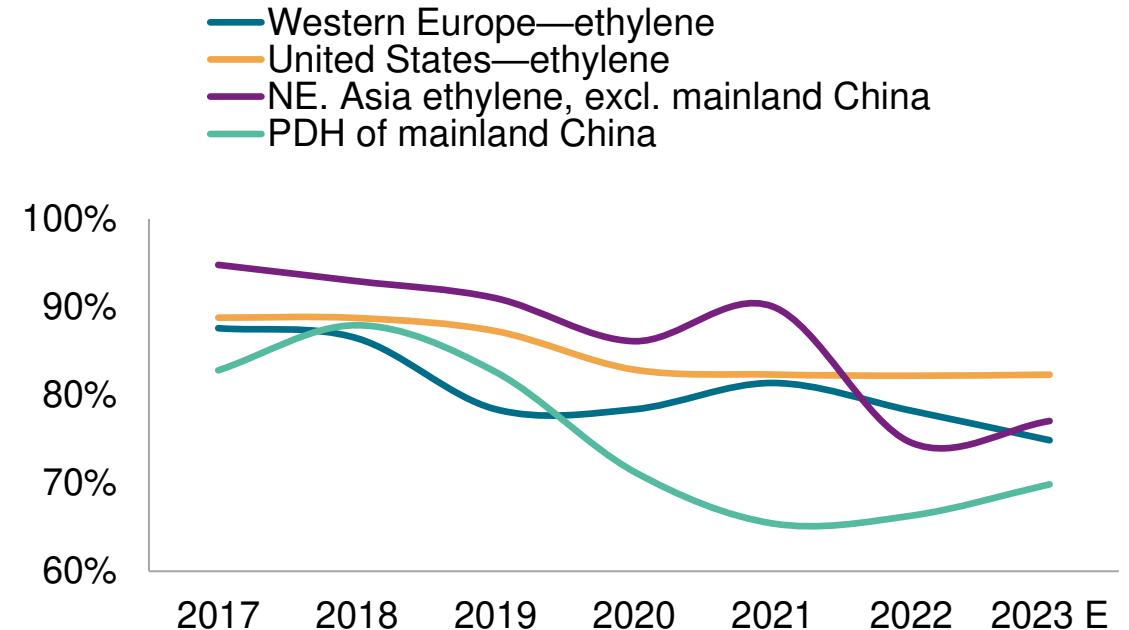
**LPG**

# Asia is expected to consume greater volumes of LPG feedstock compared to other markets: When will utilization rates improve?

**Year-on-year growth of new olefins plants—driven LPG demand in mainland China (Million Metric Tons)**



**Utilization rates of global olefins plants (Percentage)**



**Boosted by the new olefin capacity additions in mainland China, LPG demand for olefins went up in 2022 despite the lowered run rates of existing olefin plants amid the weakened chemicals market – expectation that Asian run rates will improve in 2023**

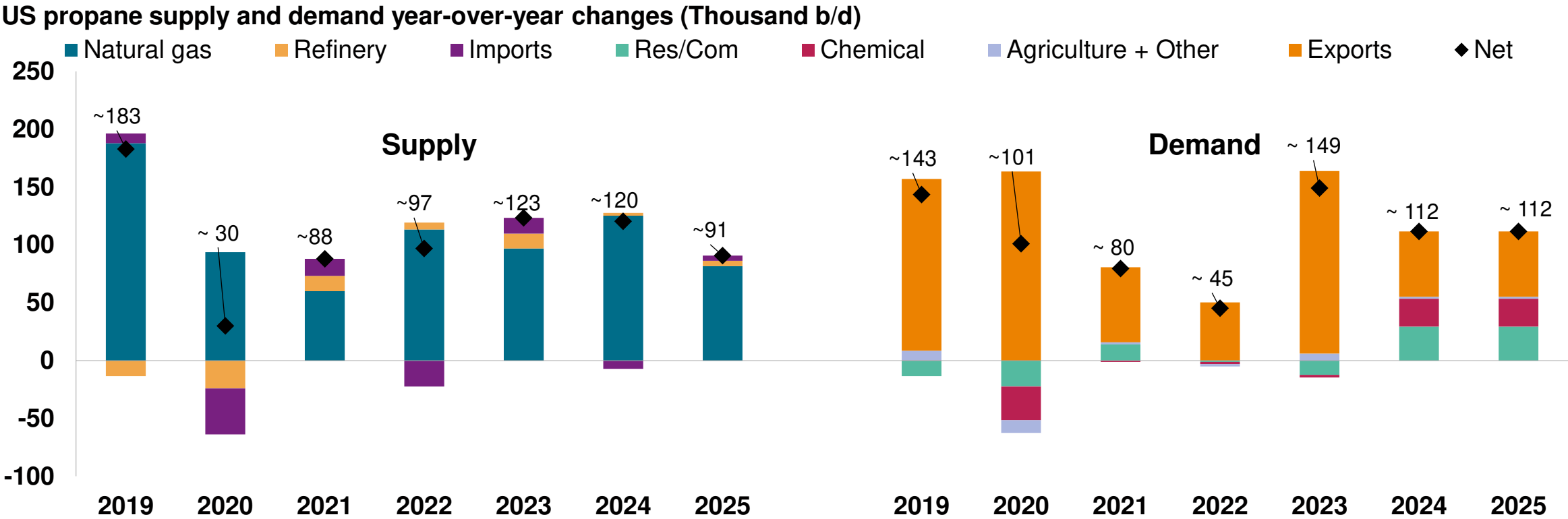
Data compiled January 2023.

N. America = North America. NE. Asia = Northeast Asia. PDH = propane dehydrogenation. One metric ton of propane equals ~12.4 barrels. One metric ton of butane equals ~11.1 barrels.

Sources: S&P Global Commodity Insights; Chemical Market Analytics by OPIS, a Dow Jones Company.

Propane

US propane exports are expected to increase by ~ 150 mb/d to support incremental demand as Middle East LPG growth is expected to be limited

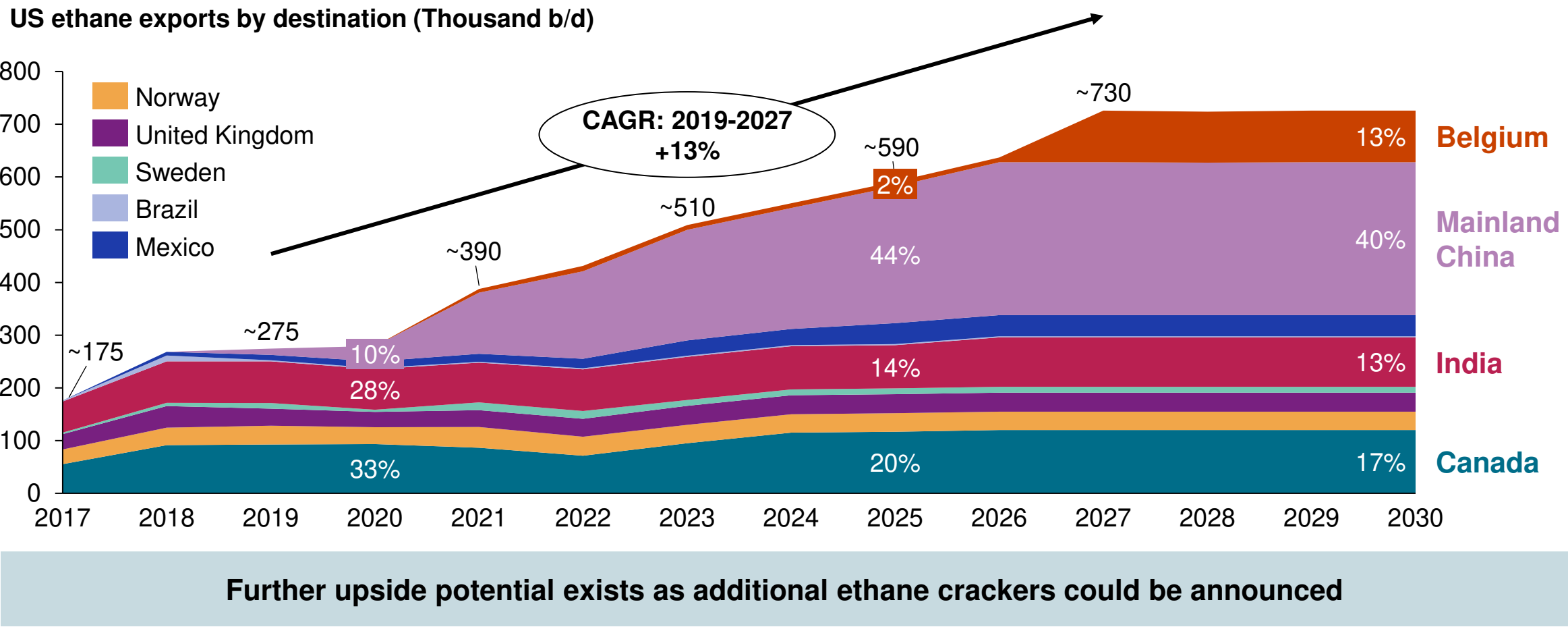


Increasing petrochemical demand in 2023-2025 could tighten market even further

Data compiled May. 31, 2023.  
Source: S&P Global Commodity Insights.

Ethane

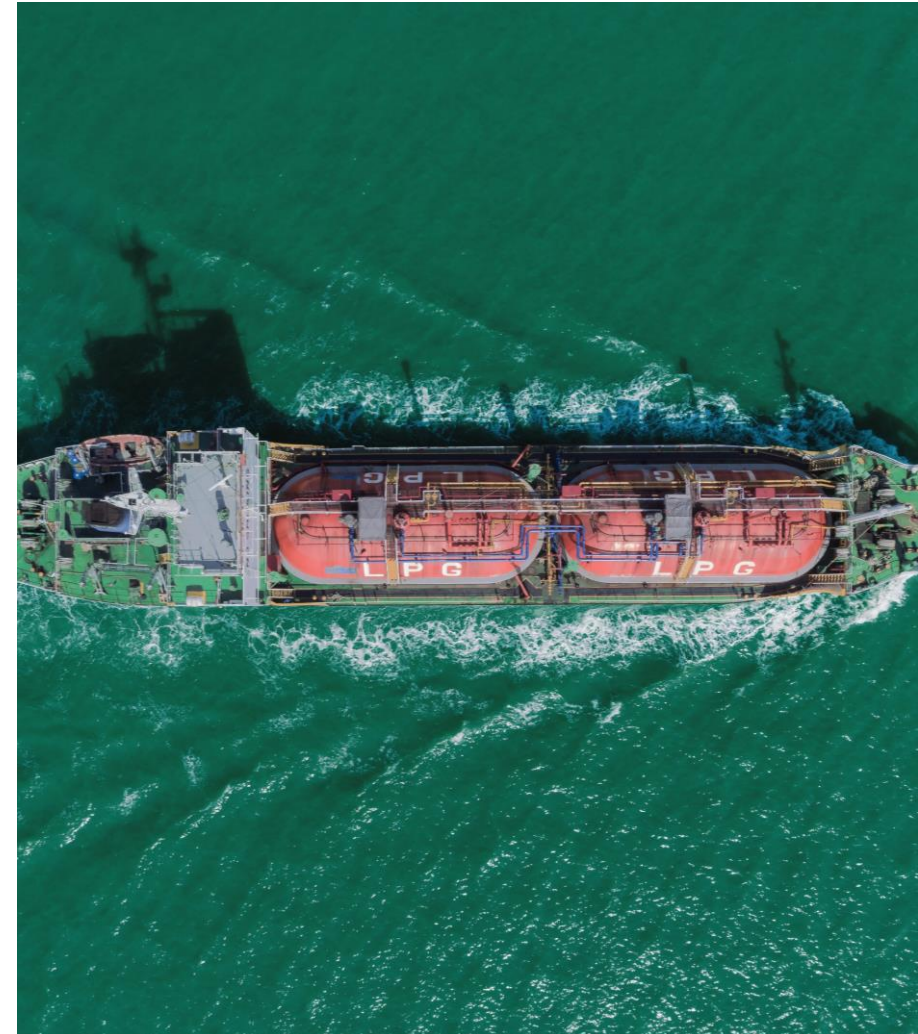
US ethane exports continue to grow, backed by long-term commitments to Asia and Europe; US ethane exports rose 38% in 1Q2023 vs 1Q2022



Data compiled May. 31, 2023.  
Source: S&P Global Commodity Insights.

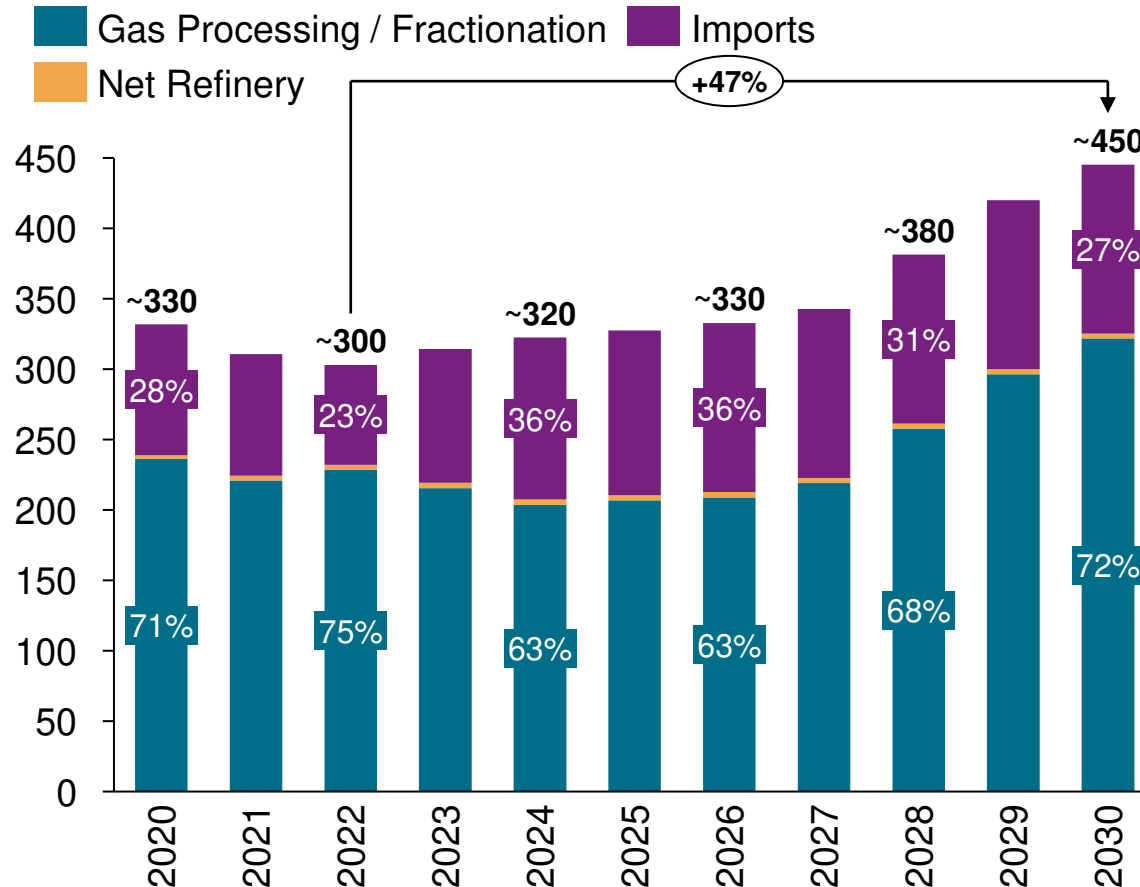
# NGL Market Overview: Canada NGL Market Outlook

Jordan Woloschuk / Commodity Insights / Associate Director



**Ethane**

# Canadian ethane supply should increase from lows seen in 2022, but domestic production will remain soft until ethane demand recovers

**Canada ethane supply (Thousand b/d)**

- Production is expected to remain weak for the next few years owing to weaker petrochemical demand / ethylene margins, but demand is expected to increase with Nova Chemical's upcoming Corunna cracker expansion and Dow's net-zero ethylene cracker.
- It is anticipated that petrochemical plant operating rates will be lower over the next few years across North America. If Canadian rates are higher than forecasted, incremental production and/or imports will be required.

**Domestic production will ultimately depend on domestic petrochemical demand and US import volumes since varying quantities of Canadian ethane are currently rejected.**

Data compiled May. 31, 2023.

Notes: Supply excludes net inventory changes.

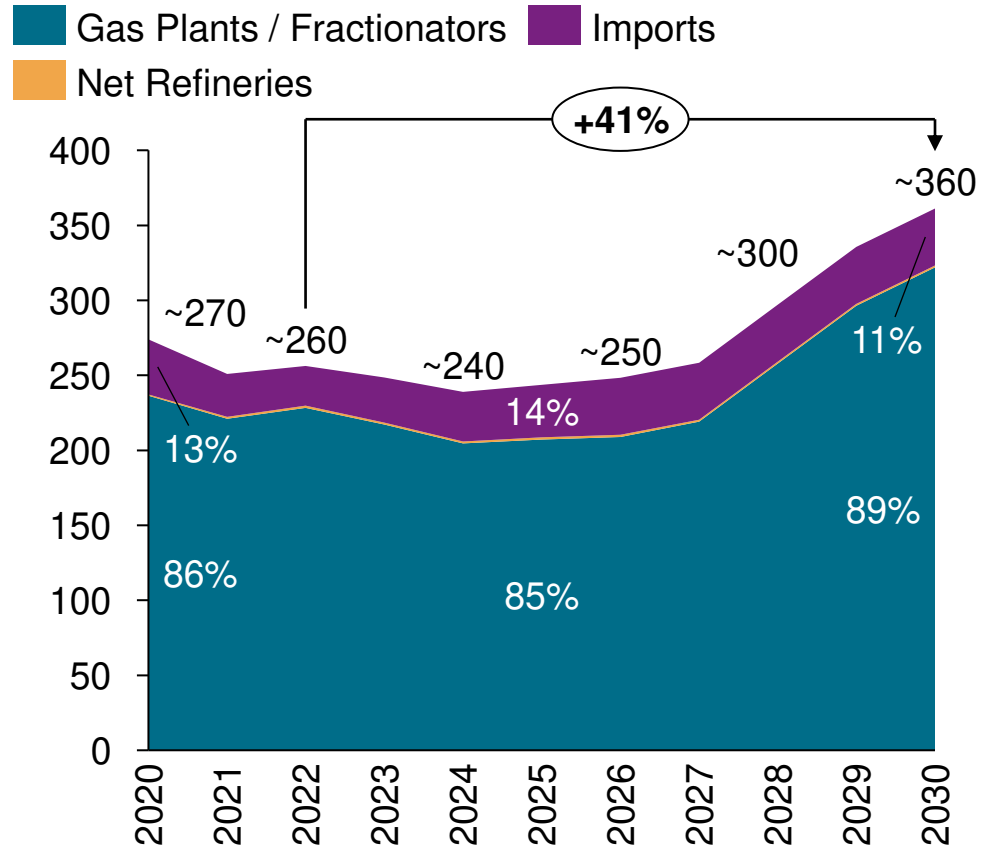
Sources: S&amp;P Global Commodity Insights, AER, Government of British Columbia, Government of Saskatchewan, Statistics Canada, CER, EIA



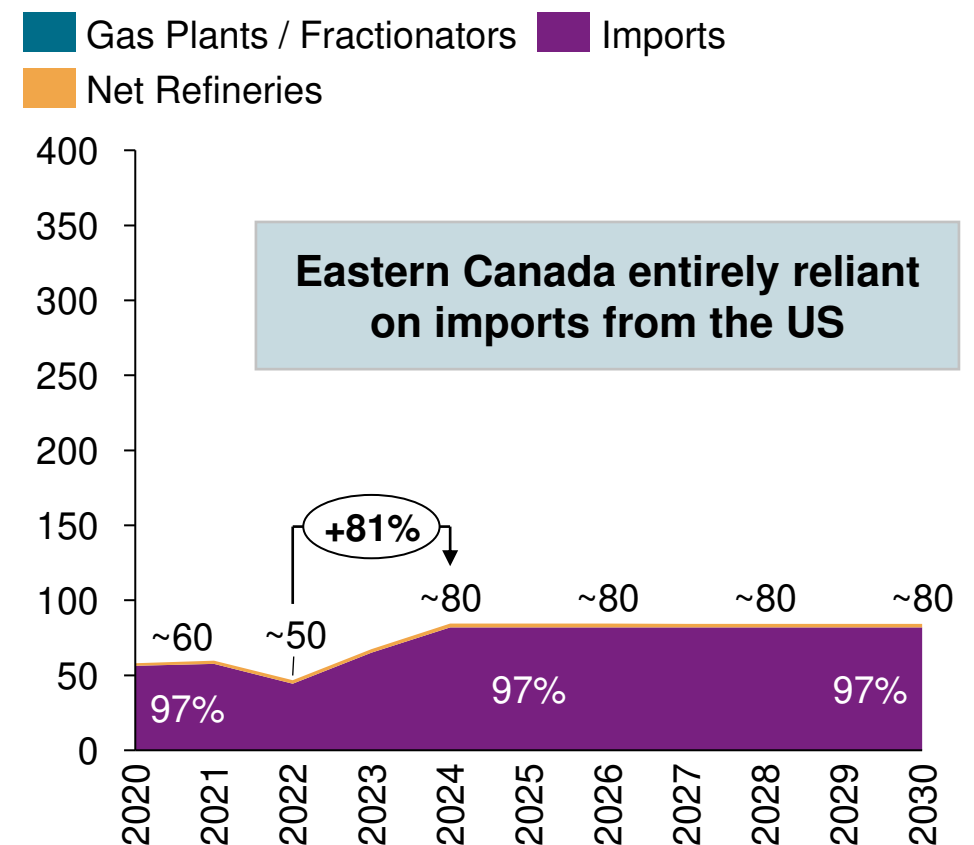
**Ethane**

Both Western and Eastern Canadian ethane supply are expected to increase before leveling out with the completion of upcoming projects

**Western Canada ethane supply / demand (Thousand b/d)**



**Eastern Canada ethane supply / demand (Thousand b/d)**



Data compiled May 2023.

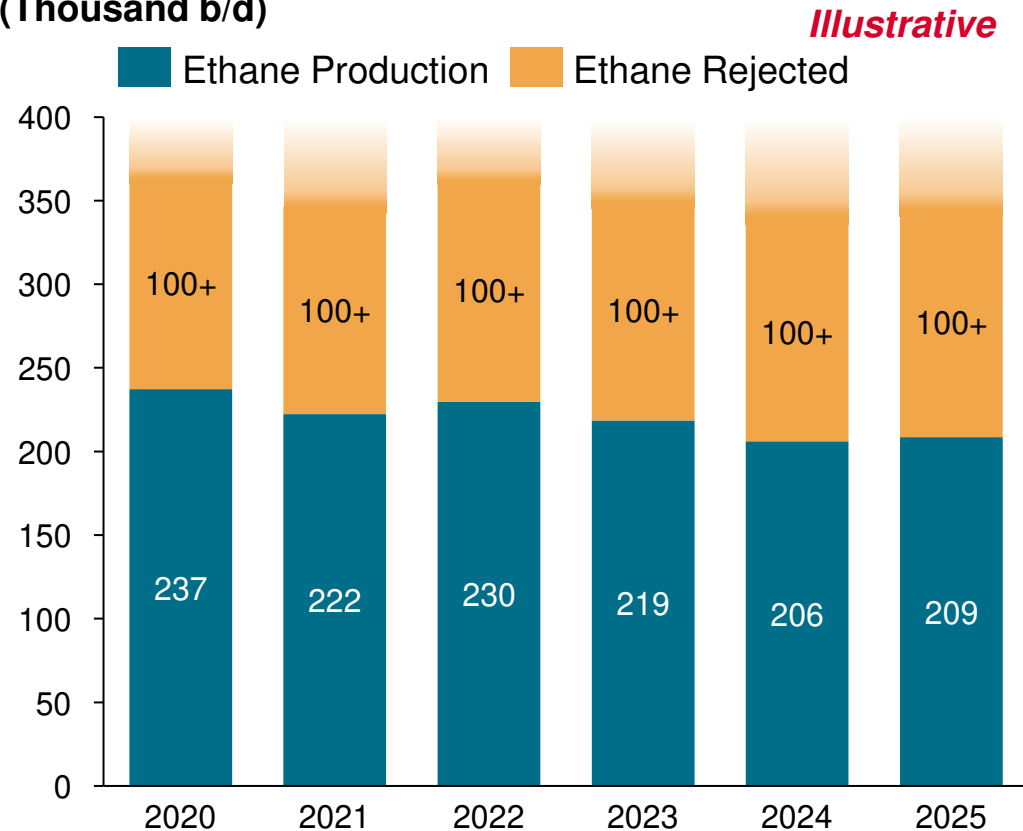
Notes: Excludes supply changes as a result of Reclassification/Other/Inventory Change and Inter-regional movements.

Sources: S&P Global Commodity Insights, Statistics Canada

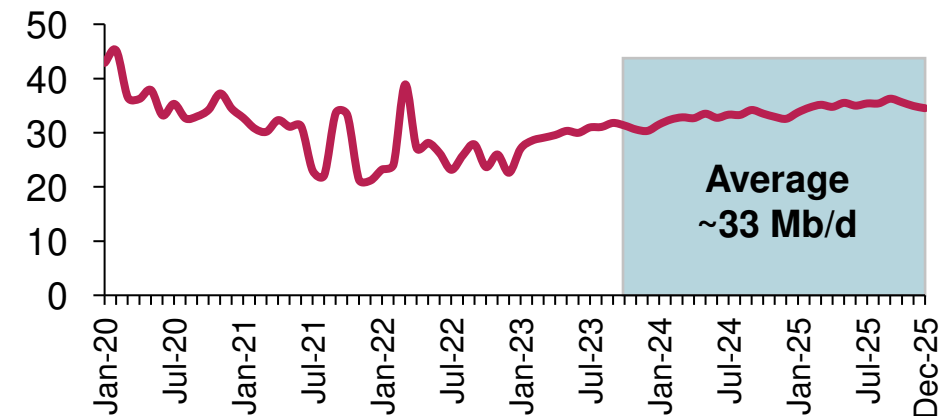
**Ethane**

Varying quantities of Canadian ethane are currently rejected but adequate supply is available; new extraction facilities would be required

**Western Canada estimated ethane rejection and production (Thousand b/d)**



**Alberta ethane imports (Thousand b/d)**



- Ample ethane supply should be available as feedstock for the new Dow ethylene complex that was announced in October 2021. Phase 1 of this project is slated to begin operations in late 2027 based on FID being made in 2023<sup>1</sup>.
- In May 2021, Wolf Midstream announced a positive final investment decision (FID) on a new project in Alberta called NGL North. This project is expected to be able to contribute to the recovery of additional ethane in Western Canada once Dow's cracker comes online.

Data compiled May 2023.

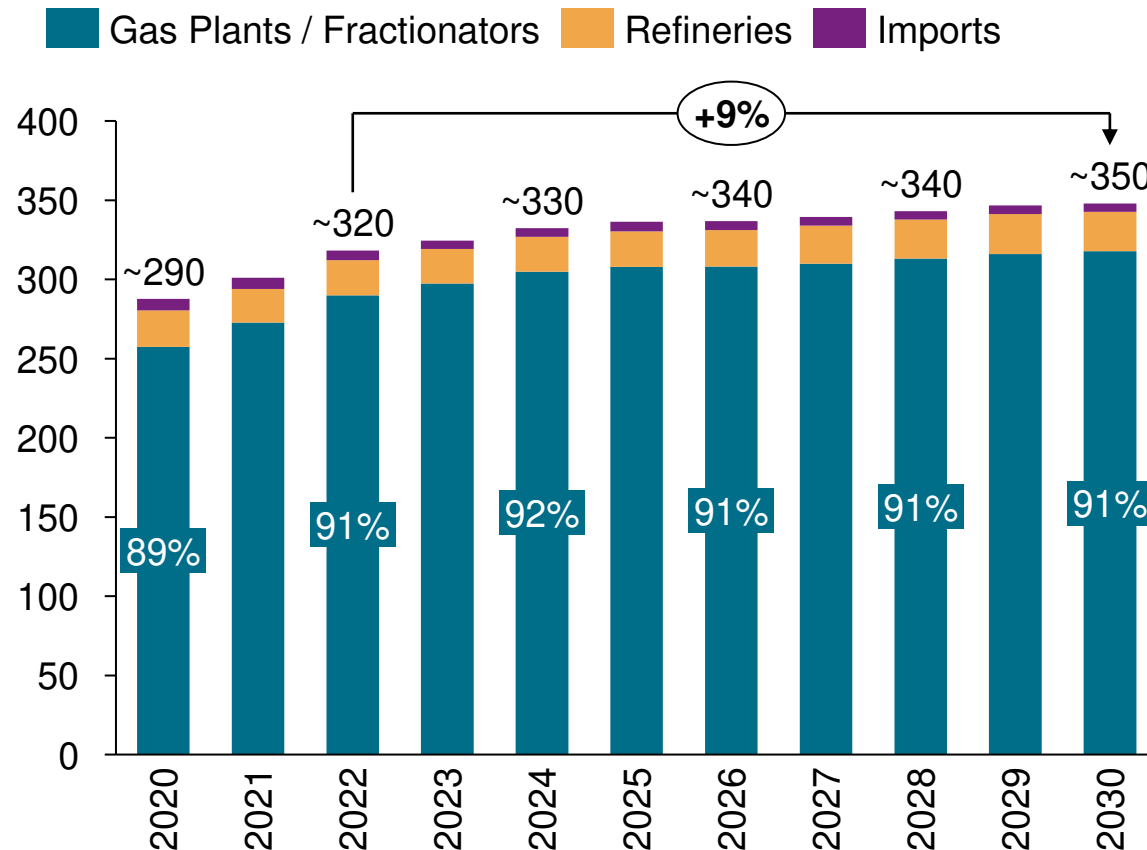
Notes: Rejected estimated based on Upstream reported gallons of NGLs produced per m<sup>3</sup> of gas processed. Assumed rejection rate of between 30-50%. 1) Dow's [Fort Saskatchewan Path2Zero](#) 2) Wolf Midstream's [NGL North](#)

Sources: S&P Global Commodity Insights, AER, Government of British Columbia, Government of Saskatchewan, Statistics Canada, CER, EIA, Dow, Wolf Midstream

## Propane

# Canadian propane supply is expected to continue recovering following a dip in 2020; longer-term outlook growth will be driven by LNG exports

## Canada propane supply (Thousand b/d)



Data compiled May 2023.

Notes: Supply excludes net inventory changes. Refinery production includes bio-propane production.

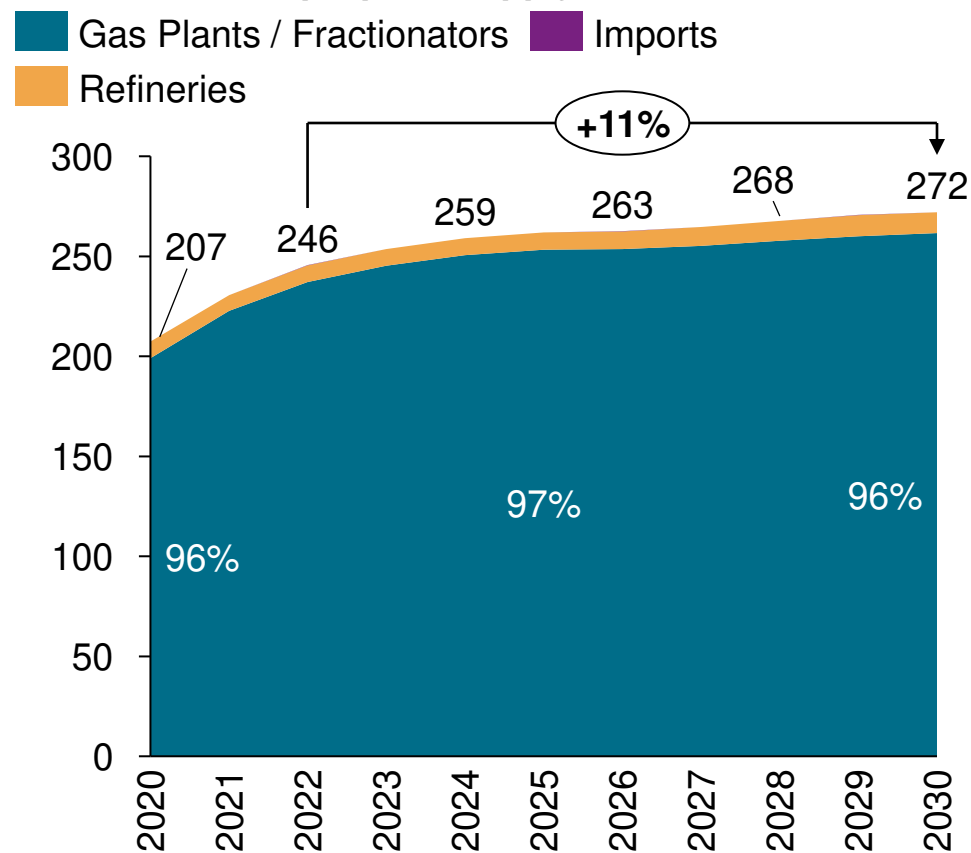
Sources: S&P Global Commodity Insights, AER, Government of British Columbia, Government of Saskatchewan, Statistics Canada, CER, EIA

- Canadian propane production for 2021 averaged around 294,000 b/d (higher compared to 2020 rates), while 2022 average production was stronger still at around 312,000 b/d.
- Production is expected to continue to grow and will average around ~323,000 b/d in 2023 and will increase to an average of ~337,000 b/d by 2025.
  - Natural gas production continues to be constrained by market access and will remain relatively flat until new LNG export terminals begin operations.
  - Domestic production far exceeds domestic demand; especially in Western Canada, and as a result excess barrels are directed towards the US market or West Coast marine export terminals.

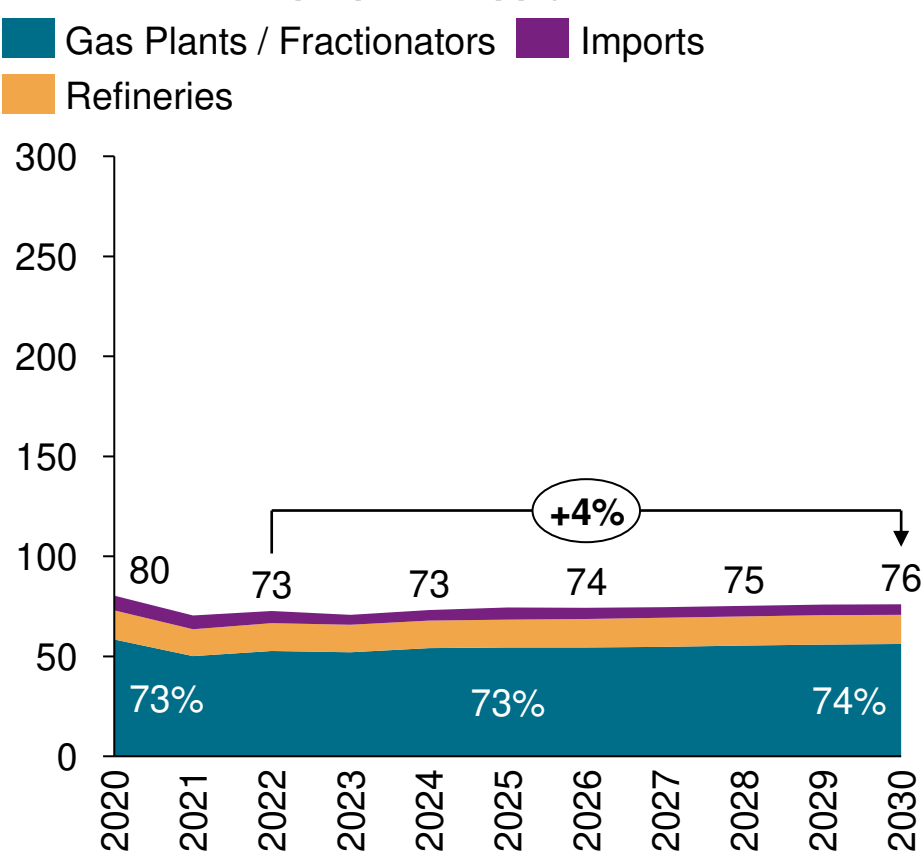
Propane

Western Canada is expected to see steady growth over the forecast period while Eastern Canada will see minimal growth

Western Canada propane supply / demand (Thousand b/d)



Eastern Canada propane supply / demand (Thousand b/d)



Data compiled May 2023.

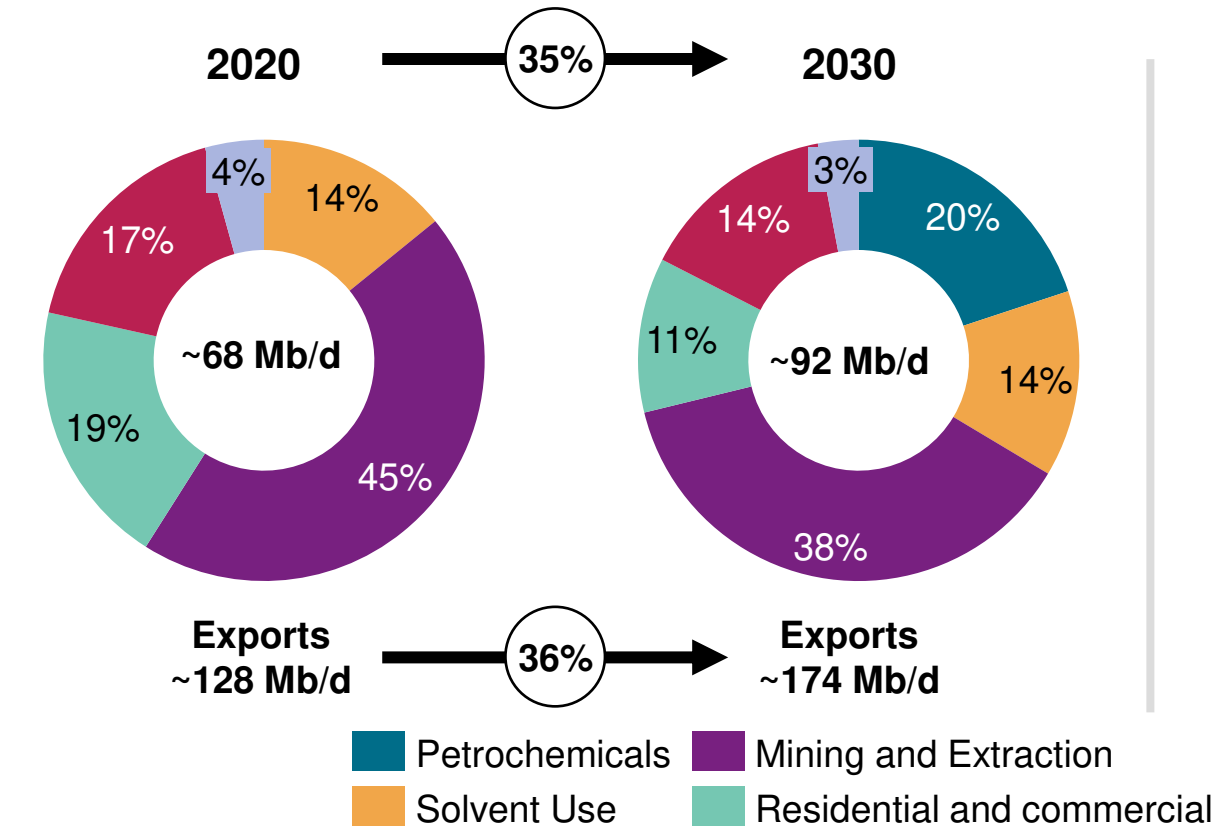
Notes: Excludes supply changes as a result of Reclassification/Other/Inventory Change and Inter-regional movements. Refinery production includes bio-propane production.

Sources: S&P Global Commodity Insights, Statistics Canada

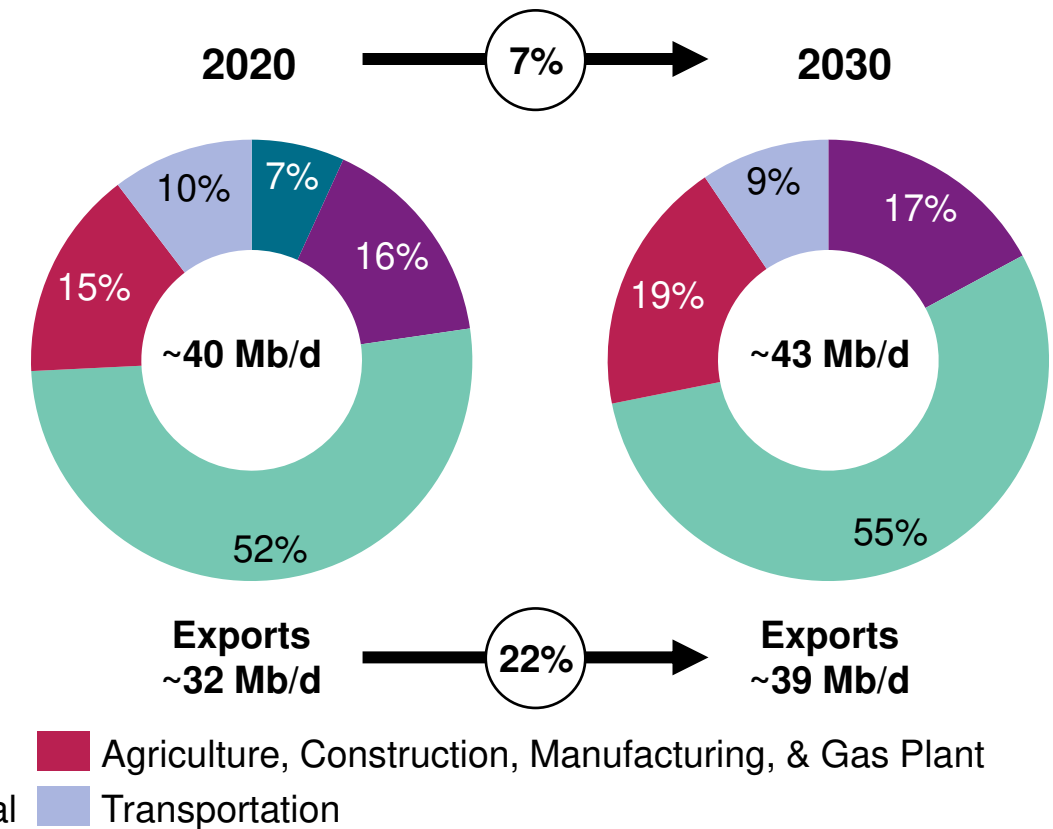
Propane

Western Canada domestic demand should increase, mainly as a result of new petrochemical demand; Eastern demand to remain relatively stable

Western Canada propane domestic demand by category



Eastern Canada propane domestic demand by category

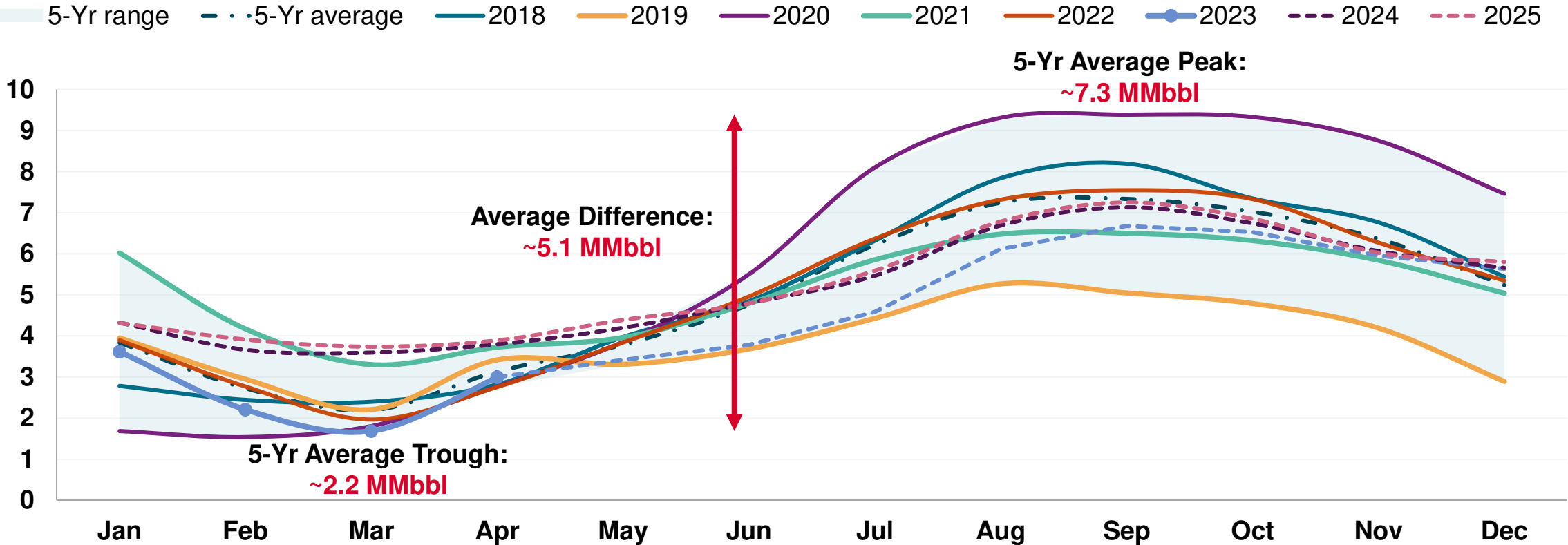


Data compiled May 2023.  
Sources: S&P Global Commodity Insights, Statistics Canada

Propane

Western inventories started 2023 slightly below historic levels; expectation that inventory peaks and troughs should remain relatively tight

Western Canada propane inventories (Million barrels)



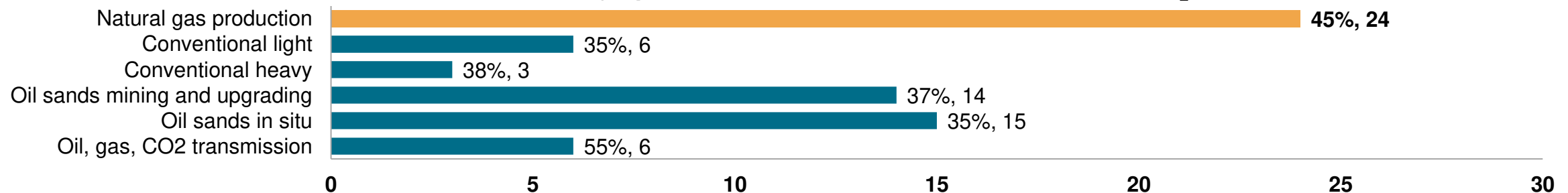
Data compiled May. 31, 2023.  
Sources: S&P Global Commodity Insights, AER, Government of British Columbia, Government of Saskatchewan, Statistics Canada, CER, EIA

# Government regulations on emissions may impact NGL outlook: How will industry respond to new government-imposed emission rules?

## Canada's proposed oil and gas emissions limits

- The government of Canada's policy proposals could result in a distinct and higher price for oil and gas sector emissions in Canada. Both approaches put forward have the potential to result in a higher price on emissions and cost for the oil and gas sector in Canada.
- Mandating oil and gas emissions limits could impact upstream investment and production in Canada. The creation of a separate and higher price increases uncertainty for further investments in the sector.
- The proposed oil and gas emission limits may increase the likelihood that Canada meets its emissions reduction ambition but may also raise the risk of carbon leakage. If stringency is too aggressive, the carbon price required may reach levels where upstream investment in Canada would shift to alternative regimes.

## "Emission Reduction Plan" modeled reductions by upstream subsector from 2019 to 2030 (MMtCO<sub>2</sub>e)



Increased government regulations regarding emissions could result in significant changes to global NGL supply and trade

Data compiled Feb. 3, 2023

The ERP breaks up oil sands mining and upgrading separately. They have been grouped together here because upgrading is not separable from mining that have integrated upgraders and for simplicity. For more information, please refer to the following insight available on Connect: [Canada's proposed oil and gas emissions limits](#) (access to individual reports depends on client subscriptions).

Sources: Environment and Climate Change Canada; 2030 Emissions Reduction Plan; S&P Global Commodity Insights.



NGL

## Key takeaways

Ethane expected to remain a competitive feedstock for ethylene production

Domestic ethane production/recovery depends on domestic petrochemical demand and US import volumes

Ample domestic ethane should be available to meet new Western demand, but additional extraction facilities would be needed



Domestic propane demand will be relatively stable; new PDH/PP facility will boost Western demand

LNG activity will spur additional supply, resulting in additional excess LPG barrels; Marine exports increasingly important

Government regulations regarding emissions could result in significant changes to NGL outlook

**New petrochemical projects will boost domestic demand, but excess supply will remain**

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