Antero Resources

# Natural Gas Liquids Fundamentals

JANUARY 2021

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# NGL Macro Momentum

- **NGL prices should continue to strengthen over the coming quarters as global demand remains resilient while supply declines (assuming current oil price strip)**
  - **For oil and the resulting transportation fuels, some of the demand destruction from the pandemic may be permanent while oil supply is abundant**

## U.S. NGL Market Overview and Outlook

### Supply

- U.S. NGL production is projected to decline in 2021, driven by reduced drilling activity in shale oil basins, before recovering to 2019 levels in 2022
- Middle East NGL production "associated" with OPEC oil production flat due to OPEC+ supply restrictions
- Lower global refinery utilization results in a decline in NGL supply as a byproduct of refining

### Demand

- Resilient domestic and international demand from petrochem and residential/commercial sectors
- Rising living standards in developing countries, particularly in Asia, create an inelastic demand pull for LPG and NGL derivative products
- Asian economies are recovering from Covid-19 pandemic and Chinese tariffs on LPG were lifted in early 2020

### Outlook for NGLs

- The impact of a decline in oil shale activity on "associated NGL" production is expected to be even more pronounced than the impact on associated gas production while global NGL demand remains stable
- Propane days of supply near 5-year lows could result in an undersupplied U.S. market in 2021
- Domestic and international LPG prices are expected to remain elevated relative to crude oil, driven by inelastic global demand from petrochemicals and res/comm
- Increasing U.S. export capacity expected to tighten Mont Belvieu pricing to international pricing

*Sources: December EIA Short Term Energy Outlook and S&P Global Platts estimates. LPG is comprised of NGL components propane and butane.*

# Significant Reduction in Drilling Rigs

- **Since March 6th, the total U.S. rig count has declined by 431 rigs, or ~56%, and oil focused rig count has declined by 60%**
  - **NGL production "associated" with shale oil activity represents 65% of total U.S. NGL production and is expected to decline due to the recent collapse in oil prices and rig count**

## U.S. Oil & Gas Drilling Rig Count Since 3/6/2020

| | 3/6/2020 | 12/25/2020 | Change Since 3/6/20 Rigs | Change Since 3/6/20 % | Current Dry Gas Production Bcf/d (1) | Current NGL Production MBbls/d (2) |
|---|---|---|---|---|---|---|
| **Oil Focused** | | | | | | |
| Permian | 429 | 187 | (242) | (56%) | 11.1 | 1,929 |
| Eagle Ford | 79 | 31 | (48) | (61%) | 4.7 | 614 |
| Bakken | 52 | 12 | (40) | (77%) | 2.1 | 332 |
| SCOOP/STACK | 41 | 13 | (28) | (68%) | 3.6 | 409 |
| DJ Niobrara | 28 | 8 | (20) | (71%) | 2.1 | 452 |
| ***Total*** | ***629*** | ***251*** | ***(378)*** | ***(60%)*** | ***23.7*** | ***3,736*** |
| **Appalachia/Haynesville** | | | | | | |
| Marcellus | 32 | 28 | (4) | (13%) | 27.2 | 866 |
| Haynesville | 41 | 47 | 6 | 15% | 12.7 | 40 |
| Utica | 14 | 9 | (5) | (36%) | 6.0 | 164 |
| ***Total*** | ***87*** | ***84*** | ***(3)*** | ***(3%)*** | ***46.0*** | ***1,070*** |
| **Other** | **50** | **-** | **(50)** | **(100%)** | **21.4** | **914** |
| **Total U.S.** | **766** | **335** | **(431)** | **(56%)** | **91.1** | **5,719** |

**26% of U.S. dry gas production**

**65% of U.S. NGL production**

**Down 9% from 3/6/20**

**Down 9% from 3/6/20**

**50% of U.S. dry gas production**

**19% of U.S. NGL production**

**Rig reduction led by oil focused areas with a 378 rig, or 60% reduction since March 6th**

*Source: Baker Hughes and S&P Global Platts.*

*1) Current dry gas production per Platts as of 12/28/2020. Other production represents Platts' "Other US Production" + offshore production.*

*2) NGL production per Platts monthly average C2+ NGL estimate for December 2020 as of 12/29/2020. Assumes ~2.7 MMBbl/d of ethane, or 46% of total C2+ NGL forecast.*

# Significant Reduction in Completion Crews

**Since March 6th, U.S. completion crew count has declined by 170 crews, or 54%, and oil focused completion crew count has declined by 60%**

## U.S. Oil & Gas Drilling Completion Crew Count Since 3/6/2020

| | 3/6/2020 | 12/25/2020 | Change Since 3/6/20 Completion Crews | Change Since 3/6/20 % | Current Dry Gas Production Bcf/d [(1)] | Current NGL Production MBbls/d [(2)] |
|---|---|---|---|---|---|---|
| **Oil Focused** | | | | | | |
| Permian | 125 | 65 | (60) | (48%) | 11.1 | 1,929 |
| Eagle Ford | 44 | 17 | (27) | (61%) | 4.7 | 614 |
| Bakken | 31 | 7 | (24) | (77%) | 2.1 | 332 |
| SCOOP/STACK | 28 | 5 | (23) | (82%) | 3.6 | 409 |
| DJ Niobrara | 19 | 5 | (14) | (74%) | 2.1 | 452 |
| ***Total*** | ***247*** | ***99*** | ***(148)*** | ***(60%)*** | ***23.7*** | ***3,736*** |
| **Appalachia/Haynesville** | | | | | | |
| Appalachia | 26 | 24 | (2) | (8%) | 33.3 | 1,030 |
| Haynesville | 18 | 15 | (3) | (17%) | 12.7 | 40 |
| ***Total*** | ***44*** | ***39*** | ***(5)*** | ***(11%)*** | ***46.0*** | ***1,070*** |
| **Other** | **26** | **9** | **(17)** | **(65%)** | **21.4** | **914** |
| **Total U.S.** | **317** | **147** | **(170)** | **(54%)** | **91.1** | **5,719** |

28% of U.S. dry gas production

Down 9% from 3/6/20

65% of U.S. NGL production

Down 11% from 3/6/20

50% of U.S. dry gas production

19% of U.S. NGL production

Completion crew count reduction led by oil focused areas with a 148, or 60% crew reduction since March 6th

NGL production "associated" with shale oil activity represents 65% of total U.S. NGL production and is expected to decline due to the collapse in oil prices and rig count

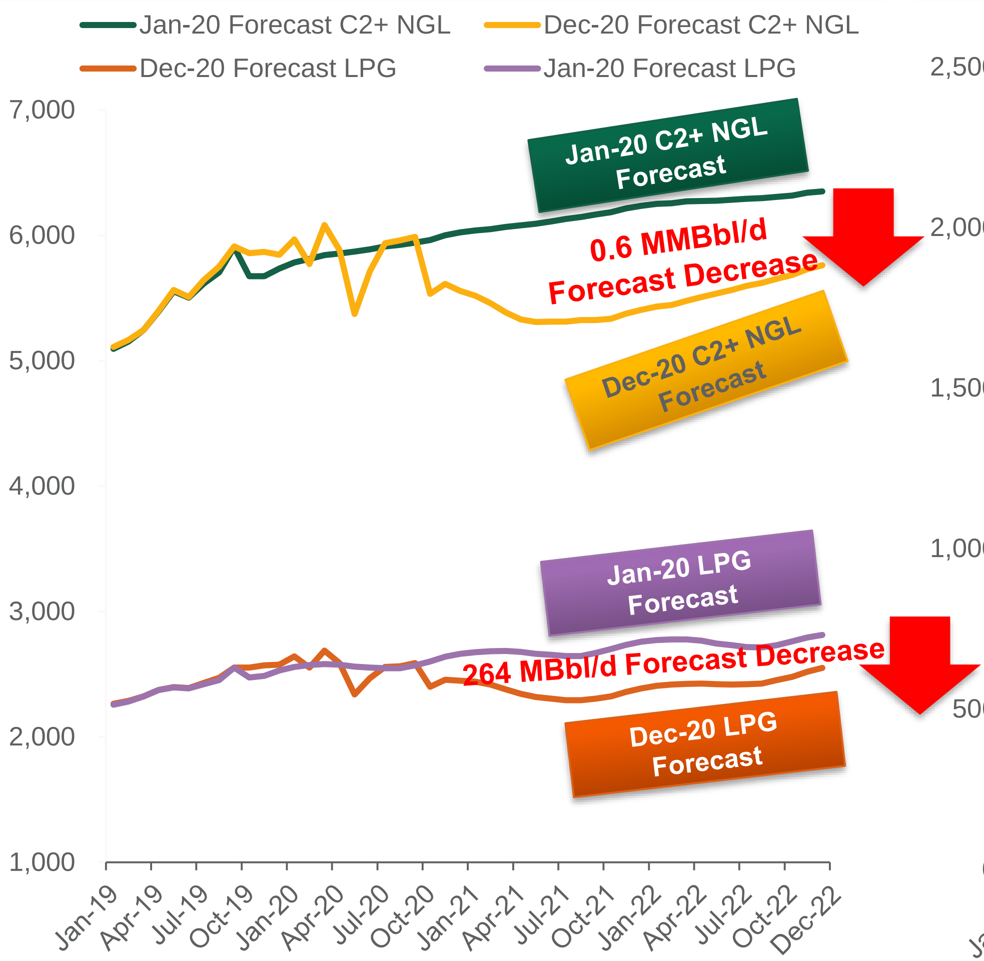
Source: Primary Vision and S&P Global Platts. Appalachia completion crew count based on Antero internal estimate to address discrepancies in Primary Vision data for Appalachia.

1) Current dry gas production represents Platts production as of 12/28/2020. Other production represents Platts' "Other US Production" + offshore production.
2) NGL production represents Platts monthly average C2+ NGL estimate for December 2020. Estimate as of 12/29/2020. Assumes ~2.7 MMBbl/d of ethane, or 46% of total C2+ NGL forecast.

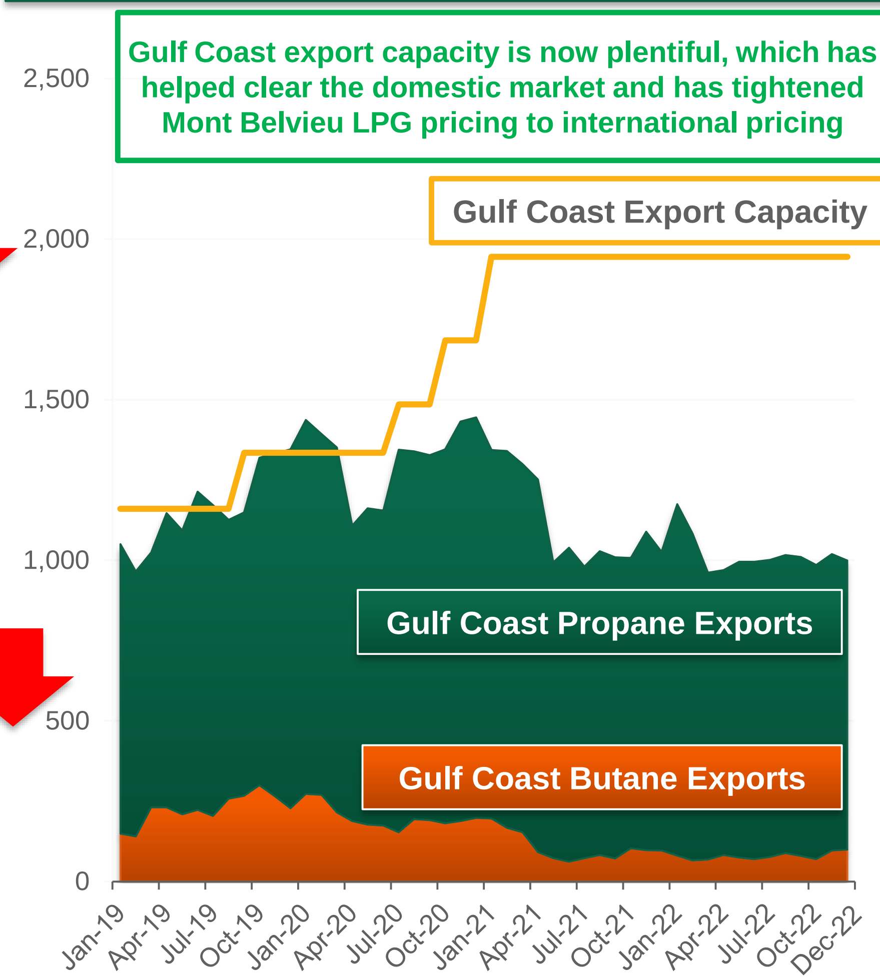
# Material Impact to NGL Production in the U.S.

**The drilling and completion activity decline is expected to have a pronounced negative impact on U.S. NGL supply, 65% of which comes from shale oil plays**

## U.S. C2+ NGL Production Forecast (MBbl/d)




## Gulf Coast LPG Export Capacity

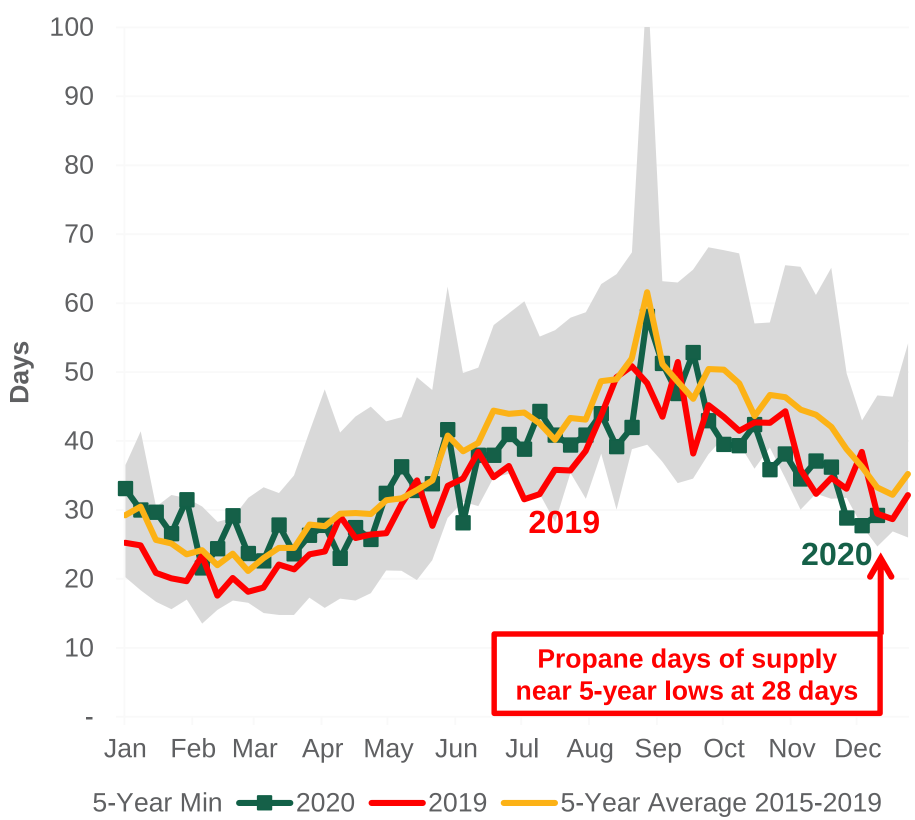



*Source: Platts Analytics data as of December 29, 2020.*

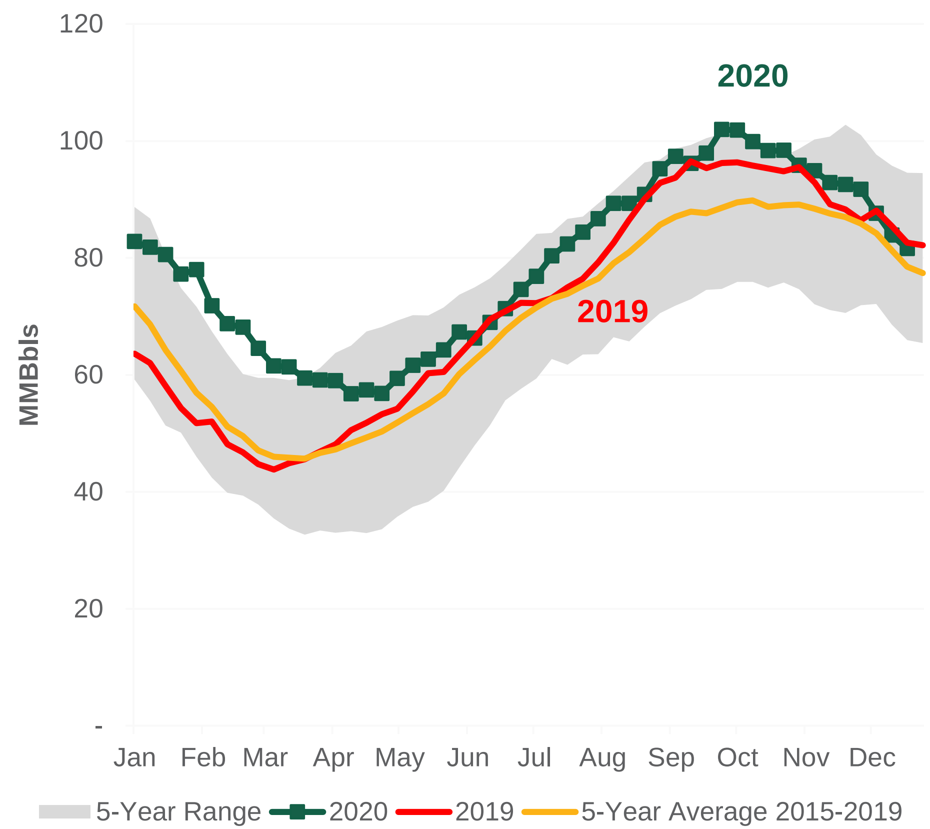
# Propane Market Fundamentals

- **Export capacity additions, robust international demand, and U.S. supply declines have led to a decline in days of supply near 5-year lows**
- **Even normalized winter temperatures could result in the U.S. market being undersupplied Propane in 2021**

## Propane Days of Supply (Days)




## U.S. Propane Inventories (MMBbls)

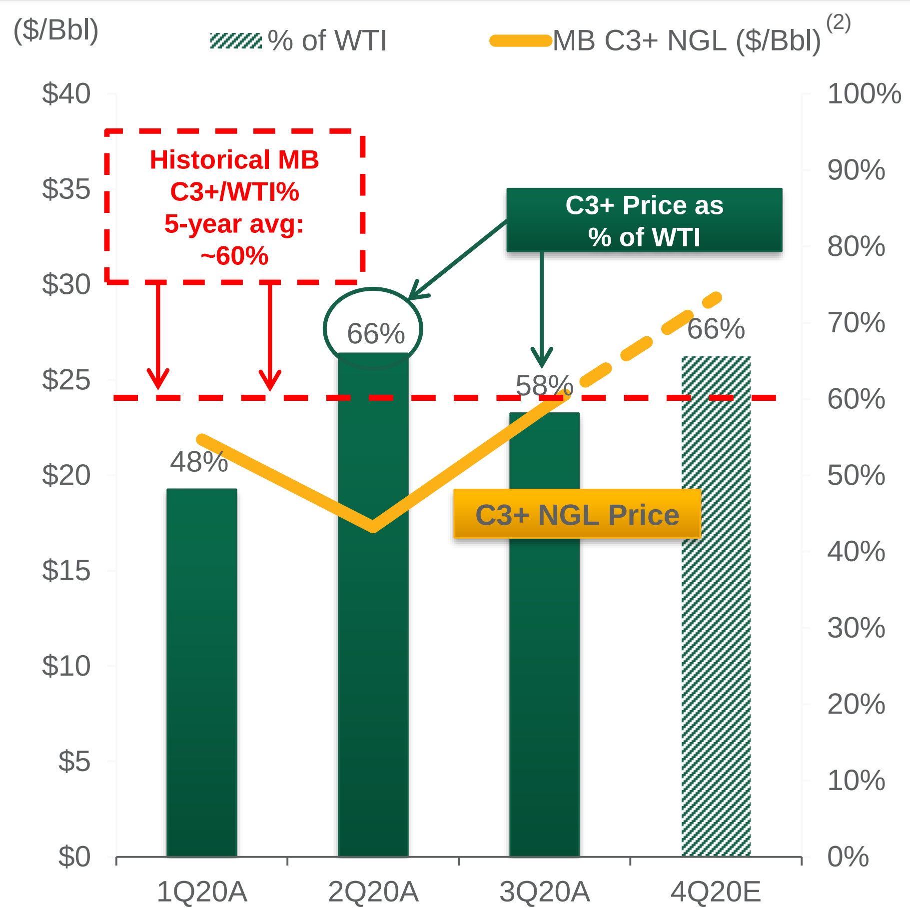



*Source: EnVantage Inc. and Energy Information Administration (EIA) as of 12/29/20.*

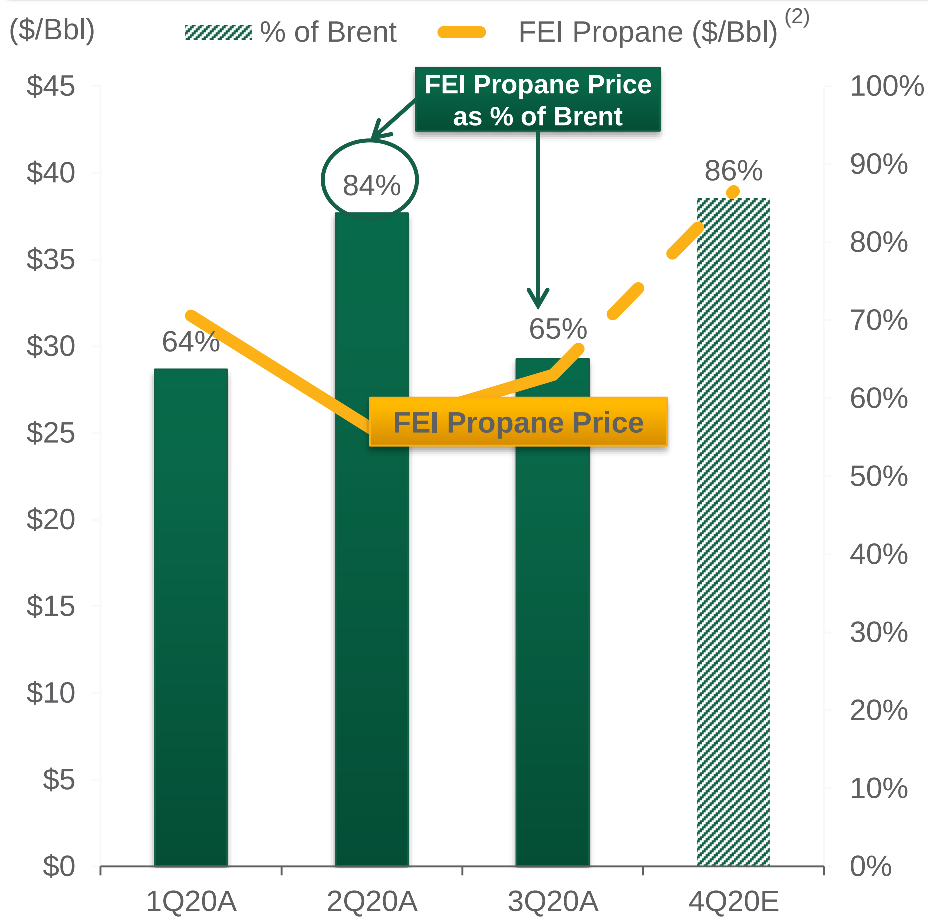
# NGL Price Recovery Underway

**Domestic and international LPG prices are improving on a relative basis to crude oil, driven by resilient global demand for LPG from petrochemicals and res/comm**

## C3+ NGL Prices & % of WTI [(1)]




## Far East Index (FEI) Propane Prices & % of Brent

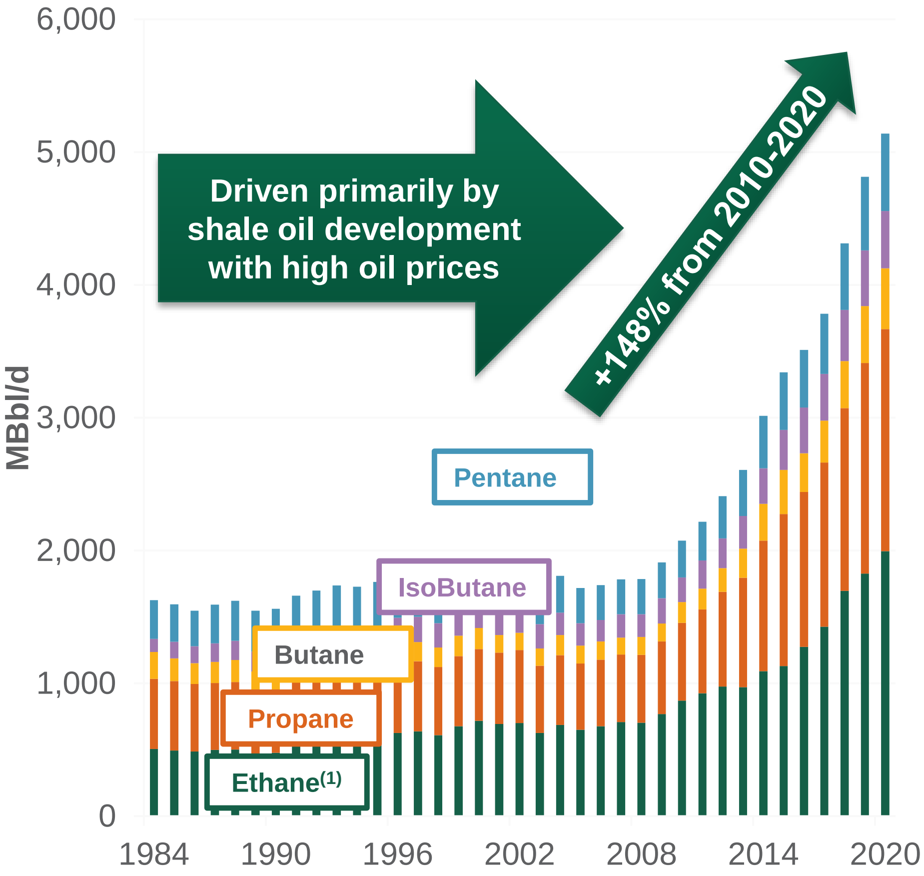



*Source: ICEdata Mont Belvieu, Far East Index, WTI and Brent strip pricing as of 12/29/2020*

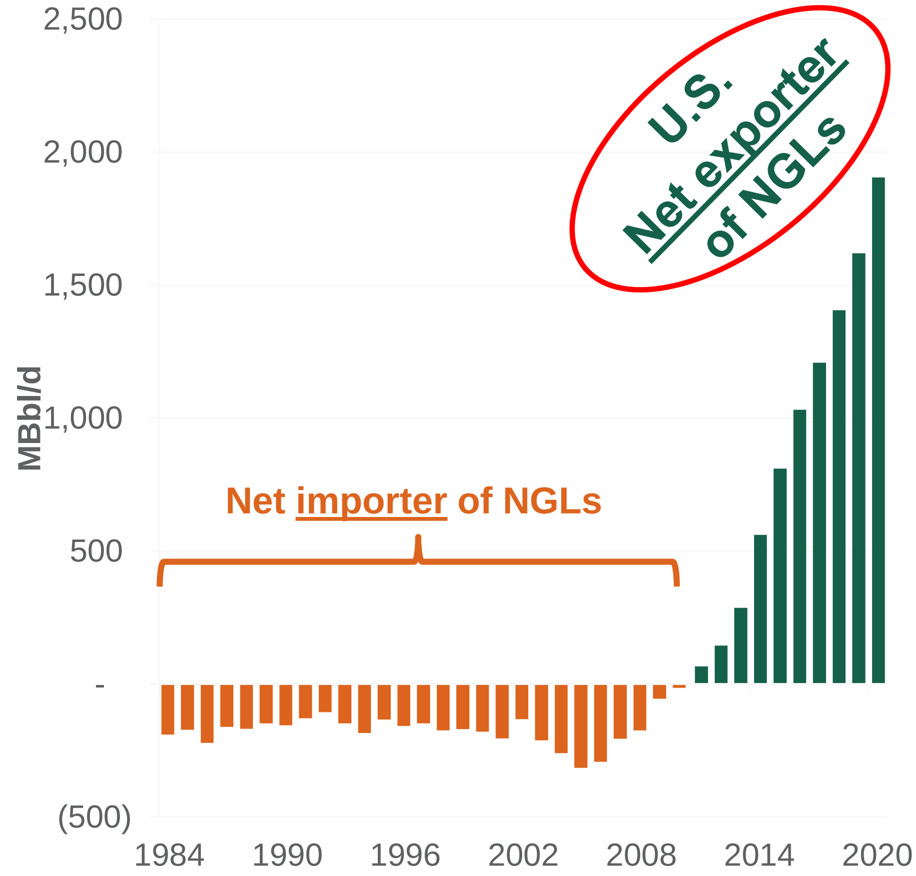
1) *Based on Antero C3+ NGL component barrel consists of 56% C3 (propane), 10% isobutane (Ic4), 17% normal butane (Nc4) and 17% natural gasoline (C5+).*
2) *Forecasted C3+ NGLs represent ICEdata Mont Belvieu strip pricing as of 12/18/2020. Forecasted FEI propane represents ICEdata Far East Index propane strip pricing as of 12/29/2020.*

## The Shale Revolution dramatically changed the NGL landscape, turning the U.S. into a net exporter after decades of importing NGL products

### U.S. NGL Production (MBbl/d) (1)




### U.S. NGL Exports / (Imports) (MBbl/d)

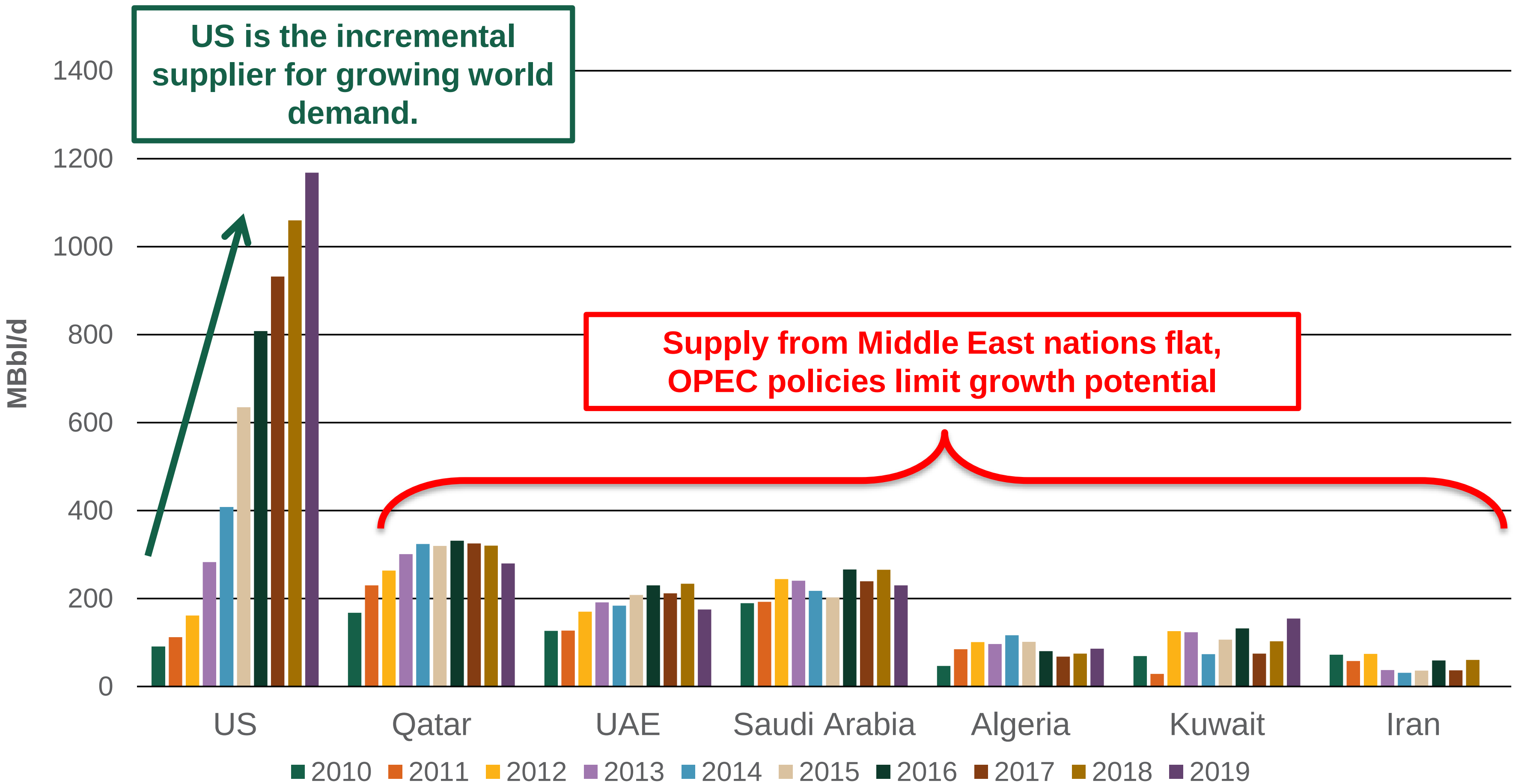



1) Includes recovered ethane volumes and natural gasoline (C5).

Source: U.S. Energy Information Administration. 2020 represents year-to-date data through December 29, 2020. NGL exports/imports includes ethane, propane, normal butane, isobutane and natural gasoline.

## US exports surpassed the entire Middle East region combined in 2019

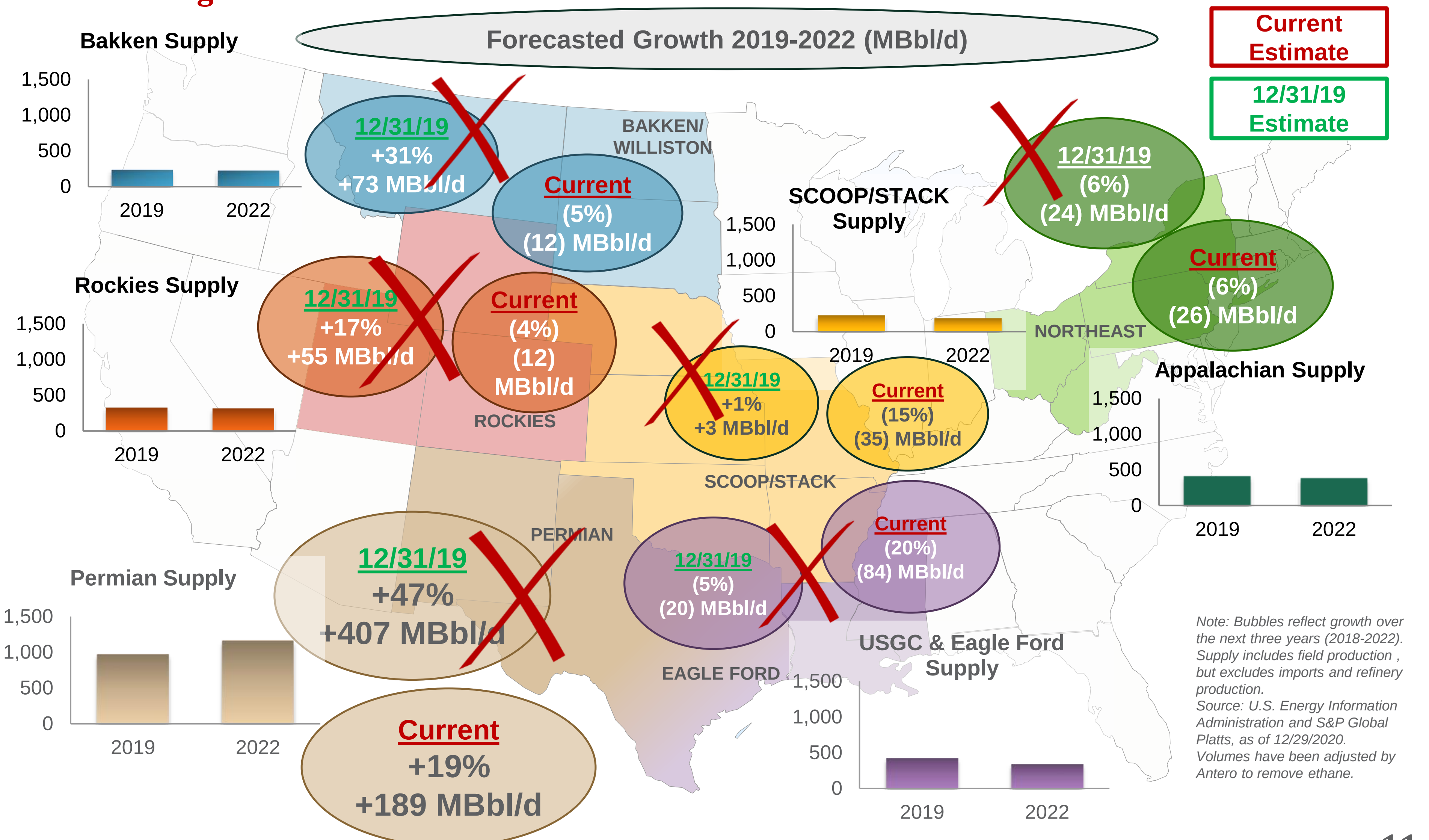
### LPG Exports: US versus Middle East




Source: Platts.
Notes: Propane and Butane exports only based on cFlow ship tracking data. US Exports do not include exports via land to Canada and Mexico.

# Future U.S. NGL Supply Challenged by Oil Price Decline

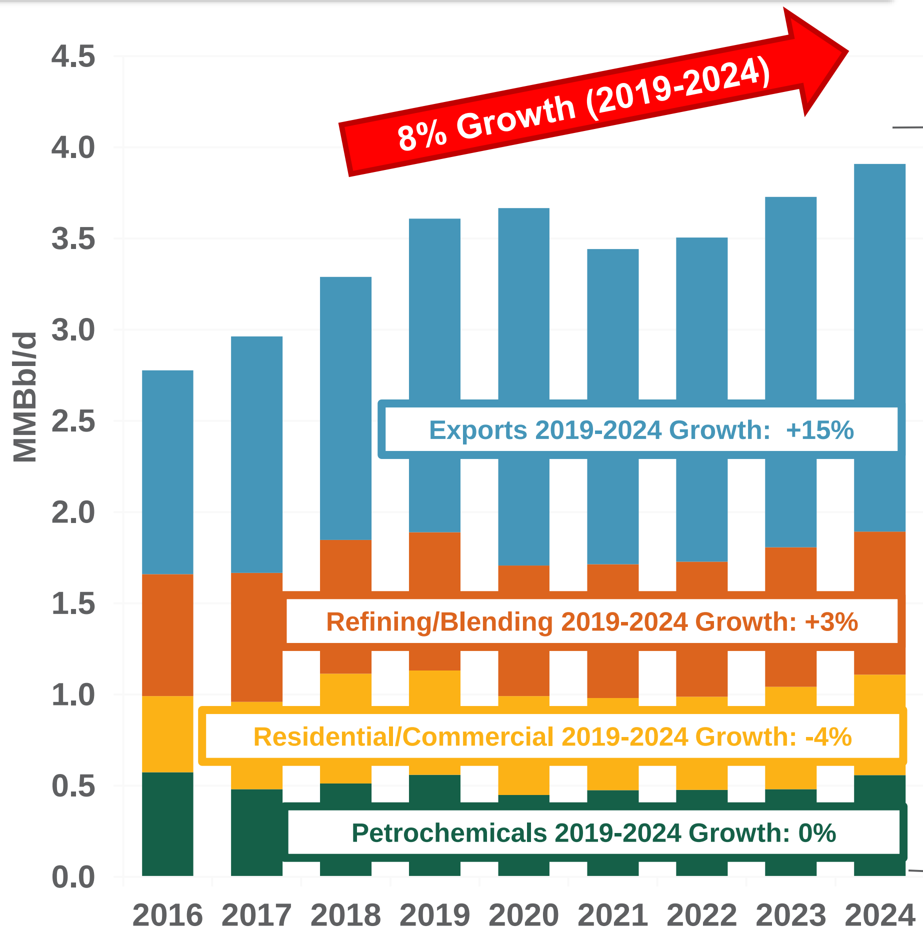
- **U.S. shale plays were previously forecast (December 2019) to grow C3+ NGL supply through 2022 by almost 500,000 Bbl/d**
- **Now, with a $48/Bbl oil strip, U.S. C3+ NGL supply is expected to decline in 2021 before recovering to 2019 levels in 2022**



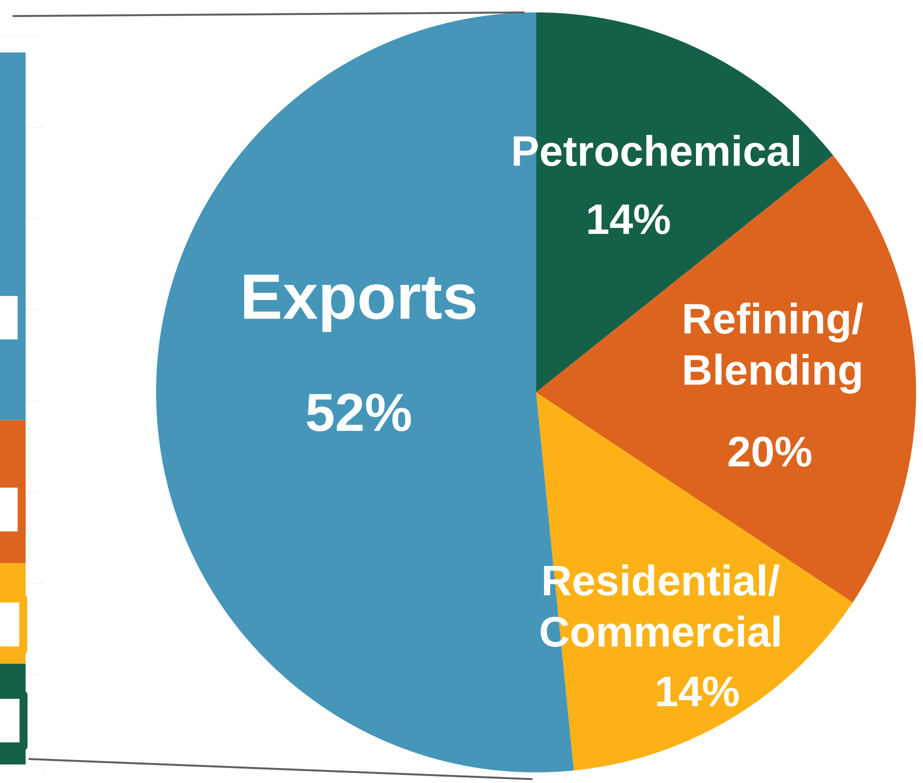

*Note: Bubbles reflect growth over the next three years (2018-2022). Supply includes field production , but excludes imports and refinery production.*
*Source: U.S. Energy Information Administration and S&P Global Platts, as of 12/29/2020. Volumes have been adjusted by Antero to remove ethane.*

## NGL demand growth driven primarily by exports of LPG (propane/butane)

### U.S. C3+ Demand by Sector (MMBbl/d)




### Estimated U.S. C3+ Demand – 2024

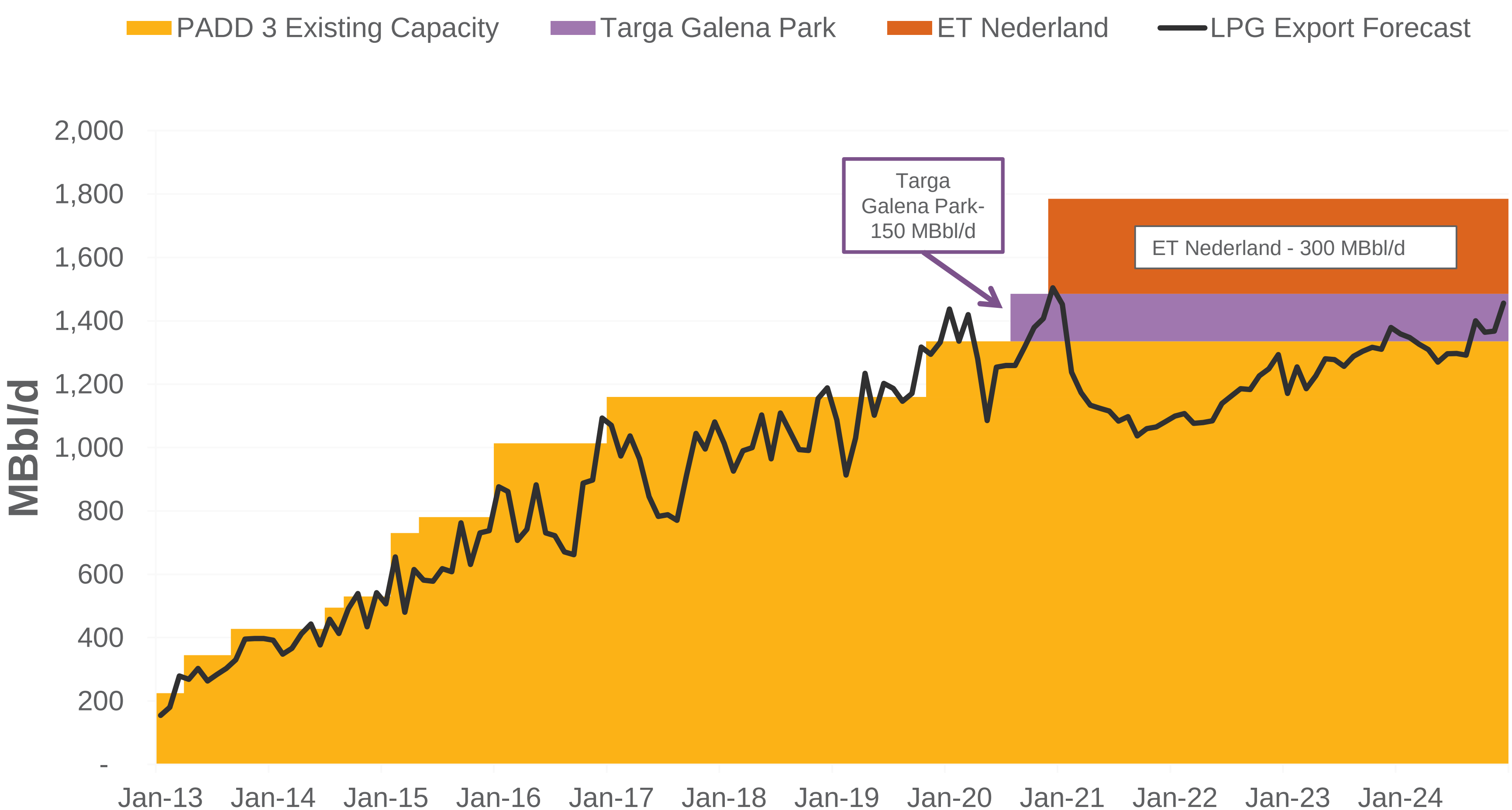



*Source: S&P Global Platts as of 12/29/20*

# LPG Export Capacity: Unconstrained Outlook

**High utilization rates prompted next round of buildout of LPG propane/ butane export capacity, resulting in unconstrained exports beginning in 2020 and positive outlook for Mont Belvieu pricing relative to international pricing**

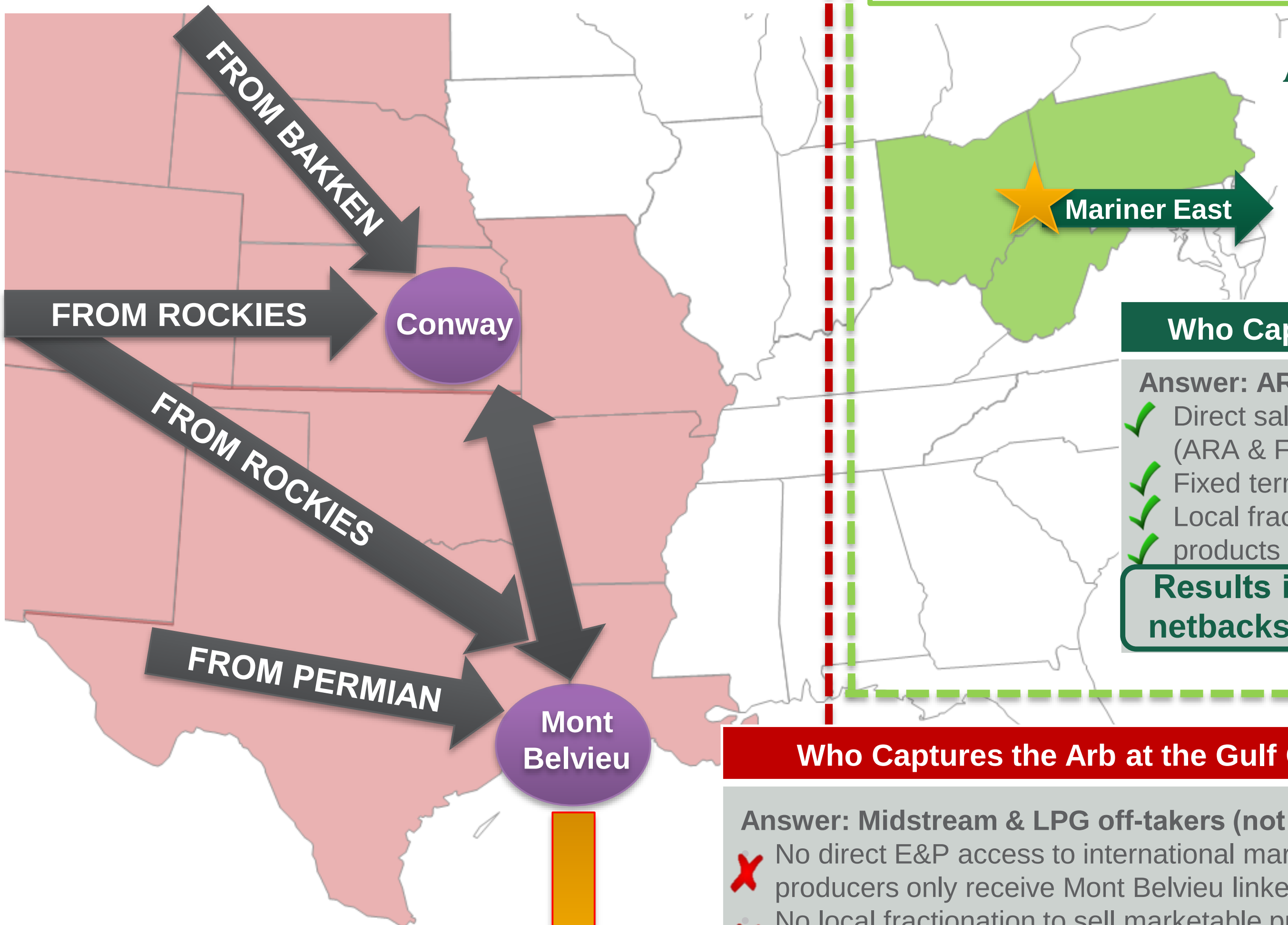
## U.S. Gulf Coast LPG Exports vs. Capacity (MBbl/d)




*Source: S&P Global Platts as of 12/29/20*

**Producer Disadvantaged:**
E&Ps in Permian, Rockies, Mid-Con & Bakken

**Producer Advantaged & Unconstrained:**
Antero Resources in Appalachia




**AR is the largest C3+ producer with the most international exposure in Appalachia**

**Anchor shipper on ME2**

**Who Captures the Arb at Marcus Hook?**

**Answer: AR and other Appalachian E&P's**
- ✓ Direct sales to most attractive international (ARA & FEI) & domestic markets
- ✓ Fixed terminal rates
- ✓ Local fractionation & marketing to sell purity products in-basin for local demand

**Results in "Mont Belvieu plus" pricing netbacks captured "at the dock" by AR**

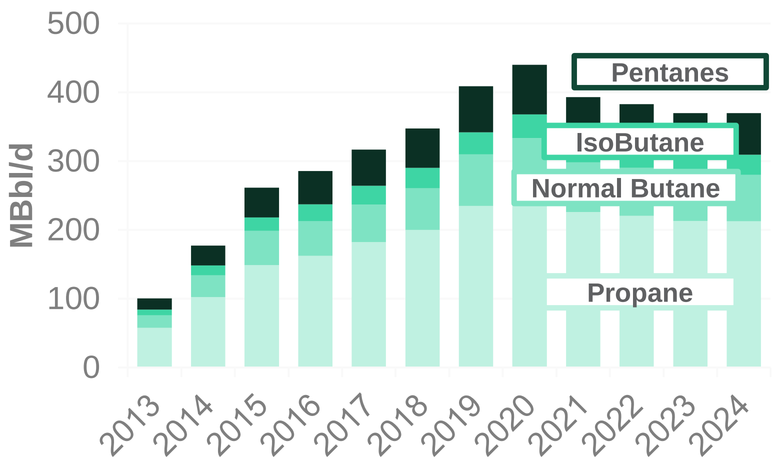
**Who Captures the Arb at the Gulf Coast?**

**Answer: Midstream & LPG off-takers (not E&P's)**
- ✗ No direct E&P access to international markets (i.e. producers only receive Mont Belvieu linked pricing)
- ✗ No local fractionation to sell marketable purity products in-basin

**Results in "Mont Belvieu Minus" pricing "before the dock"**

## Antero's C3+ blended differential to Mont Belvieu has improved with the Mariner East 2 export takeaway and ability to access international markets

### Northeast C3+ NGL Supply

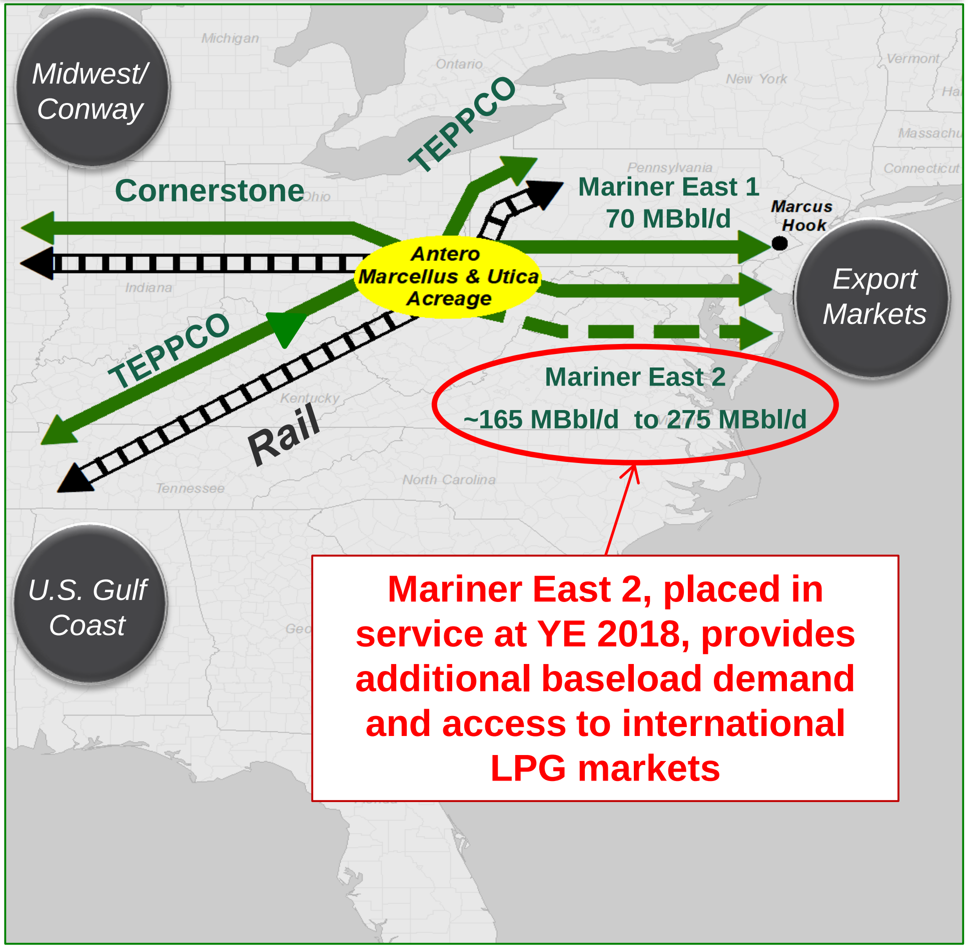



**~215 MBbl/d** of Northeast C3+ **demand** vs.
**~440 MBbl/d** of Northeast **supply** in 2020

- Resulted in **49%** of production consumed locally
- Remainder moved primarily by rail and exported

**Differentials to Mont Belvieu tightened in 2019 as ~165+ MBbl/d of LPG exported via Mariner East 2**

### Northeast C3+ NGL Takeaway

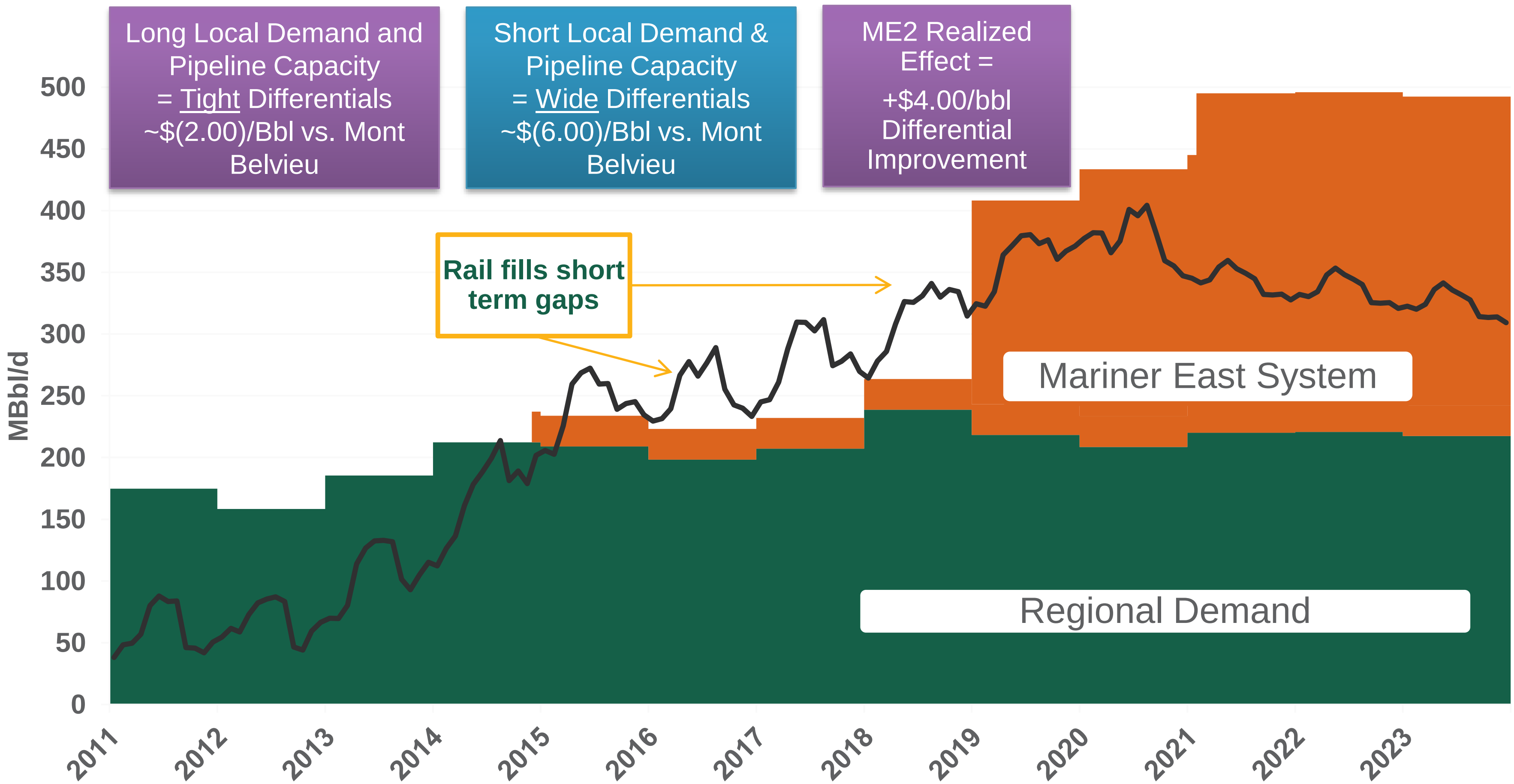



Source: S&P Global Platts as of 12/29/2020.

# LPG: Northeast Supply & Demand

**Northeast LPG markets became oversupplied in 2015 and were forced to transport via rail, which was relieved by Mariner East 2 in 2019**

## Northeast LPG NGL Supply vs. Demand & Takeaway Capacity (Excluding Rail)




*Source: S&P Global Platts, Antero Company Estimates.*

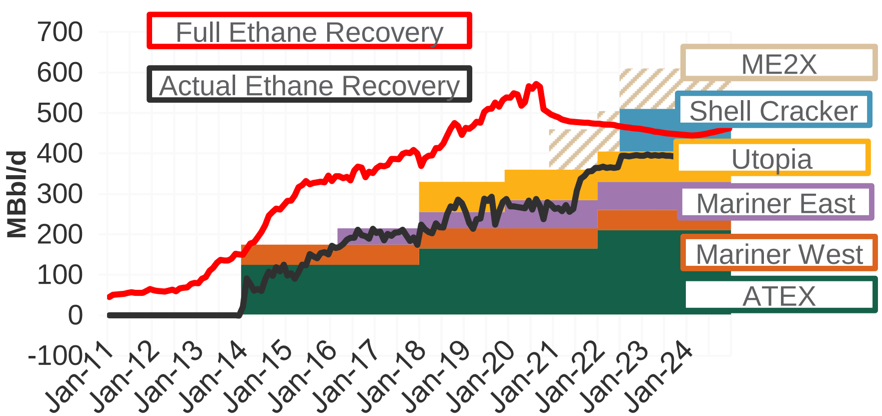
## Antero's ethane has a natural gas value pricing floor; pricing improvements from additional petrochemical and takeaway demand is all "Upside"

**~270 MBbl/d** of ethane current rejected in Northeast (~50% of potentially recoverable ethane)

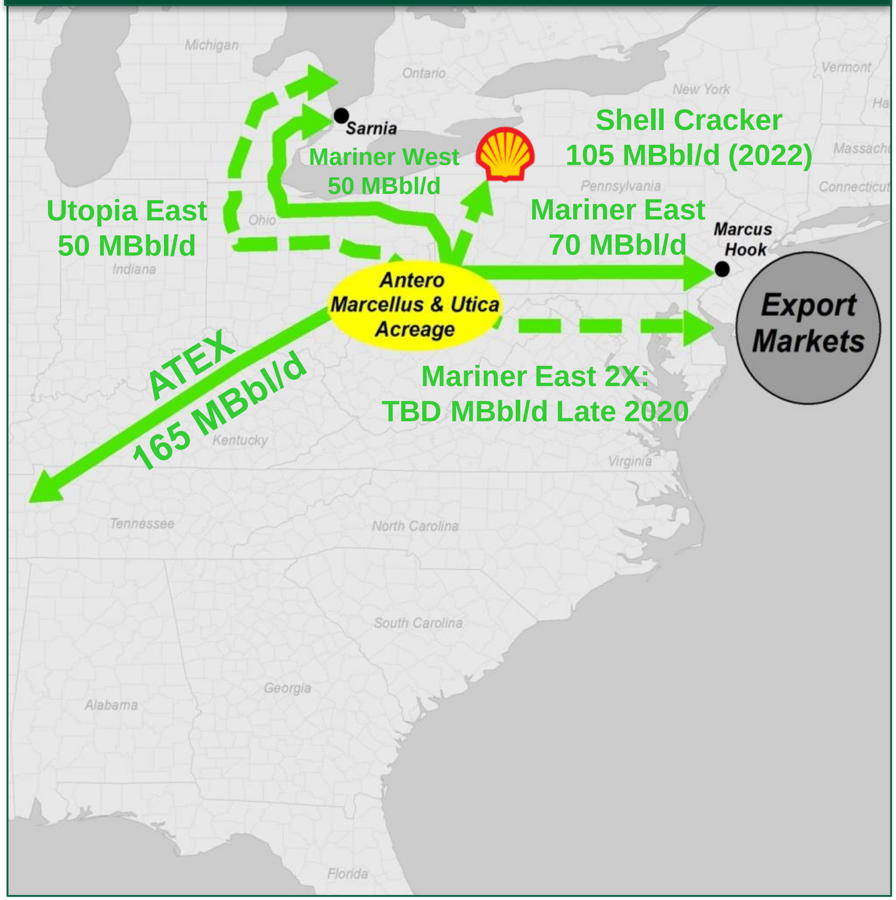
**Antero is an anchor supplier to Shell's cracker expected in-service in 2022**

**Antero ethane firm sales contracts ~50% gas-linked and ~50% Mont Belvieu-linked.**

### Northeast Ethane Supply (MBbl/d)




### Northeast Ethane Takeaway and Capacities




Source: S&P Global Platts

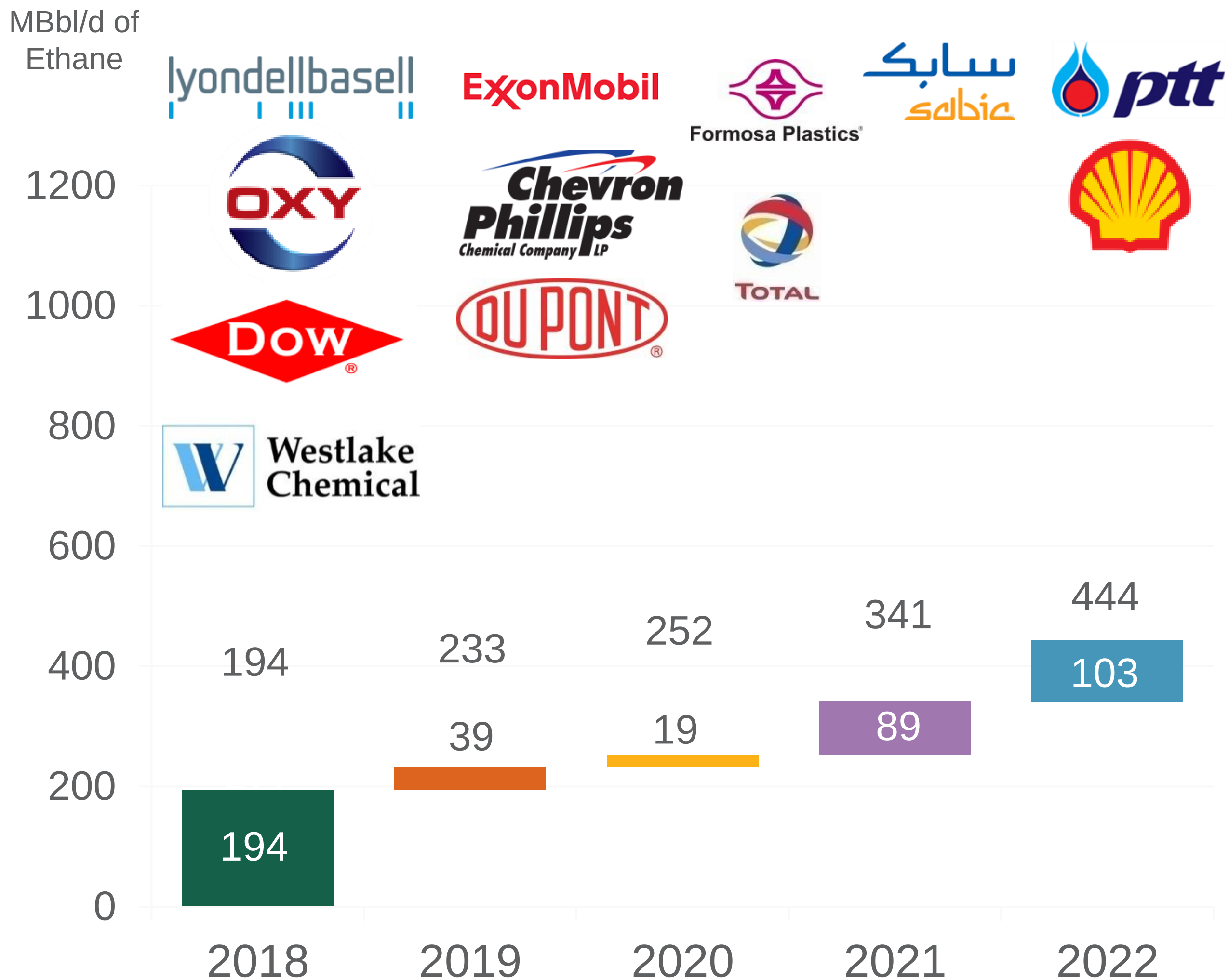
# Ethane: Demand Growth On The Horizon

**444 MBbl/d**
of incremental ethane demand from 2017 to 2022

"First Wave"
Ethylene crackers under construction, some already complete

"Second Wave"
Next round of world scale crackers at or near FID (Exxon/SABIC, CP Chem/QP) will add demand in 2023+

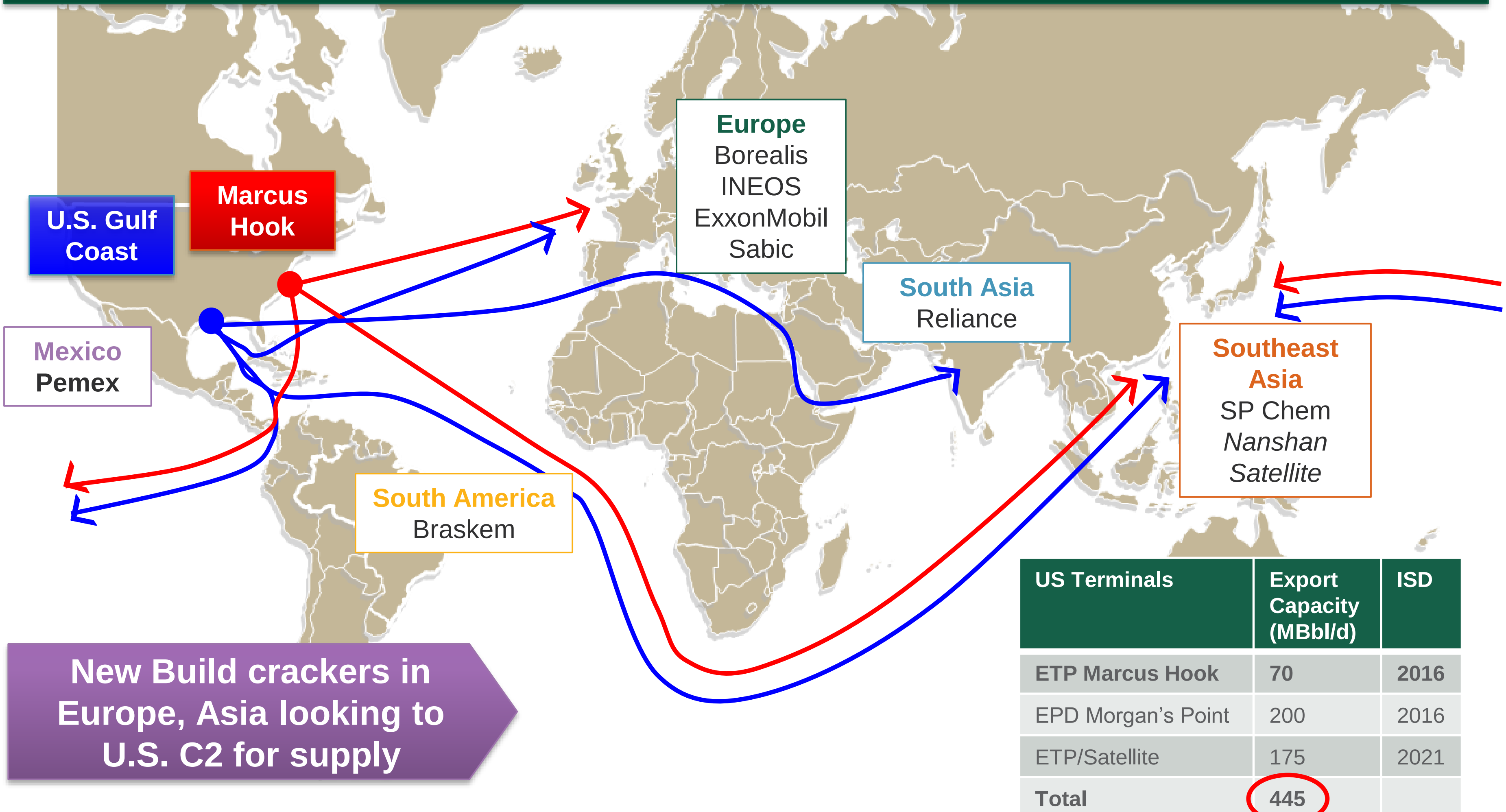
## Incremental U.S. Ethylene Plant Demand




*Source: S&P Global Platts , Company Reports*

**The ethane market continues to develop and creates opportunities for ethane sales outside of the domestic cracker pool**

## Ethane Export Suppliers and Customers




**New Build crackers in Europe, Asia looking to U.S. C2 for supply**

| US Terminals | Export Capacity (MBbl/d) | ISD |
|---|---|---|
| **ETP Marcus Hook** | **70** | **2016** |
| EPD Morgan's Point | 200 | 2016 |
| ETP/Satellite | 175 | 2021 |
| **Total** | **445** | |

*Source: S&P Global Platts , Company Reports*

# Summary

**"Associated NGL" production declines and "inelastic" international LPG demand are underappreciated by the market**

U.S. C3+ NGL production is expected to decline in 2021 before returning to 2019 levels in 2022

Propane days of supply near 5-year lows could result in an undersupplied U.S. market in 2021

Inelastic global NGL demand growth driven by improvements in living standards and subsidies

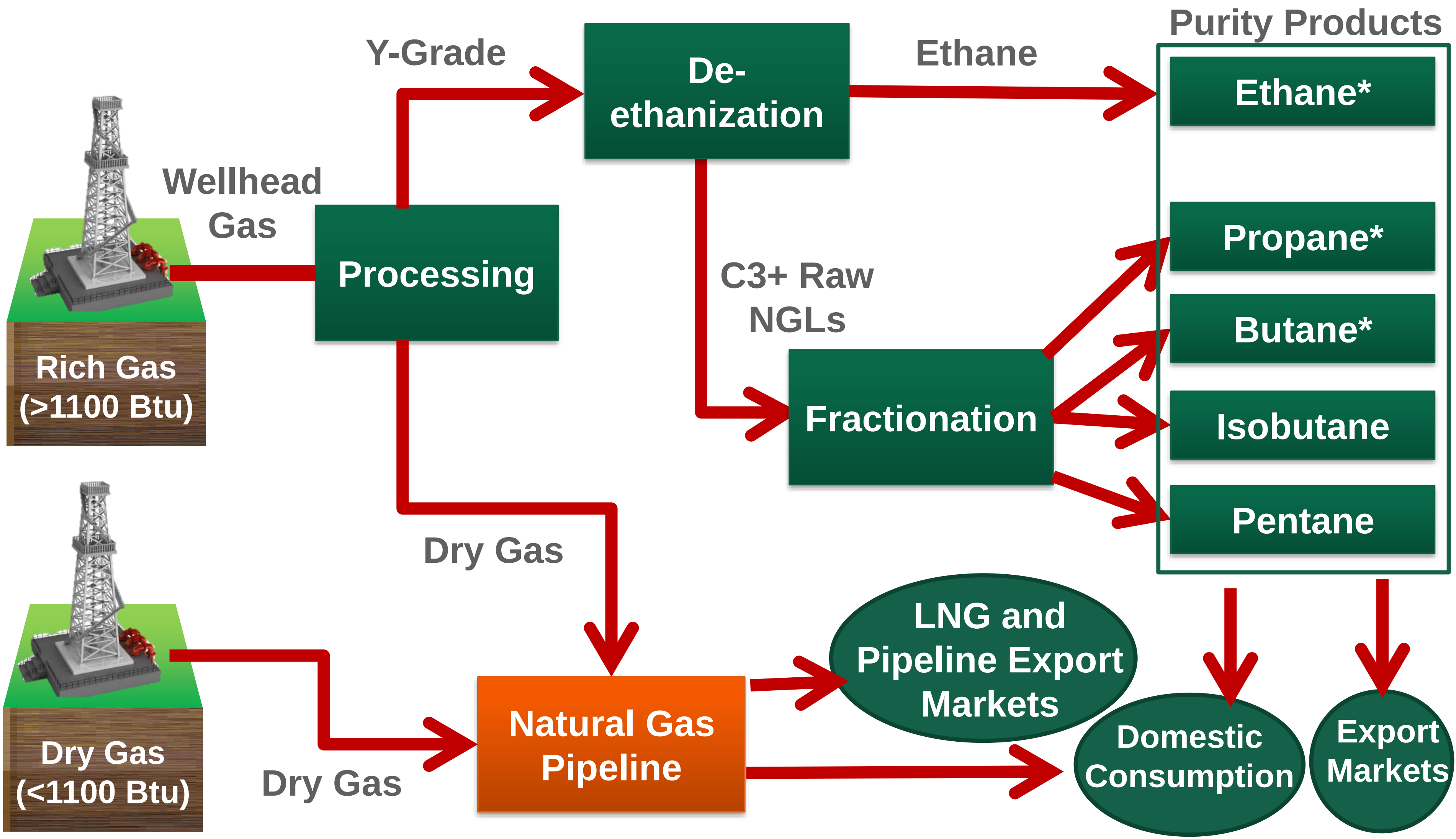
U.S. NGL differentials have tightened vs. global prices as exports provide uplift with premium Brent-linked pricing

Price outlook for U.S. LPG exports is strong as global demand grows and export supply growth from the middle east and the U.S. subsides

Appalachian producers are geographically advantaged vs. U.S. Gulf Coast producers – captures the international pricing uplift by selling at the export dock (Marcus Hook)

# Appendix

**Natural Gas Liquids "NGLs" are contained in the rich natural gas stream, but after processing, condense into liquid form for storage, shipping  and consumption**




**Primary NGL export products are propane, butane, and ethane*

**NGLs play an essential role in the domestic and international industrial, residential, commercial and transportation industries**

**Gas Linked Pricing** → **Crude Linked Pricing**

| | Methane | Ethane | Propane | Butane | Iso-Butane | Pentane |
|---|---|---|---|---|---|---|
| | Natural Gas | C2 | C3 | C4 | IC4 | C5 |
| Primary Sectors | All | Chemical Industrial | Industrial Residential Commercial, Chemical | Industrial Transportation | Industrial | Transportation |
| Primary Uses | Power | Ethylene Production (For plastics) | Heating, Crop drying, Commercial, Propylene | Winter Gasoline Blending | Alkylate feed to produce gasoline | Gasoline blend and diluent |

**Higher Heating Value**

**1000 Btu** → **4000 Btu**

# Global PDH Buildouts

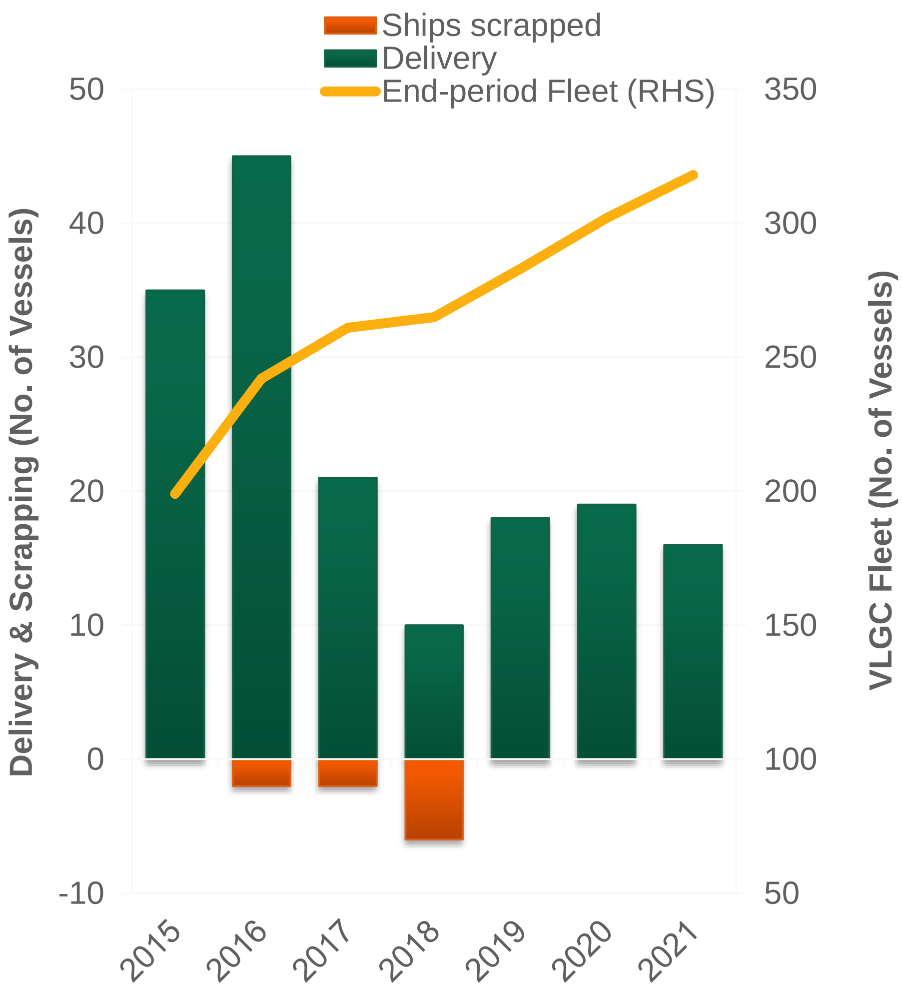
| China New Build PDH plants | Est. Propane Demand (Mb/d) | In-Service Date |
|---|---|---|
| Zhejiang Satellite | 18 | In-service |
| Shenzhen Juzhengyuan, Guandong (South) | 24 | In-service |
| Hengli Petrochemical, Dalian (East) | 10 | In-Service |
| Fujian Meide Petrochemical (PDH) | 27 | October 2020 |
| Zhejiang Petrochemical | 24 | In-Service |
| Oriental Ningbo Zhejiang (East) | 27 | 4Q 2020 |
| Shenzhen Grand Resources | 24 | 2021 |
| Liaoning Xianghui Chemical | 24 | 2022 |
| Oriental Lianyungang, Jiangsu | 27 | TBD |
| Jiangsu Weiming (East) | 27 | TBD |

| European New Build PDH plants | Est. Propane Demand (Mb/d) | In-Service Date |
|---|---|---|
| Borealis - Kallo, Belgium | 31 | 2022 |
| PDH Polska - Police, Poland | 16 | 2022 |
| INEOS - ARA Area | 31 | 2023 |

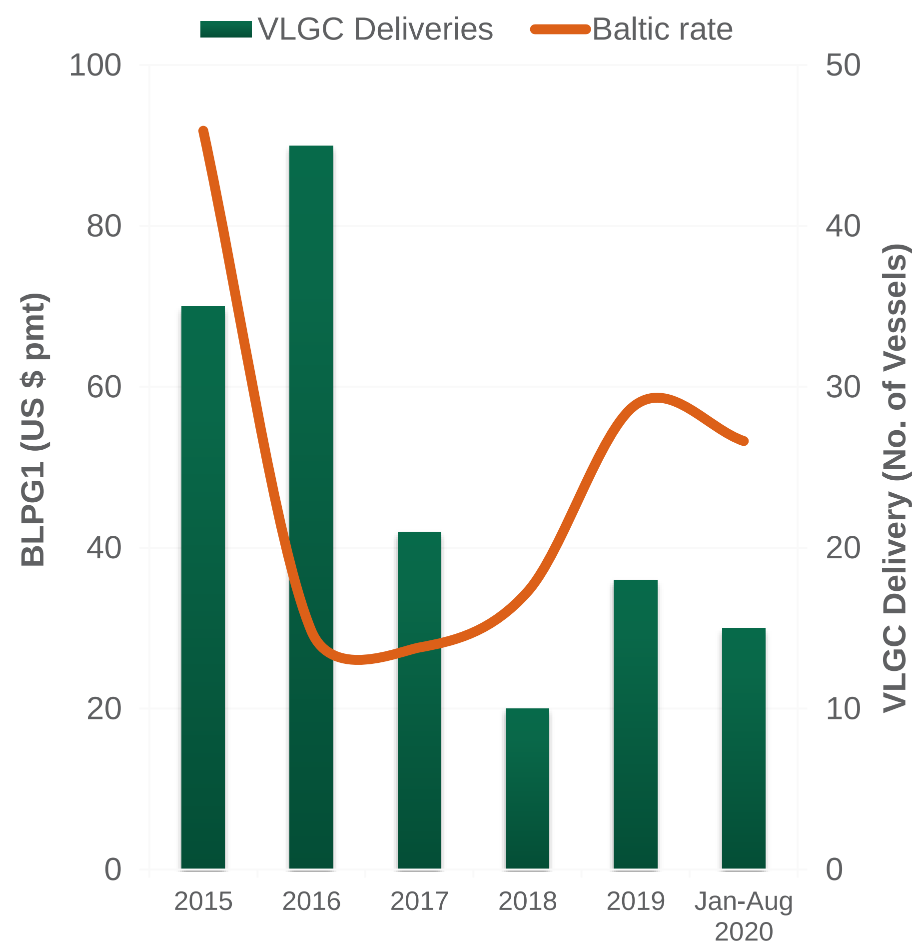
*Source: Poten and Partners*

# Expanding fleet and declining LPG exports could weigh on freight rates

## VLGC Fleet Supply




## Baltic Rate and VLGC Fleet




*Note: Based on the latest orderbook schedule without accounting for future orders and scrapping.*

*Source: Poten & Partners as of 5/11/20.*

# Antero's Ethane Export

- **Antero's 11,500 Bpd C2 sales contract with Borealis commenced on November 1, 2018**
- **Expect to load ~1 ship per month, bound for Borealis' steam cracker in Stenungsund, Sweden, for duration of 10-year contract**