Air and Waste Management Association

"The State of the Oil and Gas Industry"

Eric N. Smith
Tulane Energy Institute
10-27-21

First the News

- Nature Article: To Limit warming, most of the world's fossil fuel must remain untapped.

- Shell: Certain GOM production to remain offline until 2022 due to IDA hurricane damage to West Delta-143, the main transport hub for Mars corridor production.

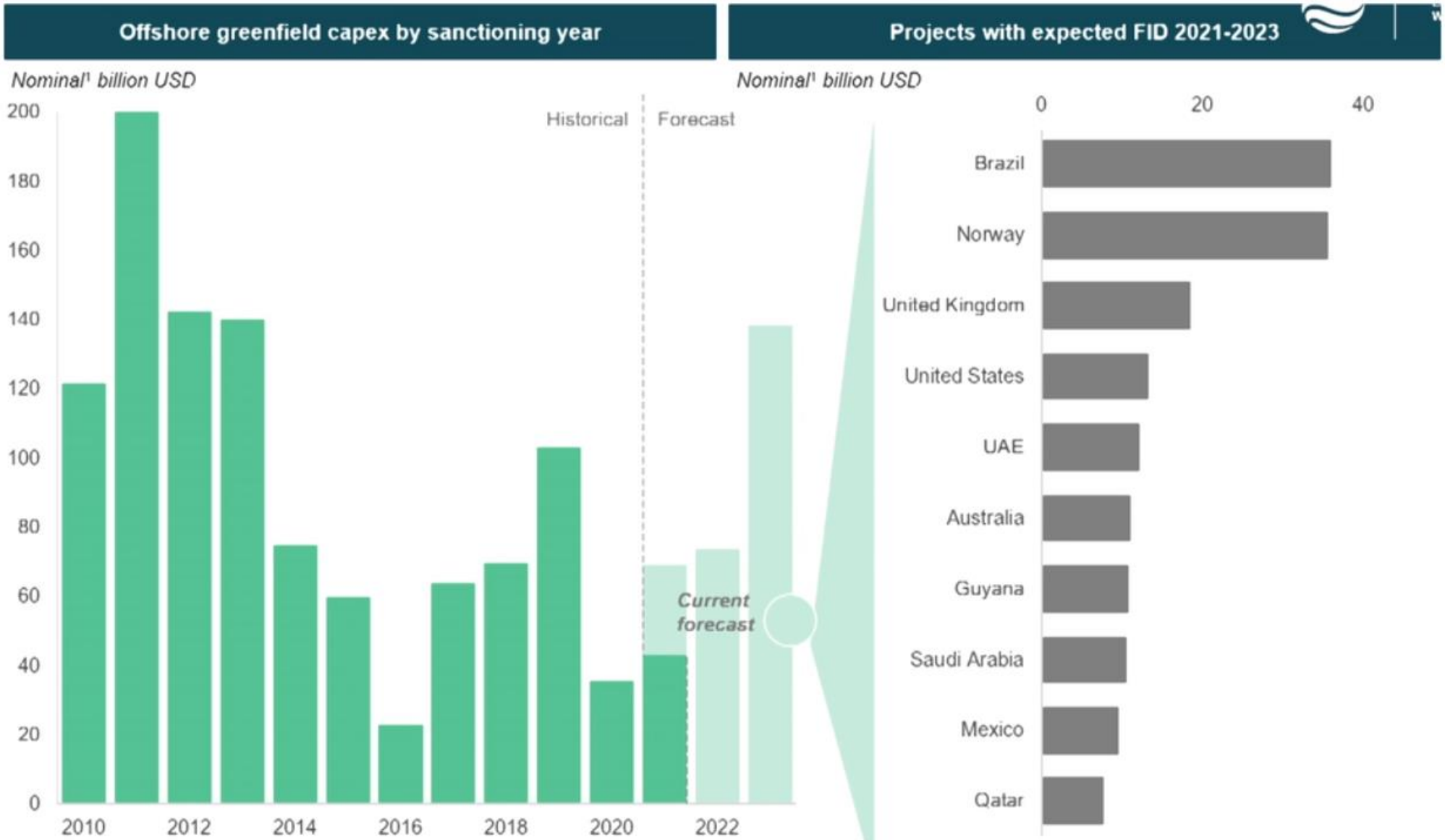
- Port Fourchon: significant damage to port facilities supporting deep water GOM exploration and production resulting in delays on restarting offshore exploration and production.

- Industrial trade group pursues restrictions on LNG exports to mitigate price increases for domestic natural gas consumers this coming winter.

- Europe faces winter crisis years in the making. Early enthusiasm for renewables has consequences. Current gas price increases shut down smaller utilities, close synthetic fertilizer plants in the UK and threaten food processors due to the lack of by-product CO_2 for beverage and meat processing.

- Strategic reverberations of the AUKUS deal will be long lasting. Designed to counter China's trade ambitions, it has thoroughly irritated the French who temporarily withdrew their ambassadors from the US and from Australia.

Brazil leading the pack in terms of upcoming FIDs

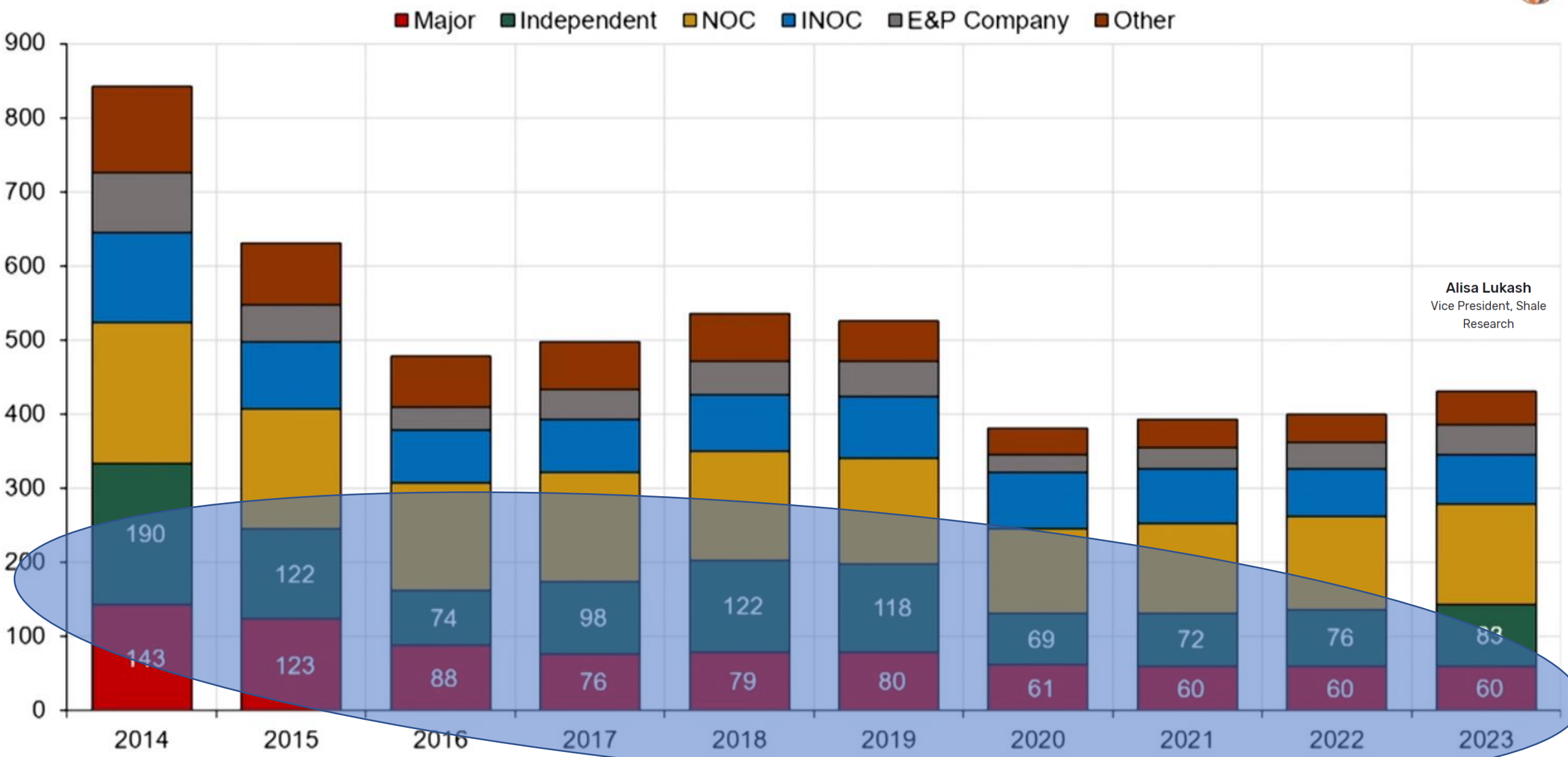


1) Including 2.5% annual cost inflation

Lars Eirik Nicolaisen
Senior Partner & Deputy CEO

Global upstream investments by company segment

Billion USD

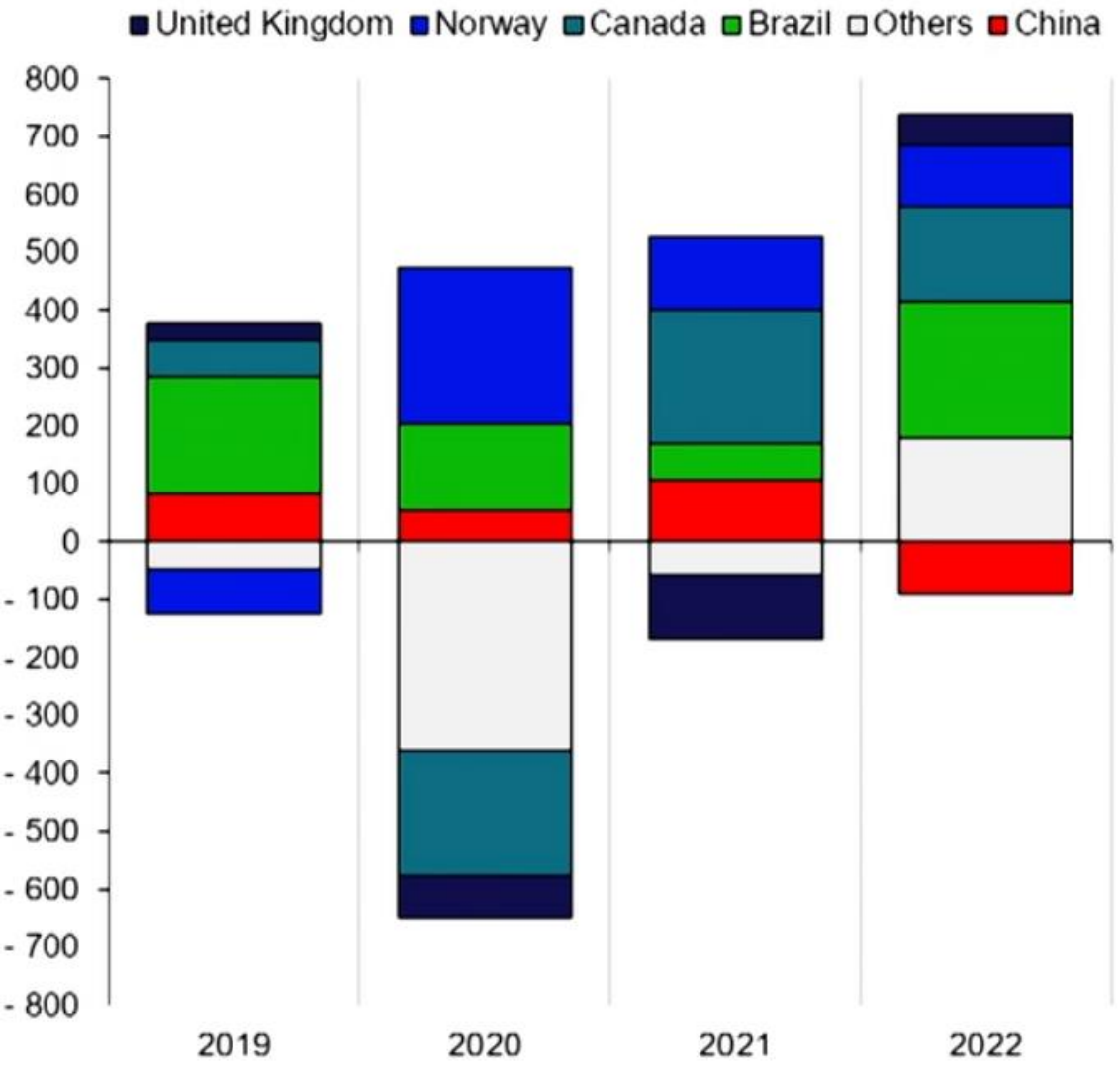


Source: Rystad Energy UCube, September 2021

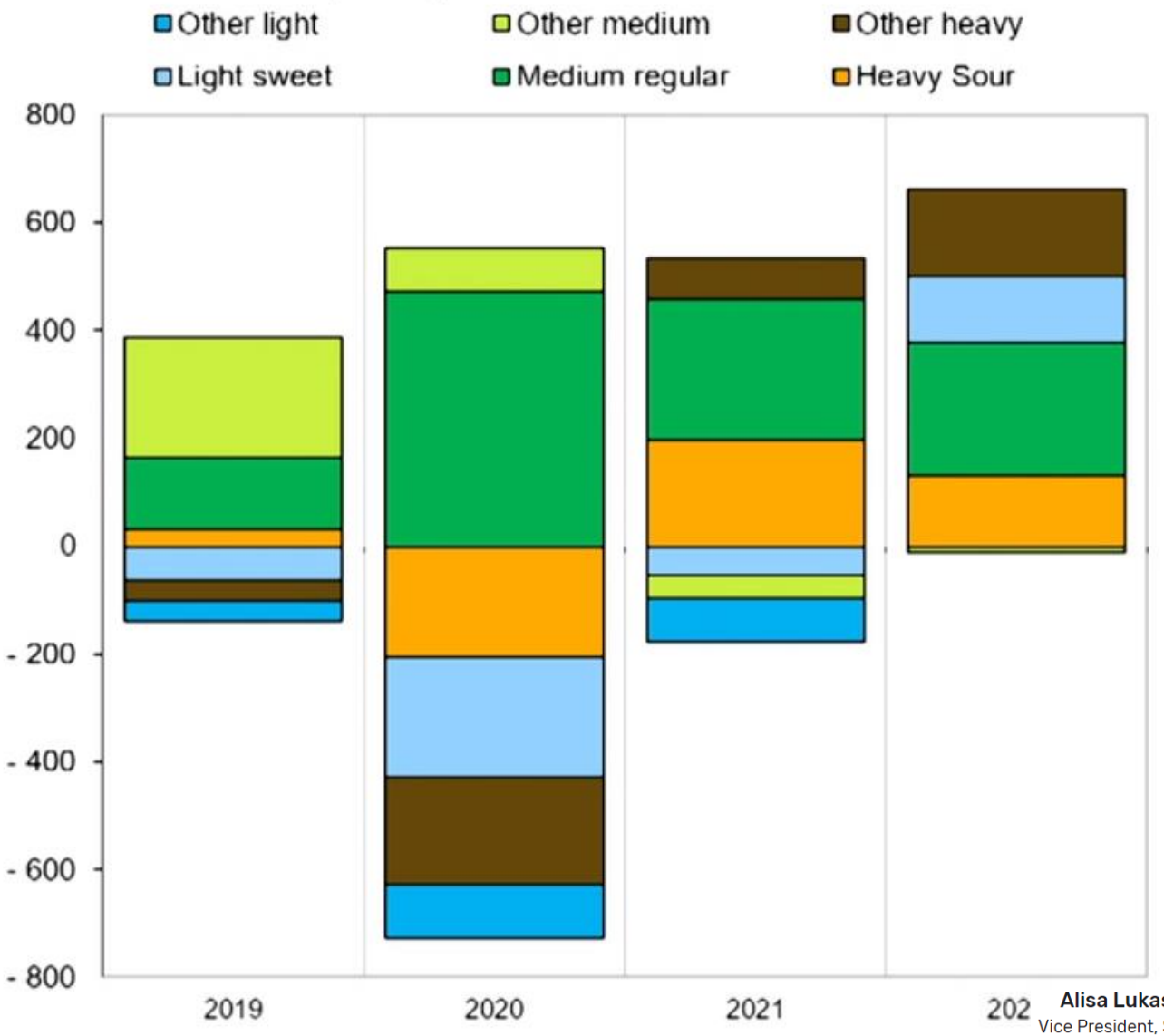
Alisa Lukash
Vice President, Shale Research

Brazil, Canada and Norway to lead supply additions in 2022 from non-OPEC+ excl. US

Y-o-Y change in oil production for non-OPEC+ excl. US
Thousand barrels per day



Y-o-Y change in oil production for non-OPEC+ excl. US, by quality
Thousand barrels per day

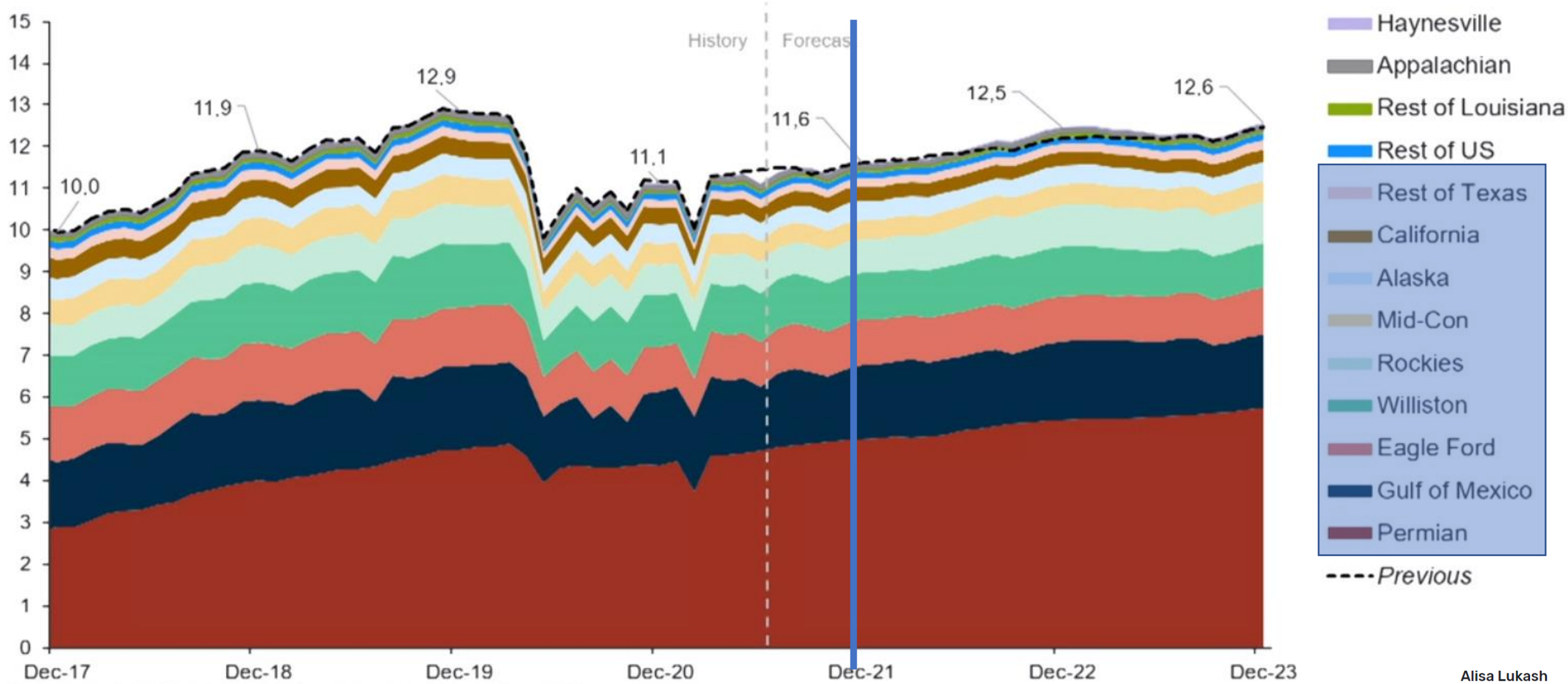


Source: Rystad Energy research and analysis

Alisa Lukash
Vice President, Shale Research

Steeper growth expected for 2022, but lower elasticity of supply

US oil* production outlook by basin, base case**
Million barrels per day

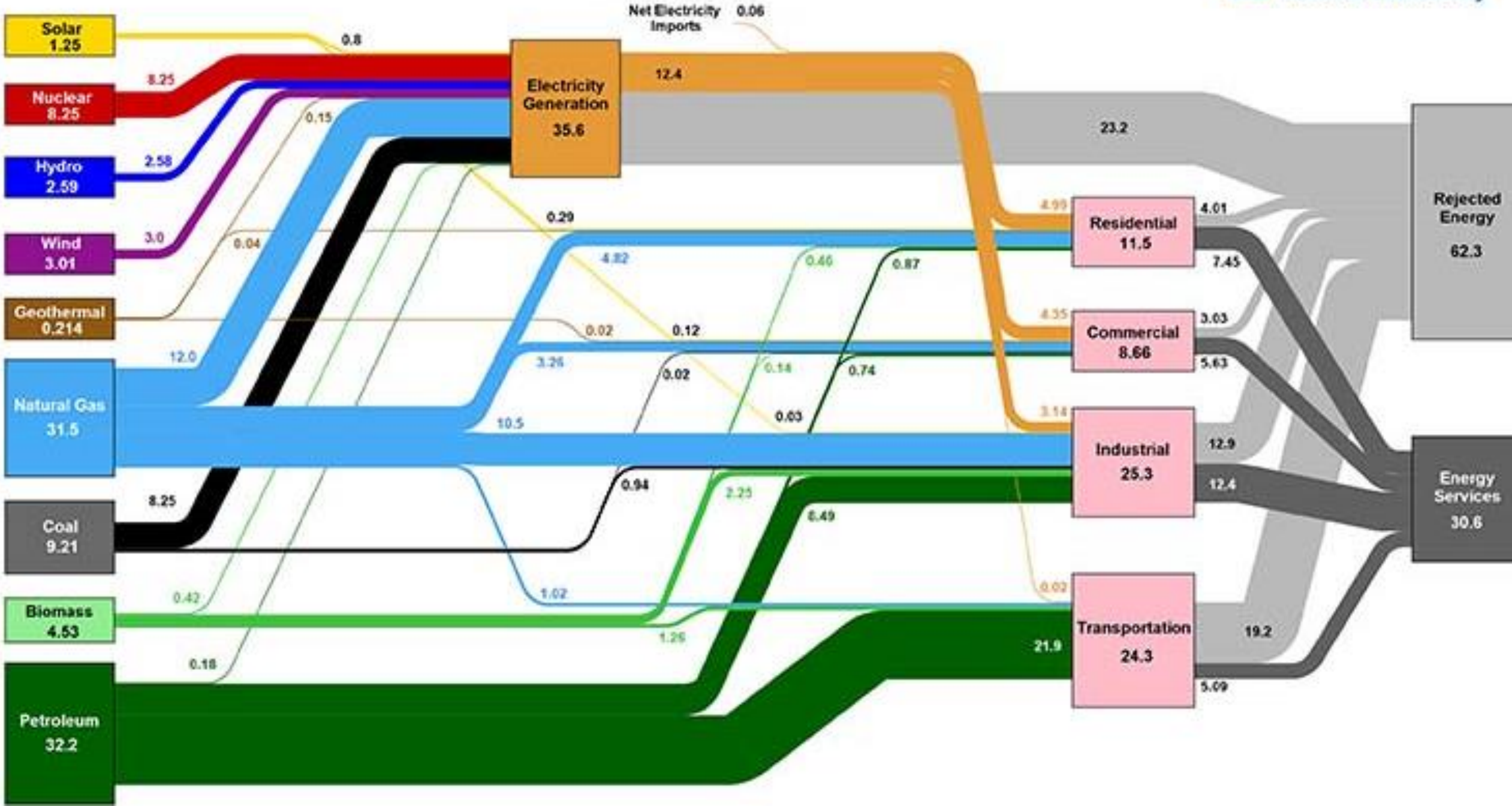


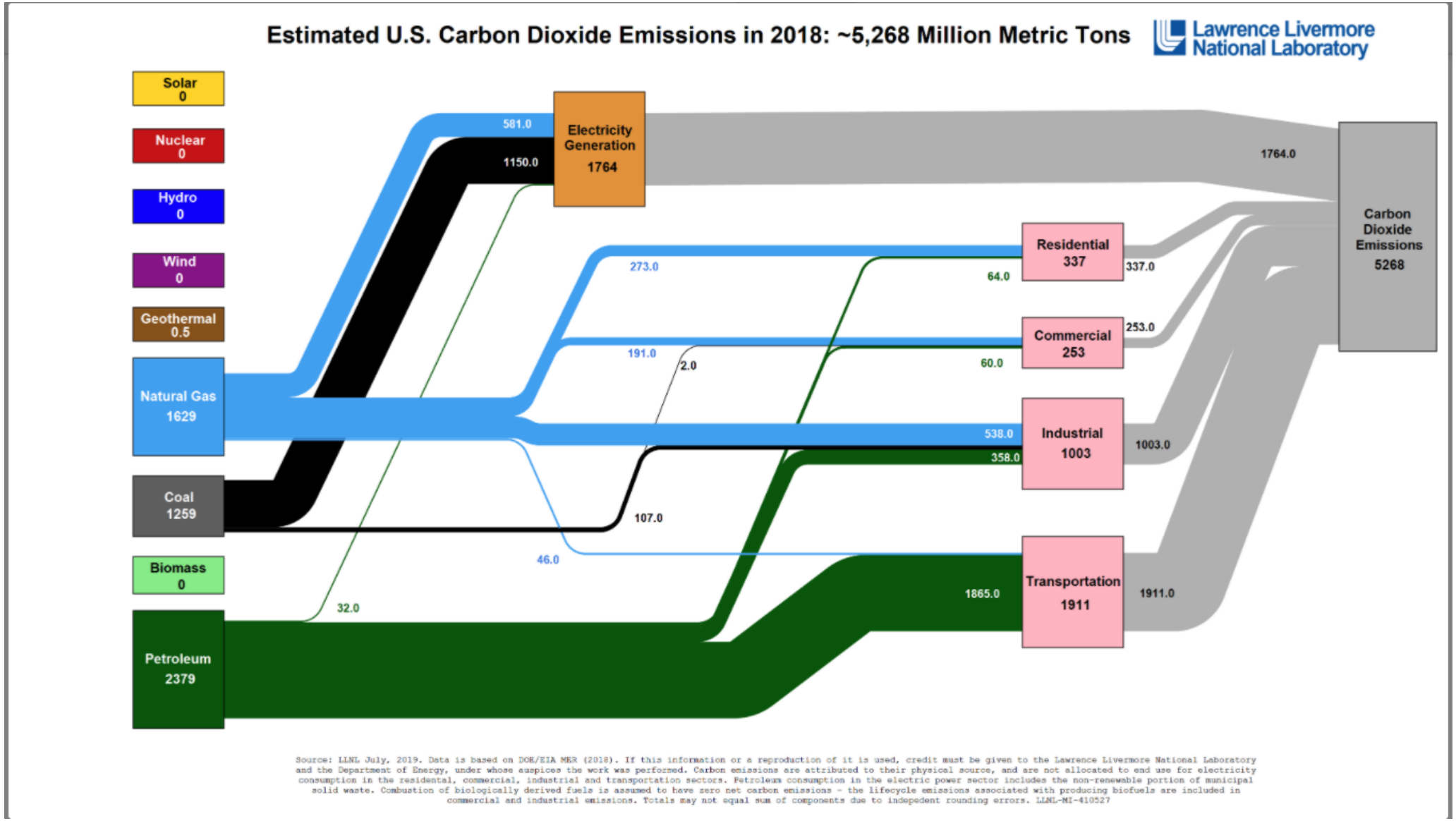
** Base case is $63, $57 and $54 WTI Cushing price for 2021, 2022 and 2023, respectively
Source: Rystad Energy research and analysis, Rystad Energy ShaleWellCube, OilMarketCube

Alisa Lukash
Vice President, Shale Research

Estimated U.S. Energy Consumption in 2020: 92.9 Quads

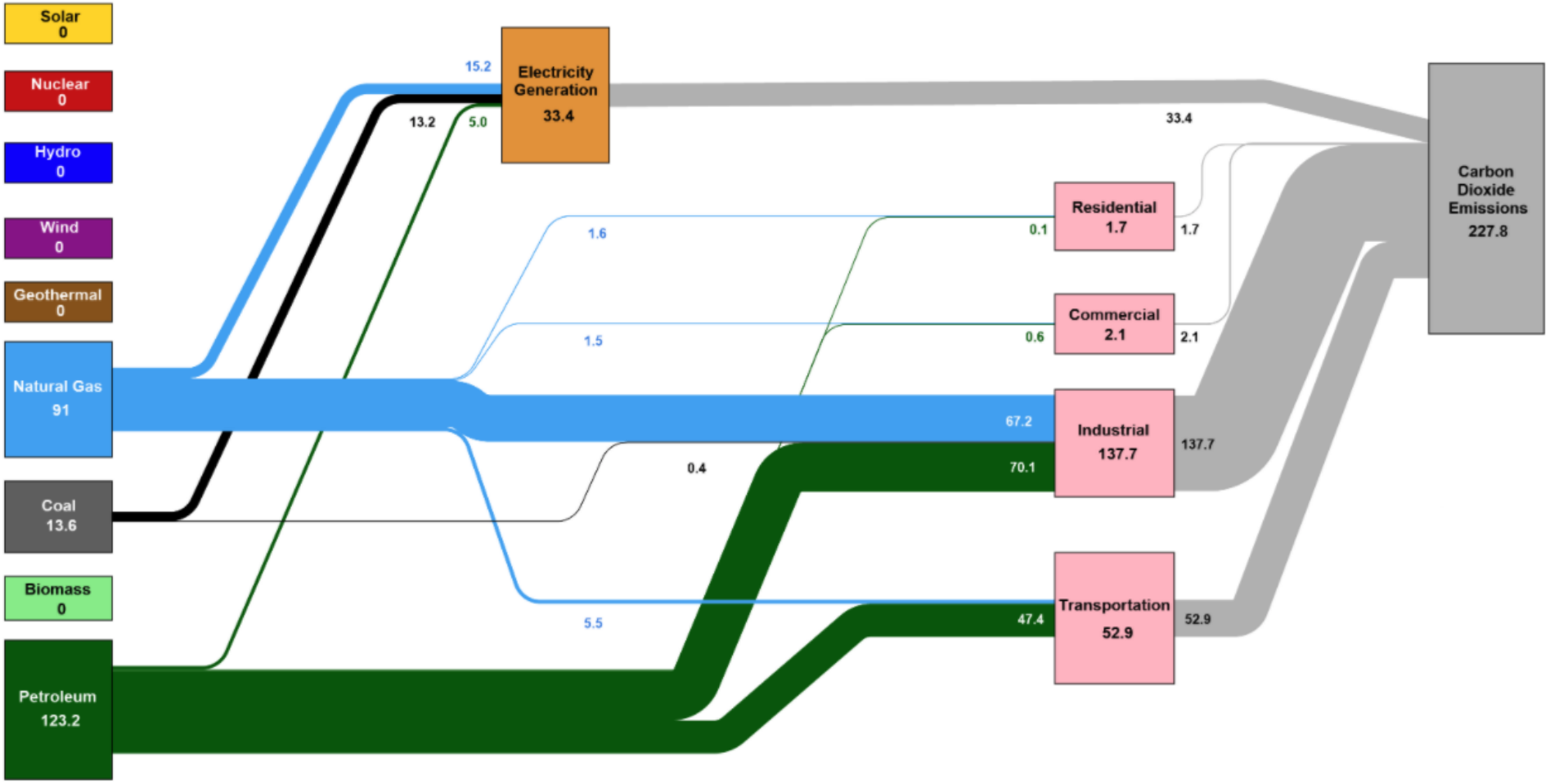
Lawrence Livermore National Laboratory



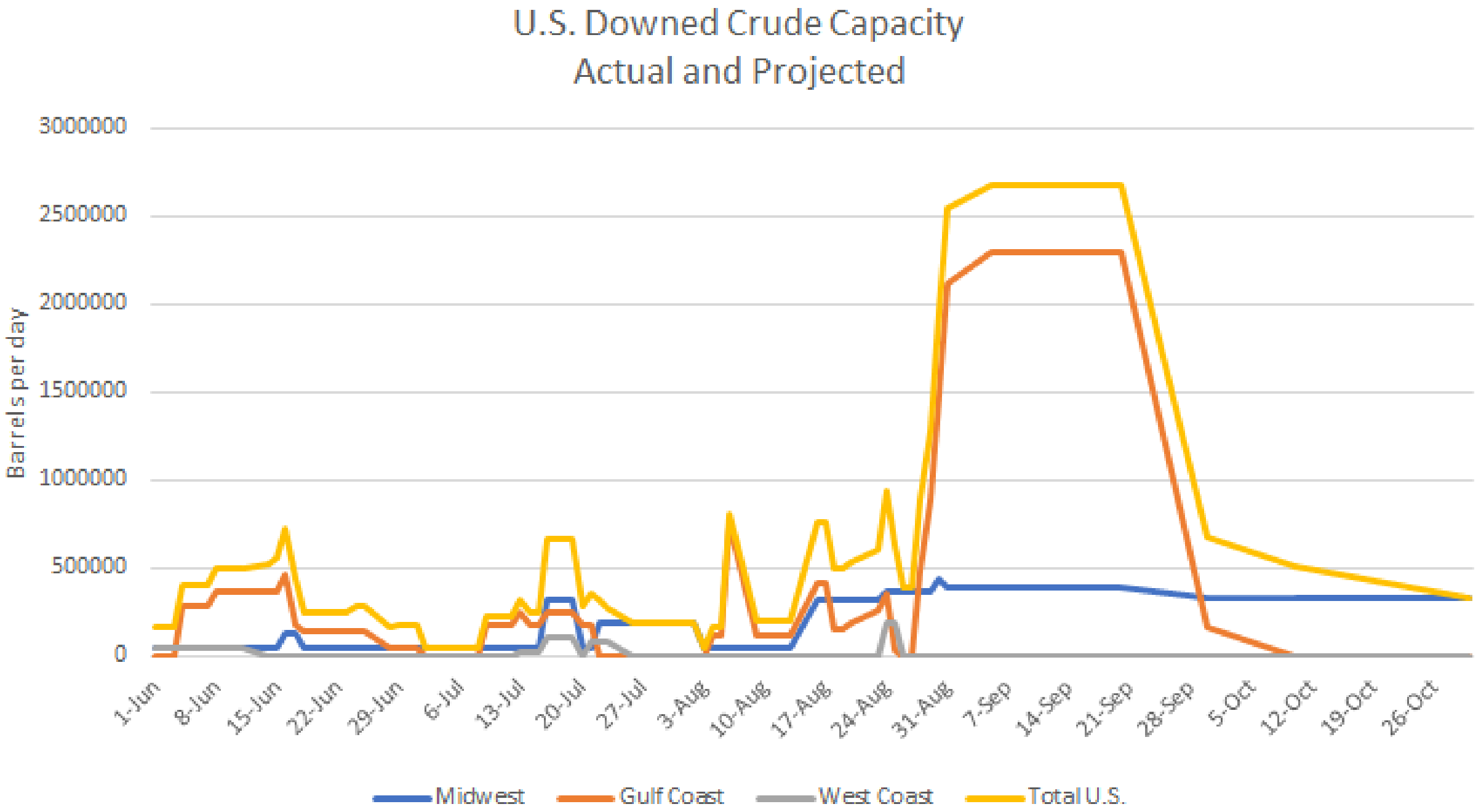

Estimated U.S. Carbon Dioxide Emissions in 2018: ~5,268 Million Metric Tons
Lawrence Livermore National Laboratory
Solar 0
Nuclear 0
Hydro 0
Wind 0
Geothermal 0.5
Natural Gas 1629
Coal 1259
Biomass 0
Petroleum 2379
581.0
1150.0
Electricity Generation 1764
1764.0
273.0
191.0
2.0
64.0
60.0
538.0
358.0
107.0
46.0
32.0
1865.0
Residential 337
Commercial 253
Industrial 1003
Transportation 1911
337.0
253.0
1003.0
1911.0
Carbon Dioxide Emissions 5268
Source: LLNL July, 2019. Data is based on DOE/EIA MER (2018). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Carbon emissions are attributed to their physical source, and are not allocated to end use for electricity consumption in the residental, commercial, industrial and transportation sectors. Petroleum consumption in the electric power sector includes the non-renewable portion of municipal solid waste. Combustion of biologically derived fuels is assumed to have zero net carbon emissions - the lifecycle emissions associated with producing biofuels are included in commercial and industrial emissions. Totals may not equal sum of components due to indepedent rounding errors. LLNL-MI-410527

Estimated Louisiana Carbon Dioxide Emissions in 2017: 227.8 Million Metric Tons

Lawrence Livermore National Laboratory

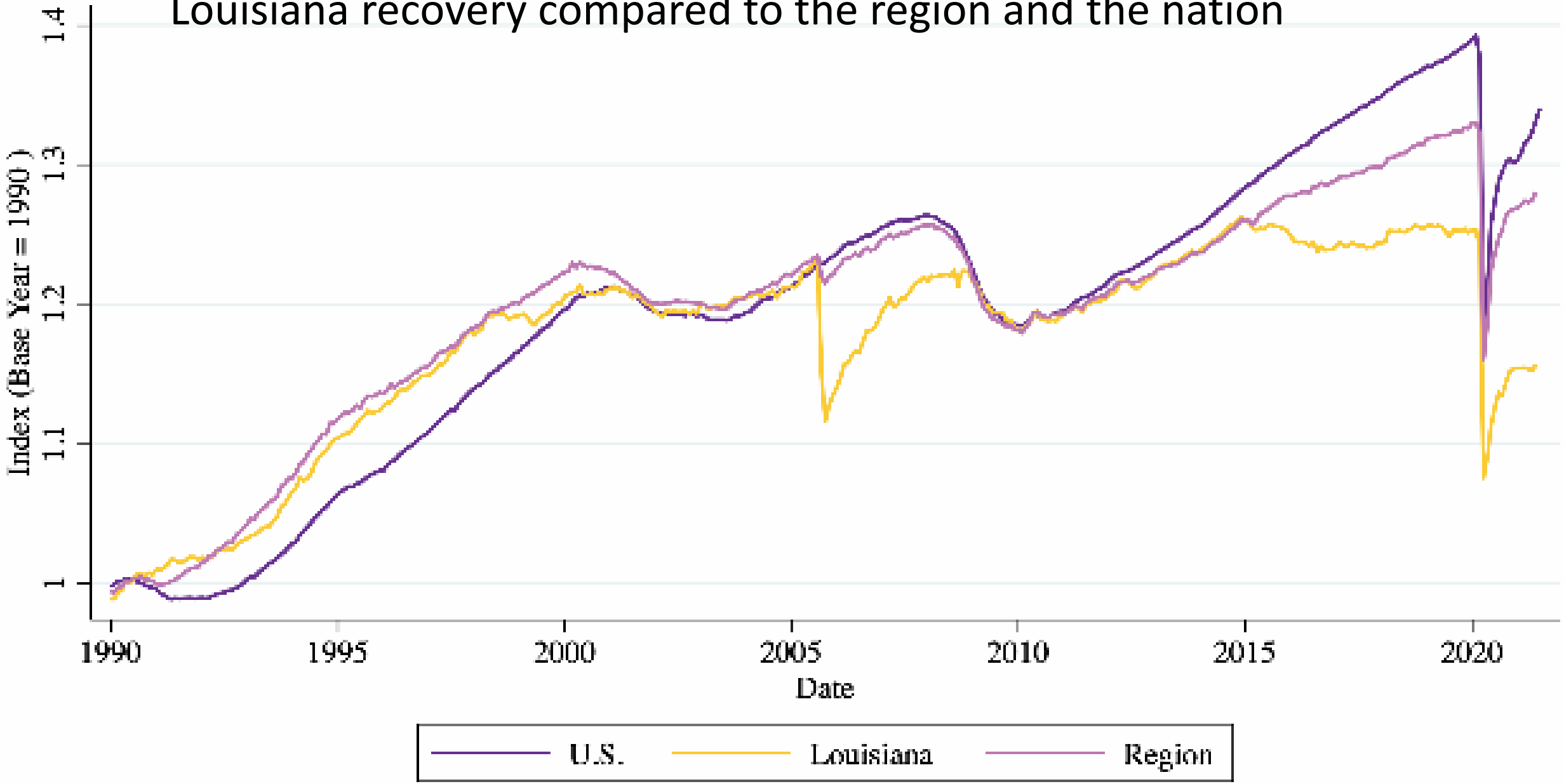


Source: LLNL July, 2019. Data is based on DOE/EIA State Carbon Dioxide Emissions Data (2018). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Carbon emissions are attributed to their physical source, and are not allocated to end use for electricity consumption in the residental, commercial, industrial and transportation sectors. Petroleum consumption in the electric power sector includes the non-renewable portion of municipal solid waste. Combustion of biologically derived fuels is assumed to have zero net carbon emissions - the lifecycle emissions associated with producing biofuels are included in commercial and industrial emissions. Totals may not equal sum of components due to indepedent rounding errors. LLNL-MI-410527



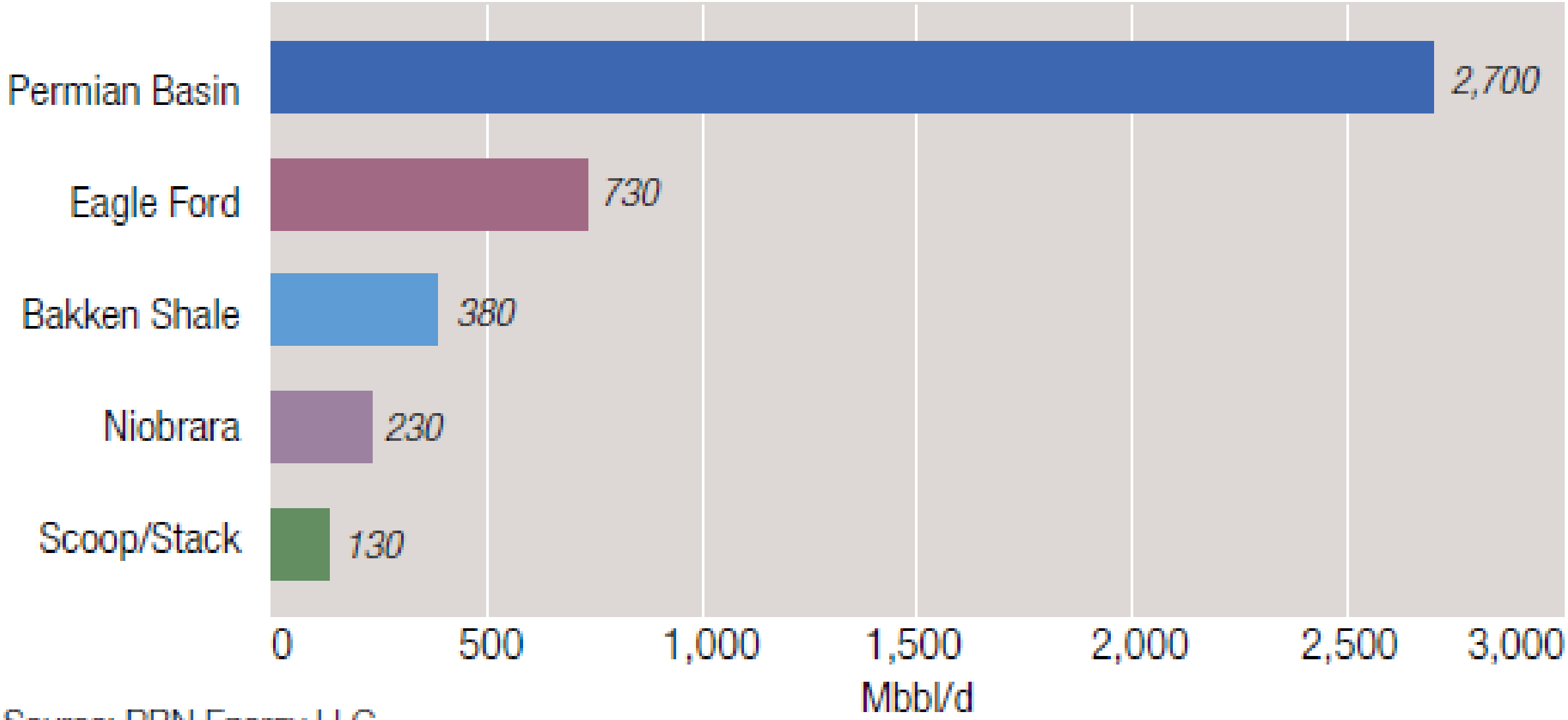
Source: OPIS by IHS Markit

Louisiana recovery compared to the region and the nation



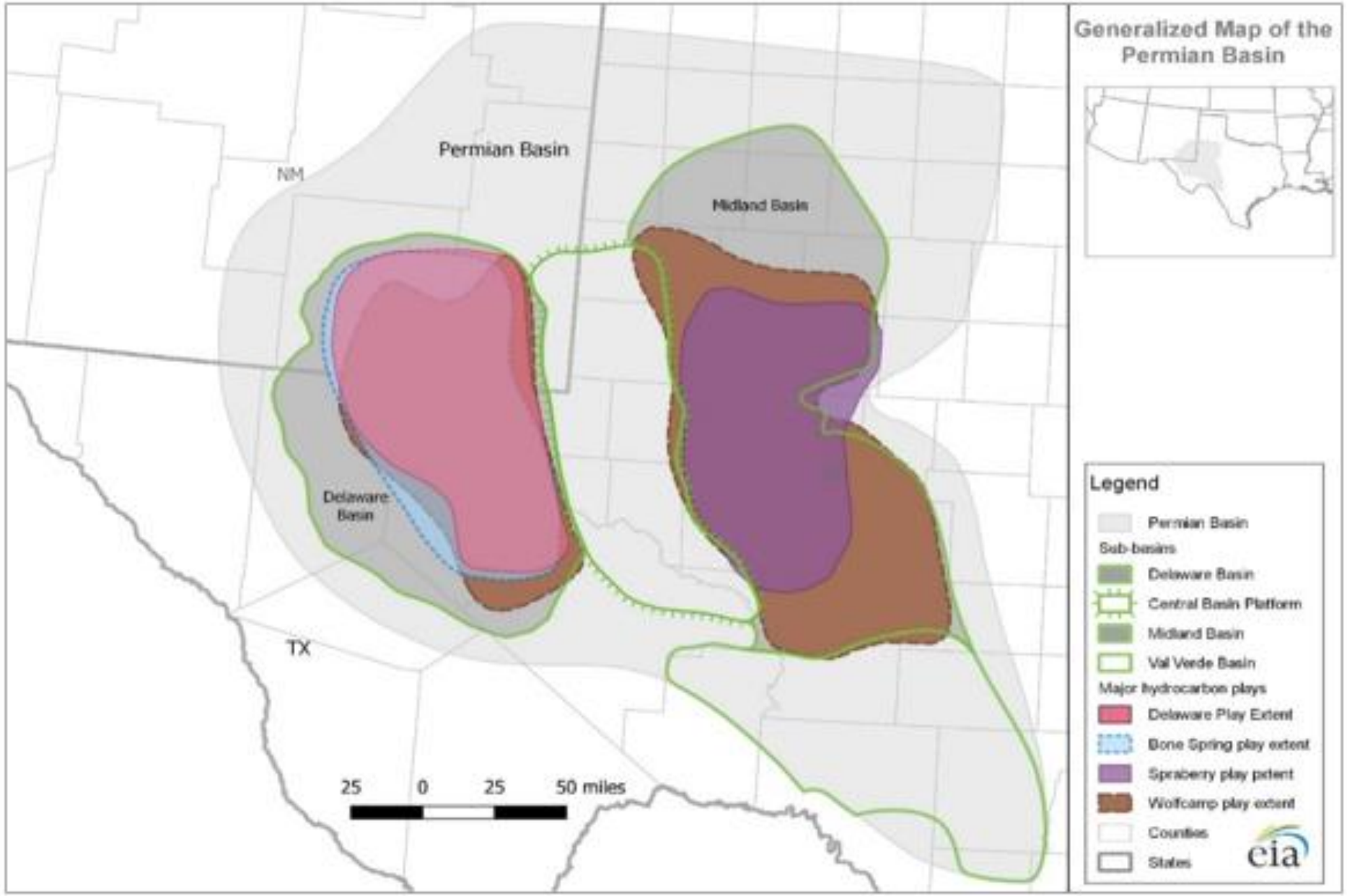
Source: Bureau of Labor Statistics, Current Employment Statistics (CES), Total Non-Farm Employment, Seasonnaly Adjusted, Retrieved from FRED.

Oil Production Growth By Basin, 2019-2024



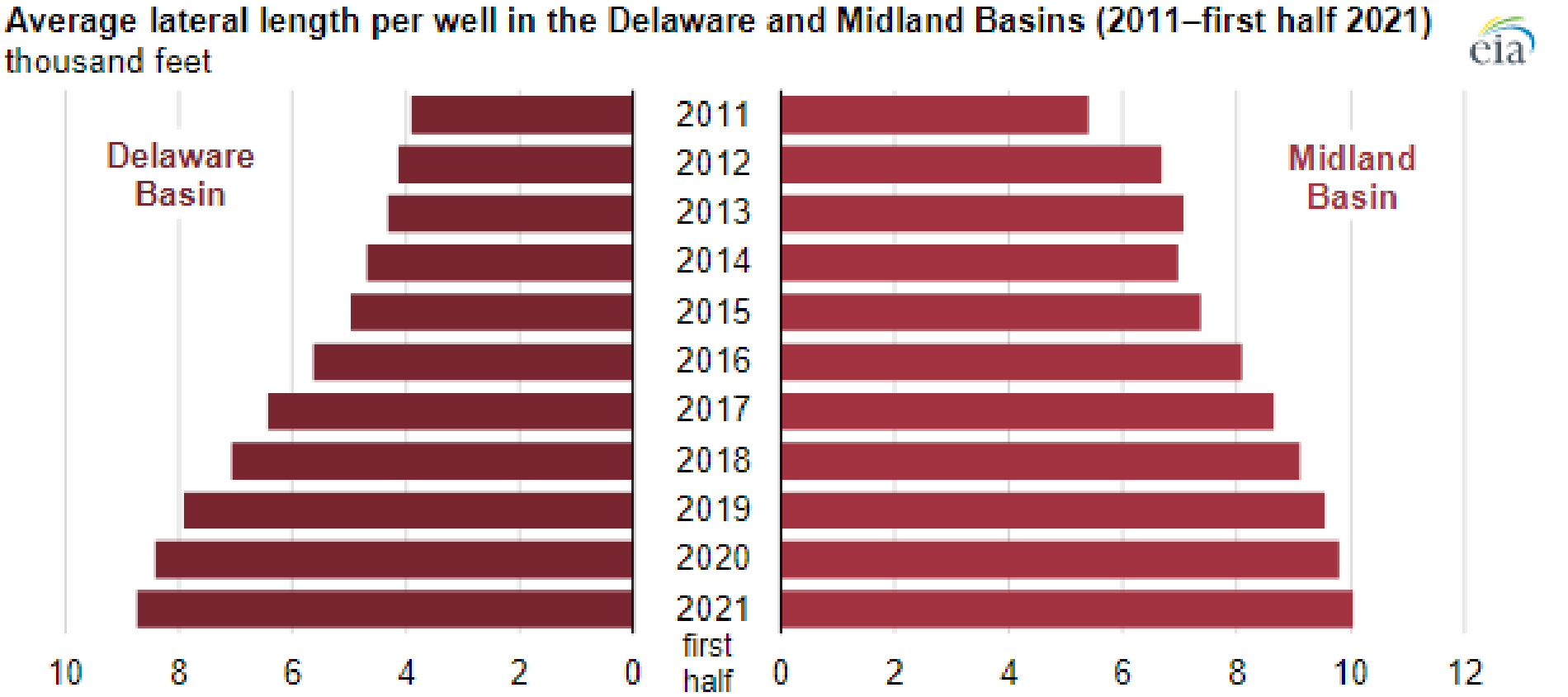
Source: RBN Energy LLC

Map of the Permian Basin in Texas and New Mexico



Source: Created by the U.S. Energy Information Administration, *U.S. Low Permeability Oil and Natural Gas Play Maps, Permian Basin*, based on data from Enverus

Drilling and completion improvements support Permian Basin hydrocarbon production



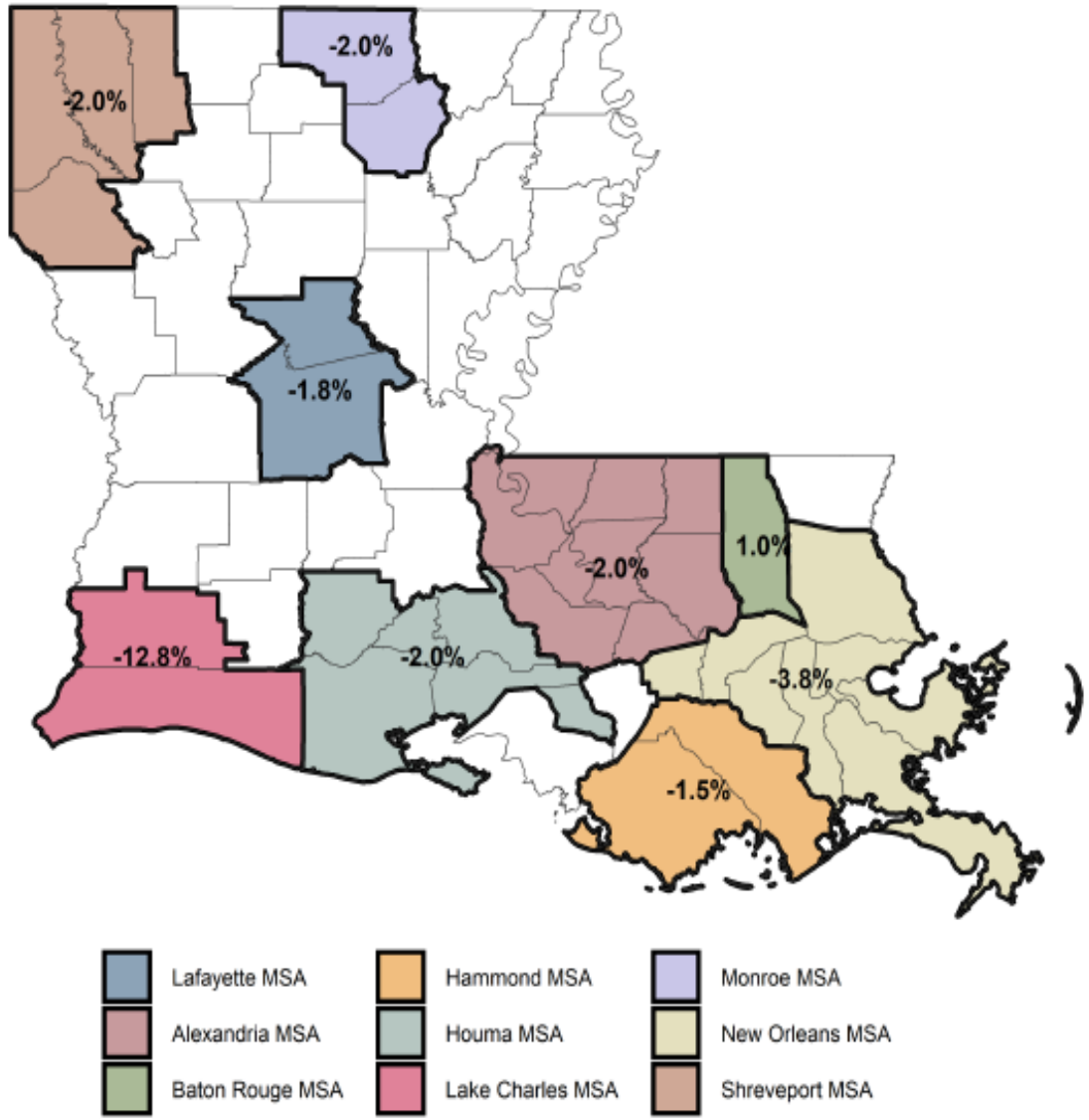
Source: Created by the U.S. Energy Information Administration, based on data from Enverus

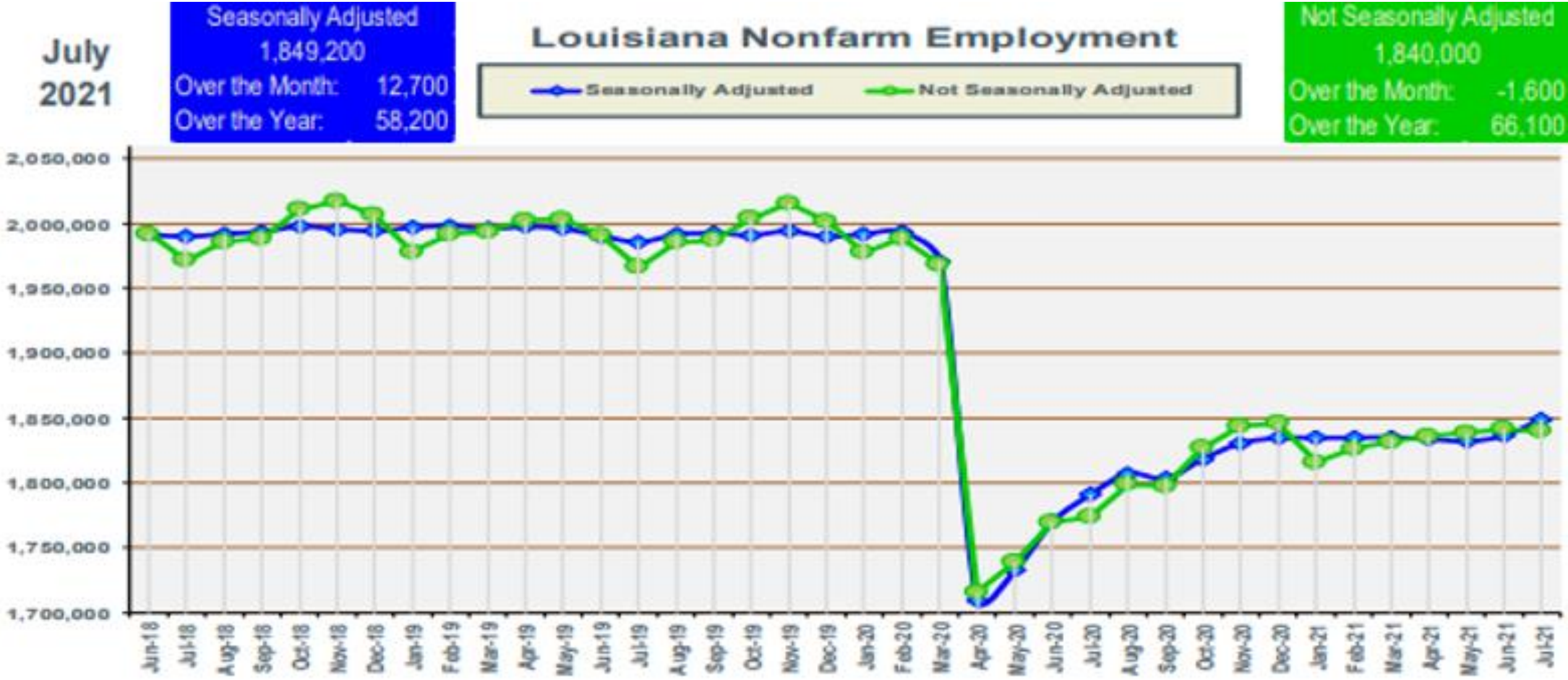
The Permian Basin, which spans western Texas and eastern New Mexico, represents the most prolific hydrocarbon production region in the United States. They accounted for about 30% of U.S. crude oil production and 14% of U.S. natural gas production (measured as gross withdrawals) in 2020. Technology innovations, such as longer lateral wells and multi-well pad drilling, has helped reduce costs and increase productivity in developing oil and natural gas resources in the Permian Basin.

Figure 8: Labor Force Recovery in Louisiana's Metro Areas

Metro Area Labor Force Size: Relative to 12 Month Pre-Covid Average

As of June, 2021





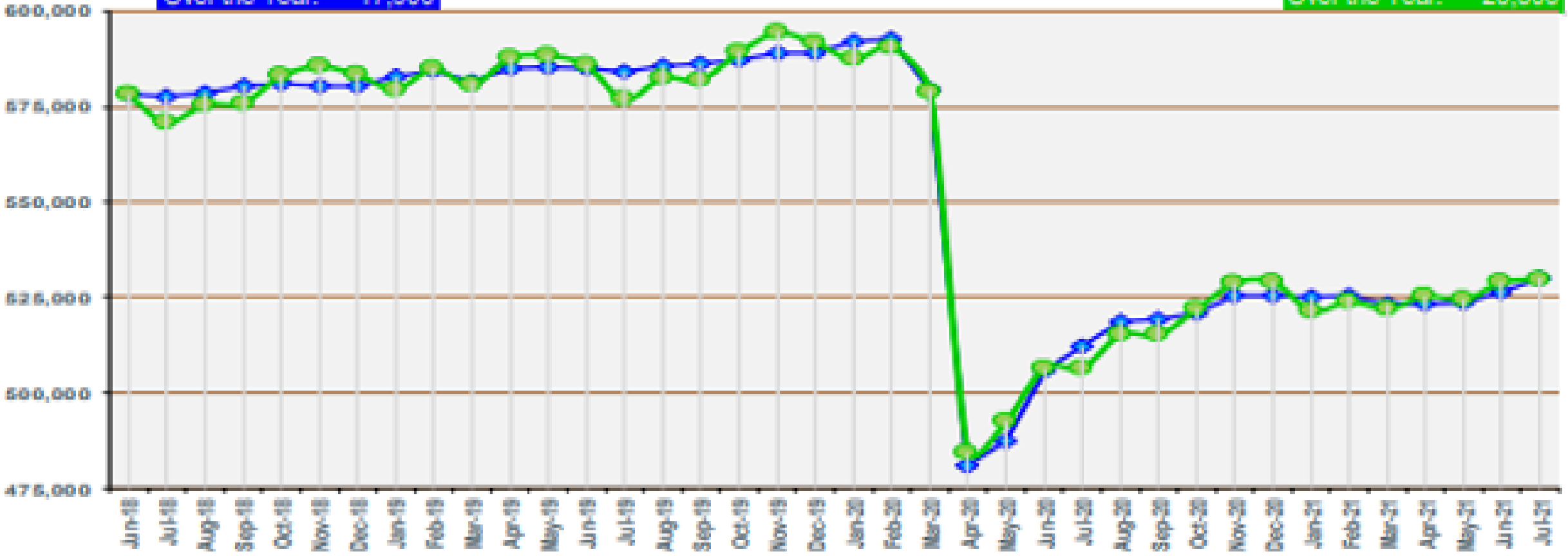
Louisiana Workforce Commission

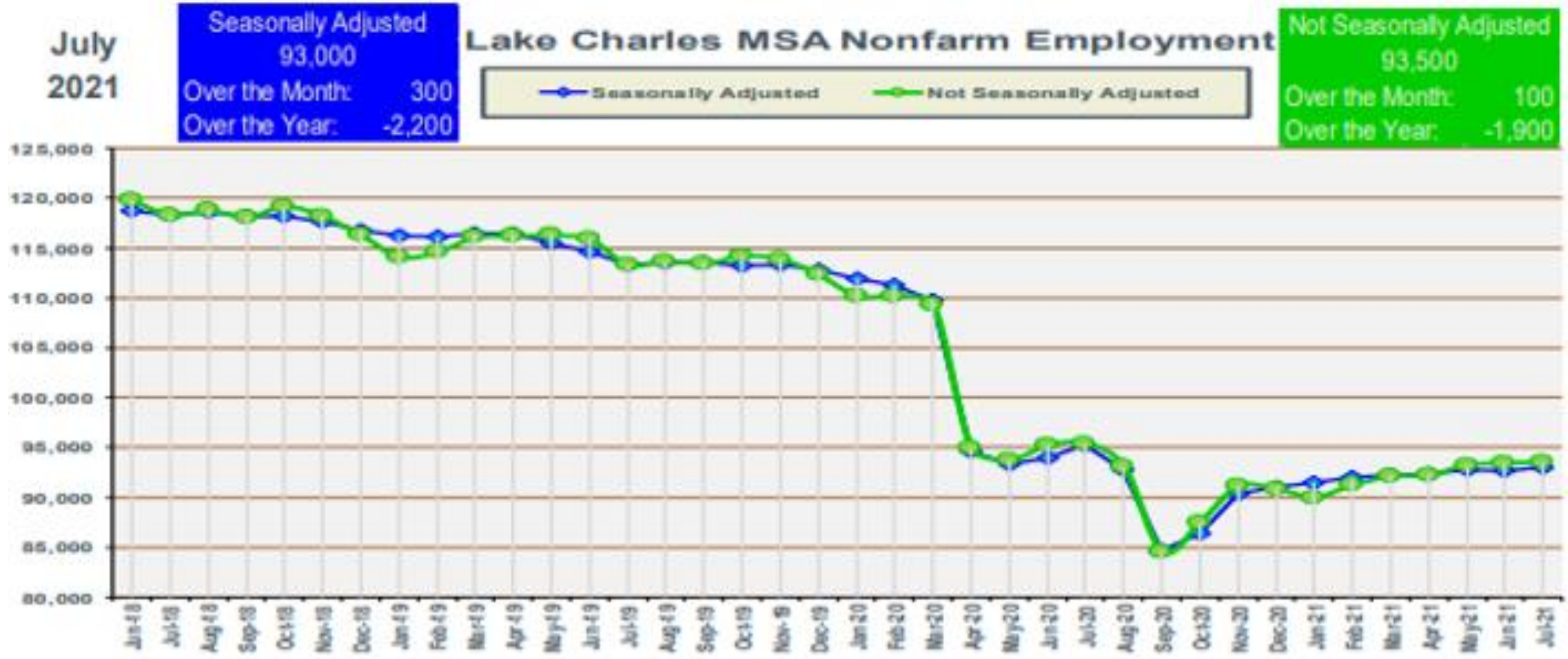
July 2021

Seasonally Adjusted
530,000
Over the Month: 3,700
Over the Year: 17,900

New Orleans MSA Nonfarm Employment

Not Seasonally Adjusted
529,700
Over the Month: 700
Over the Year: 23,300





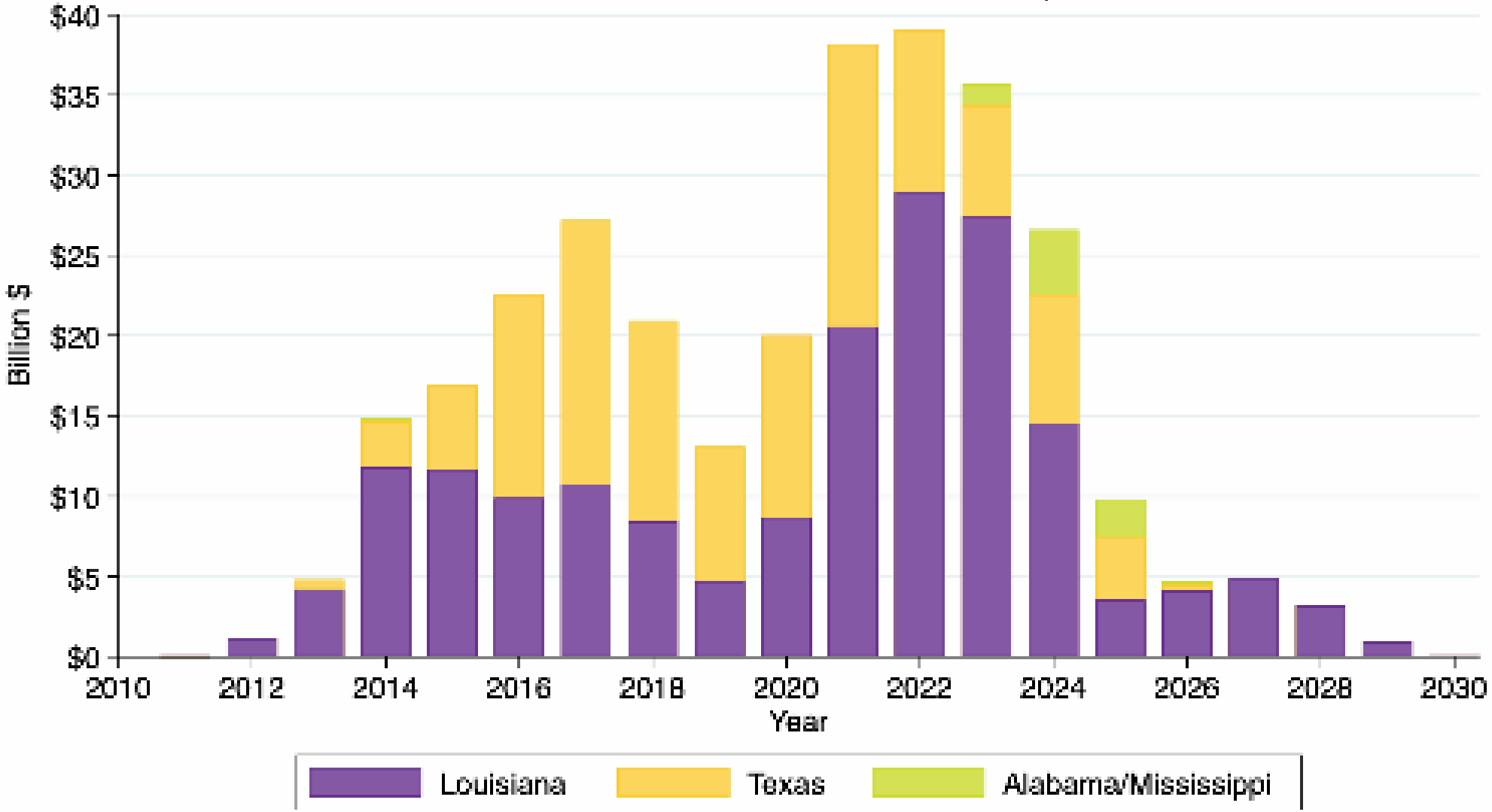
Louisiana Workforce Commission

Louisiana Construction activity

- Louisiana construction jobs lag the rest of the U.S.
- Louisiana construction unemployment rate stood at 9.6% in June.
- Louisiana sustained the second largest percentage loss, -15.1% of jobs, from before the viral outbreak. Only Wyoming was worse at -15.3%.
- Lake Charles had the second-largest US percentage decline, between Feb. 2020 and June 2021, with a loss of 6,700 jobs, a 34% decrease. The worst location was Odessa, Tx. which saw a 38% decrease.

GOM Energy Manufacturing Investment by State

Louisiana was the Gulf Coast Capex Driver



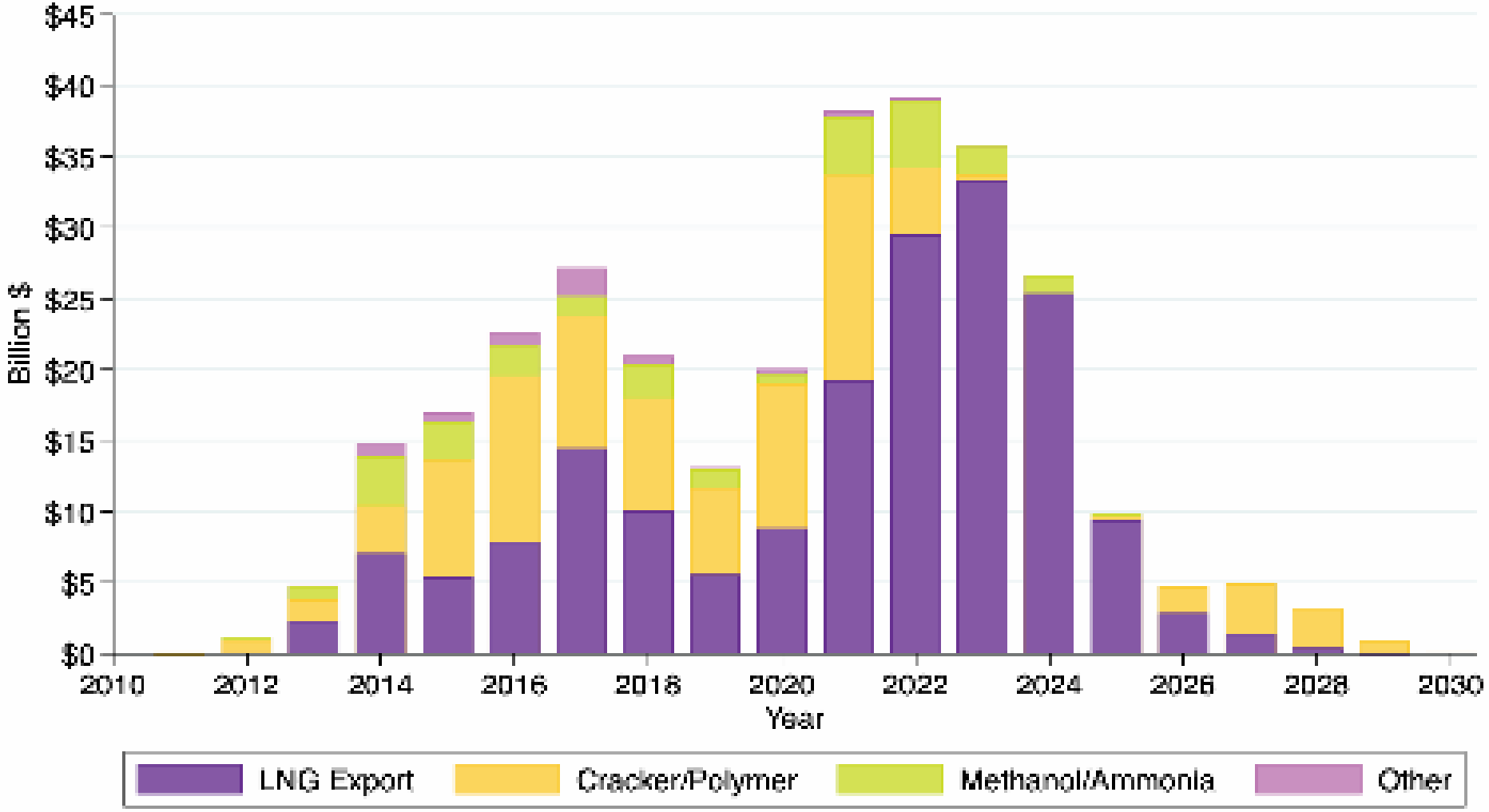
$142 billion through 2020) **and 163 billion** in announcements remaining.

To date, 51% in LA and 49% in Texas.

Remaining: 66% in LA and 29% in TX.

GOM Energy Manufacturing Investment by Sector

LNG for Export was the Gulf Coast Capex Driver



Prior to 2020, LNG investment accounted for **$52.7 billion** (43 percent) of capital investments. Olefins (cracker) and other petrochemical based investments accounts d for **$49.1 billion** (40 percent).

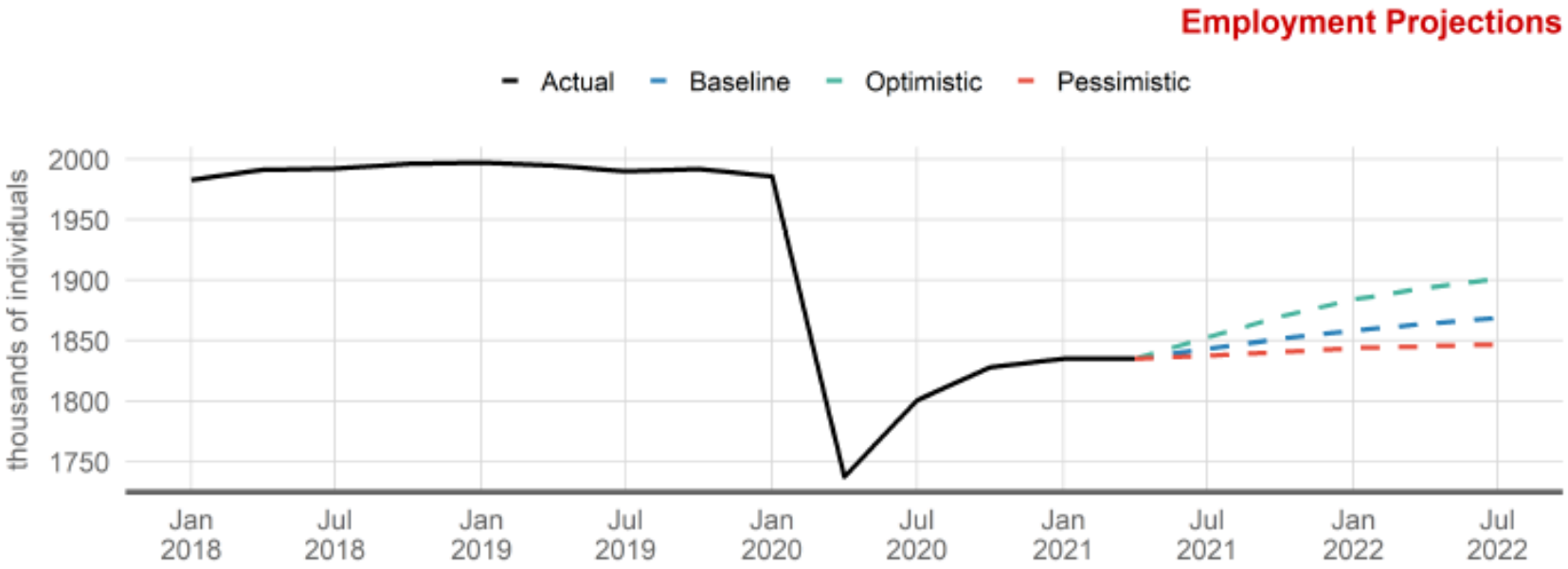
Despite gaining zero (net) jobs between
the first and second quarter of 2021, year-over-year job growth from 2020:Q2 to 2021:Q1 increased at a rate of 5.6%.

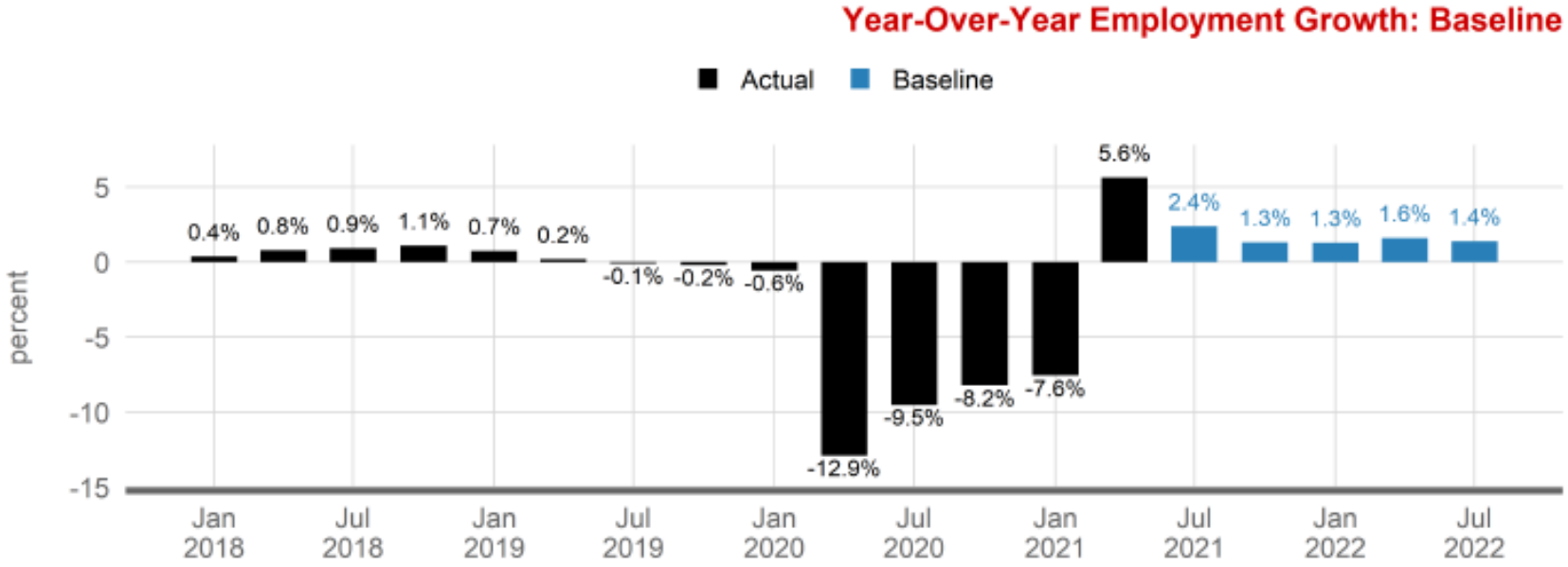
Job growth is now expected to slow in the coming year relative to previous projections. Current projections point to job gains of 29,000 over the next four quarters,

**The state lost 248,000 jobs between
the first and second quarters of 2020.**

To date, Louisiana has regained 97,500 of those jobs (or 39% of the total lost).

Figure 2: Louisiana Employment Projections





UNIVERSITY of LOUISIANA
B.I. Moody III College of Business Administration

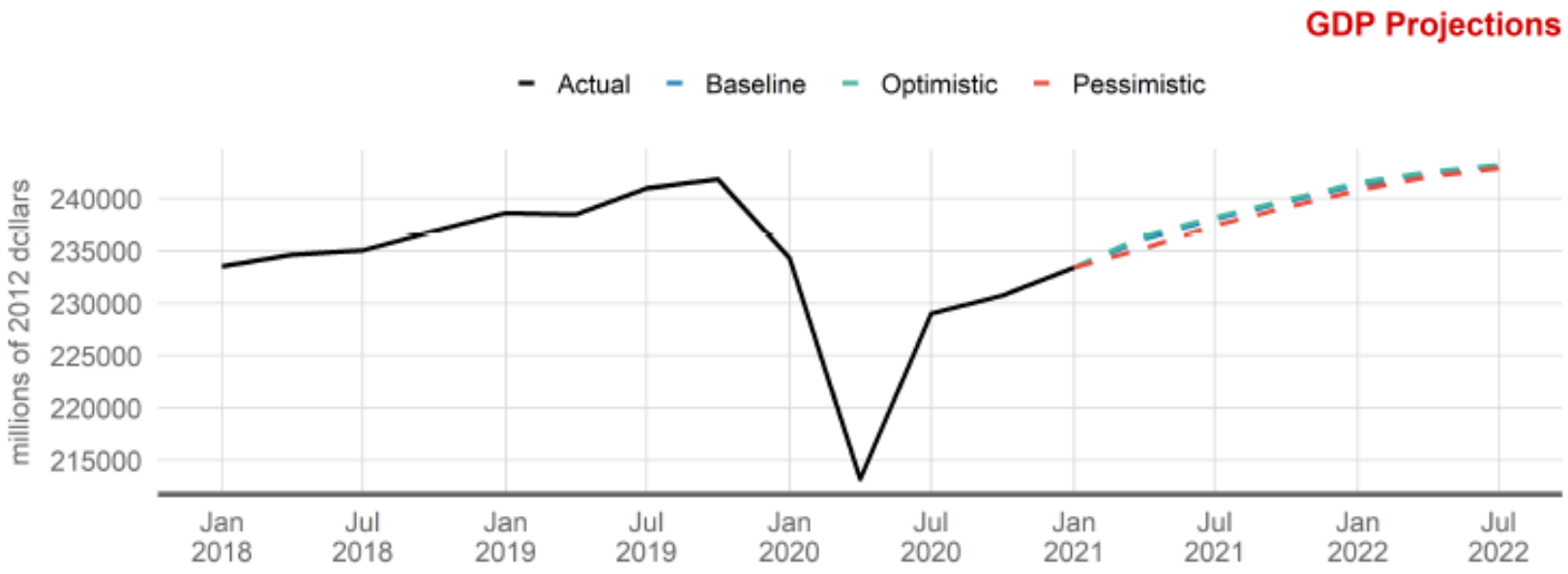
Louisiana's GDP expanded at an annualized
rate of 4.7% in the first quarter of 2021.

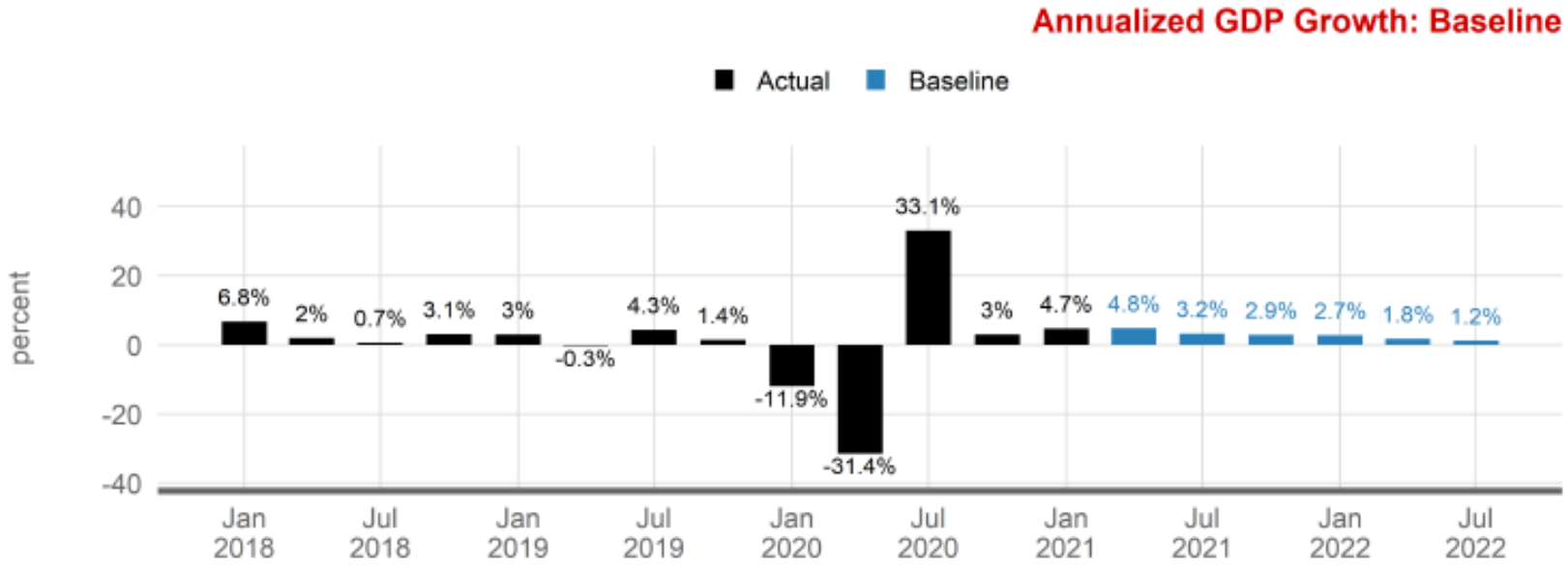
Despite a downgraded outlook, GDP is expected to grow at 4.8% in Q2 and 3.2% in Q3.

Over the next four quarters, the Baseline
scenario points to annual growth at 3.4%.

**(real) GDP in Louisiana remains 3.5% below pre-pandemic levels, which
ranks the state in the bottom five in terms of its relative economic recovery**.

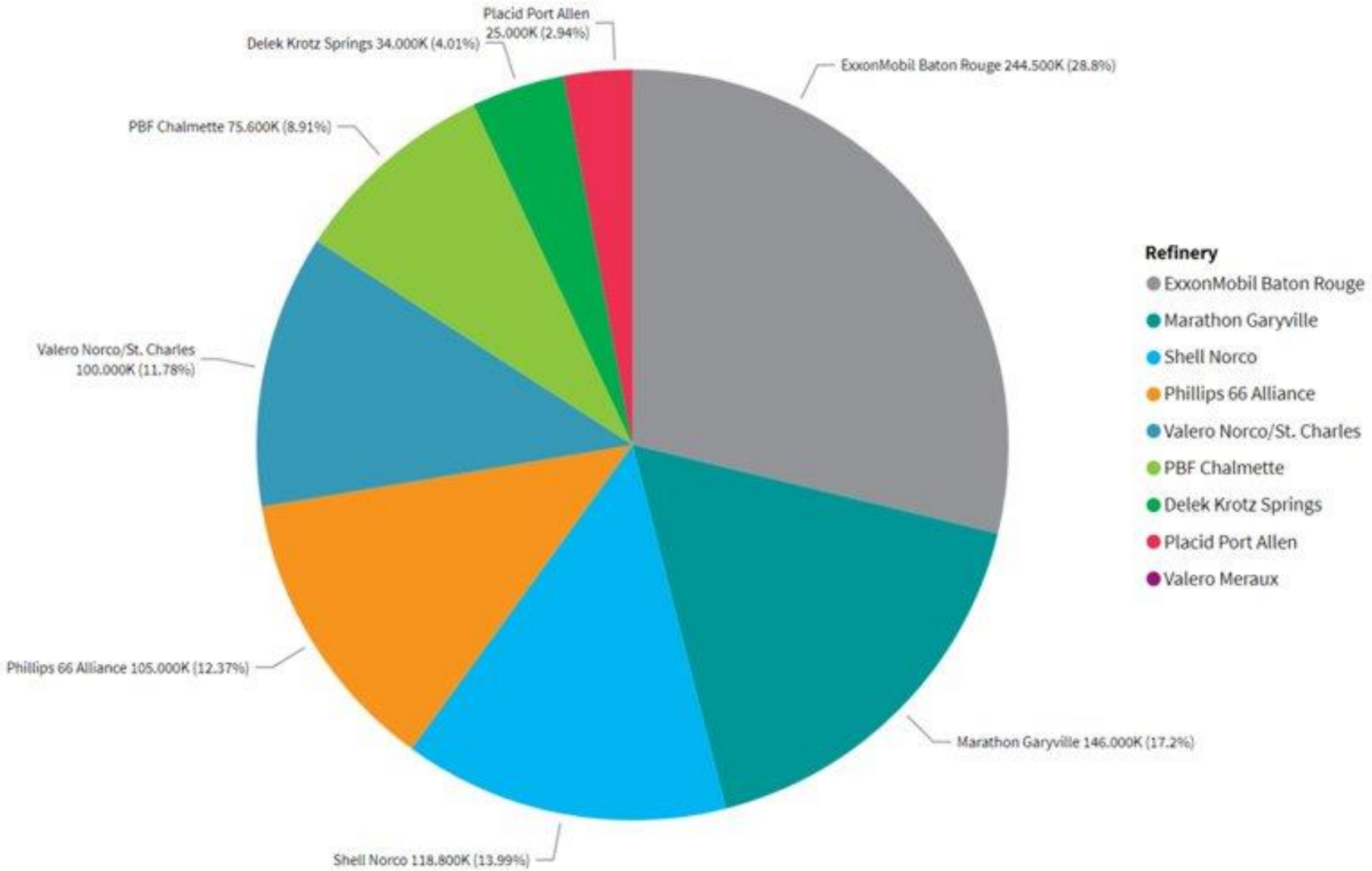
Figure 4: Louisiana GDP Projections





What about Hurricane IDA?

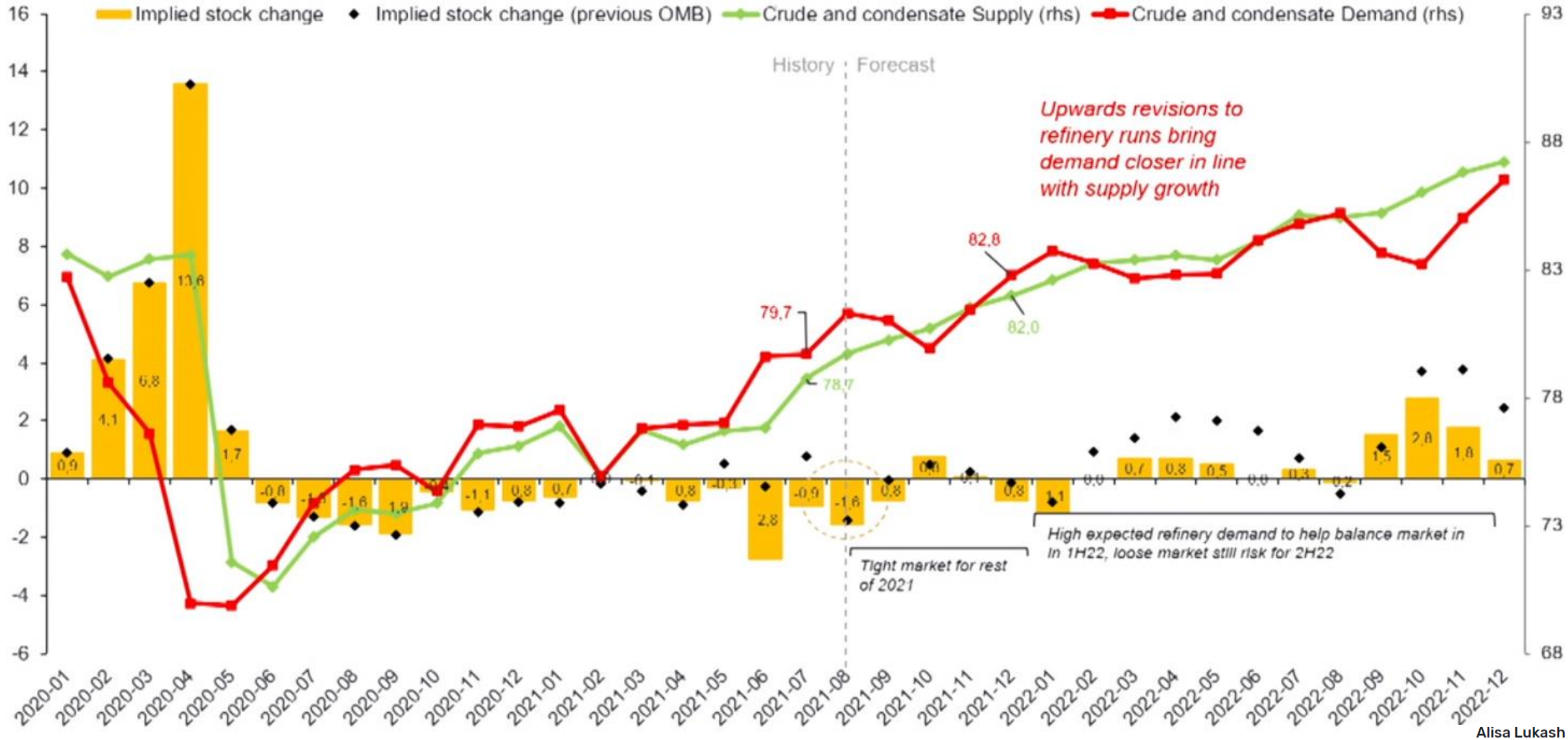
U.S. Gulf Coast FCC Capacity Taken Out by Ida



Source: OPIS by IHS Markit

2022 looking more balanced as refineries fire up

Global crude and condensate balances, monthly
Implied stock change (million bpd)

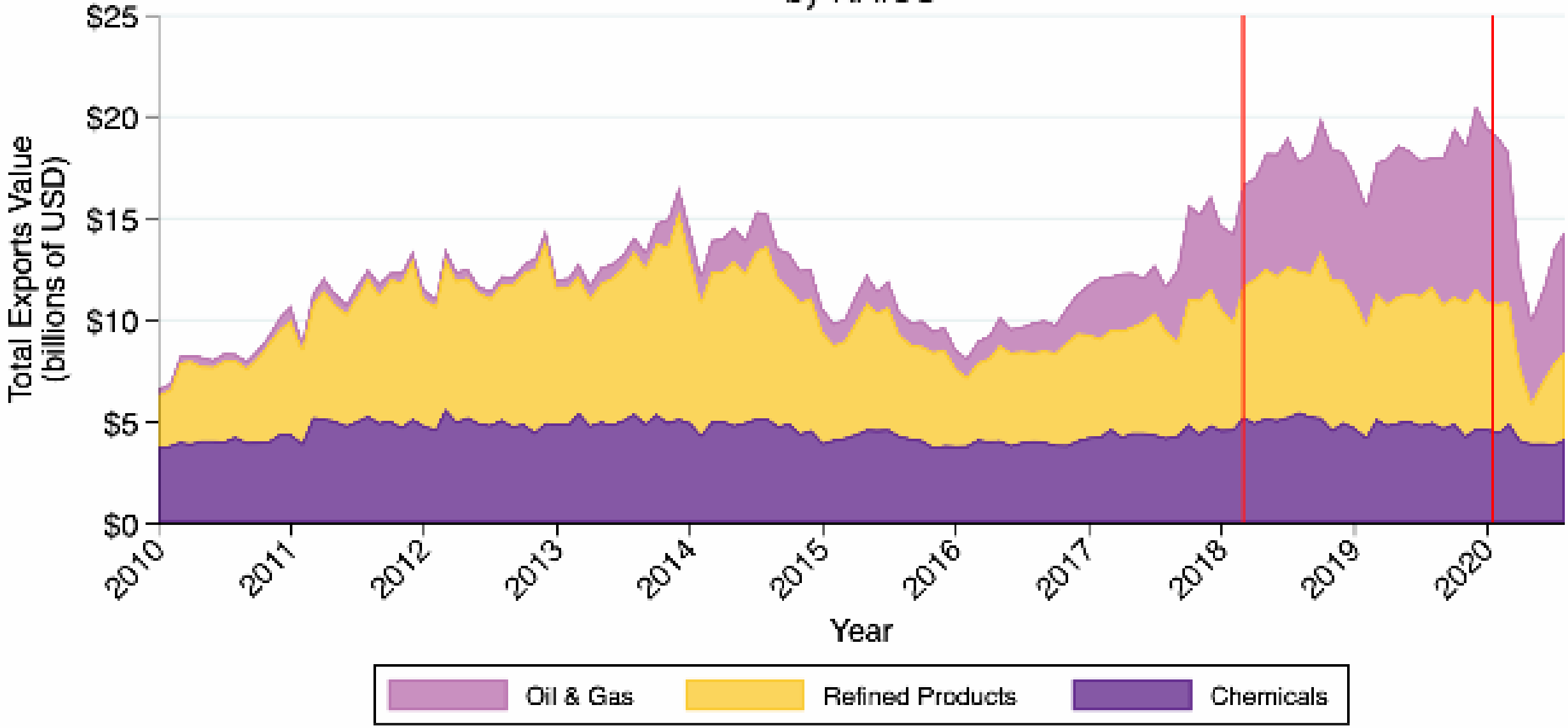


Alisa Lukash
Vice President, Shale Research

Source: Rystad Energy research and analysis; OilMarketCube, September 2021

Gulf Coast Exports to World

by NAICS



Source: U.S. Census Bureau: Economic Indicators Division USA Trade Online

Louisiana Announcements

Pros

- Natural Gas Exports continue to grow in 2021.
- **Haynesville Half Cycle IRRs hit 29%,** Rig count is at 57,the highest since 2019
- Production of 12.8 bcf/day poised for new record.
- **CF Industries began reducing CO2 emissions** using Denbury's Green Pipeline and a new Hydrogen Electrolysis unit.
- CF Industries receives financial support from UK for CO2 production.
- 82 new EV charging stations are coming to Louisiana
- **IMTT returns to New Orleans** and looks to spend $100 mm on new terminal facilities for renewable fuels
- **Louisiana's governor initiates energy task force**, reporting to him, made up of ~140 experts. The task force is to identify viable methods for gradually reducing CO2 emissions in Louisiana without decimating existing refining and petrochemical economies and employment.
- California, in extremis, decides to add five "temporary" natural gas power facilities to improve power reliability.
- Louisiana has become an export-oriented manufacturer

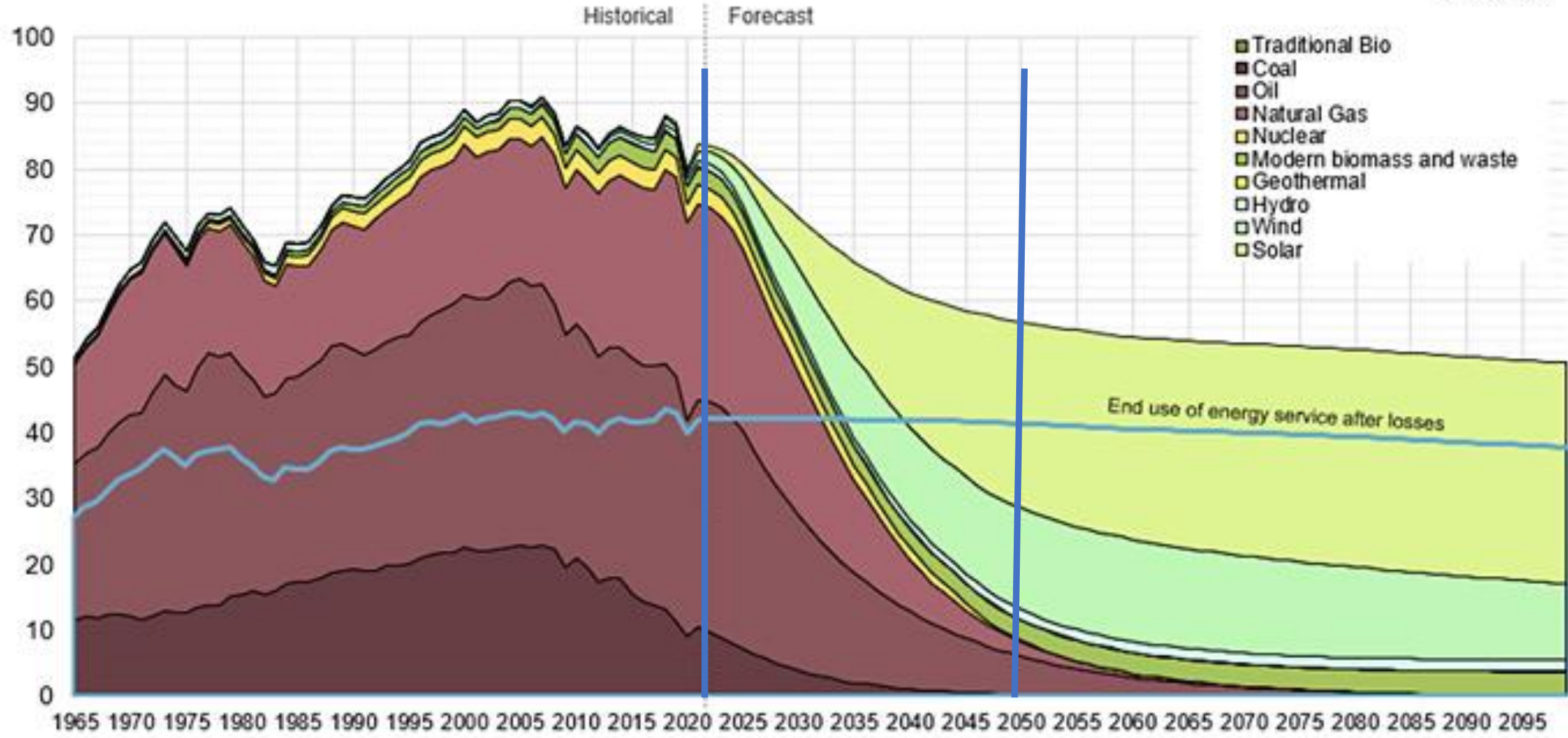
Cons

- Shell Convent Refinery Closes
- Phillips Alliance Refinery is for sale and suffers flooding damage
- Nucor drops Louisiana steel expansion plans
- **US Treasury opposes international development bank investment in Fossil Fuel additions, thwarting US (and Louisiana) technology and raw material exports.**
- Woodside buys BHP's Oil and Gas business, worldwide, including GOM
- Continued issues with Corona Virus
- Continued pressure to de-carbonize Louisiana industry on an accelerated basis.
- **Federal energy regulations in disarray. In some cases, the same law results in diametrically opposed regulations depending on where it is enforced.**
- **Hurricane Ida damages both upstream and downstream infrastructure** with onshore transmission damage being a significant drag on industrial output.
- Ditto for damage to Mars production hub offshore. **Oil supply losses from Hurricane Ida reached 30 million barrels, as of Sept. 15th impacting gasoline prices worldwide.**
- Louisiana has become an export-oriented source of energy products.

The “Brave New World” of industrial de-carbonization

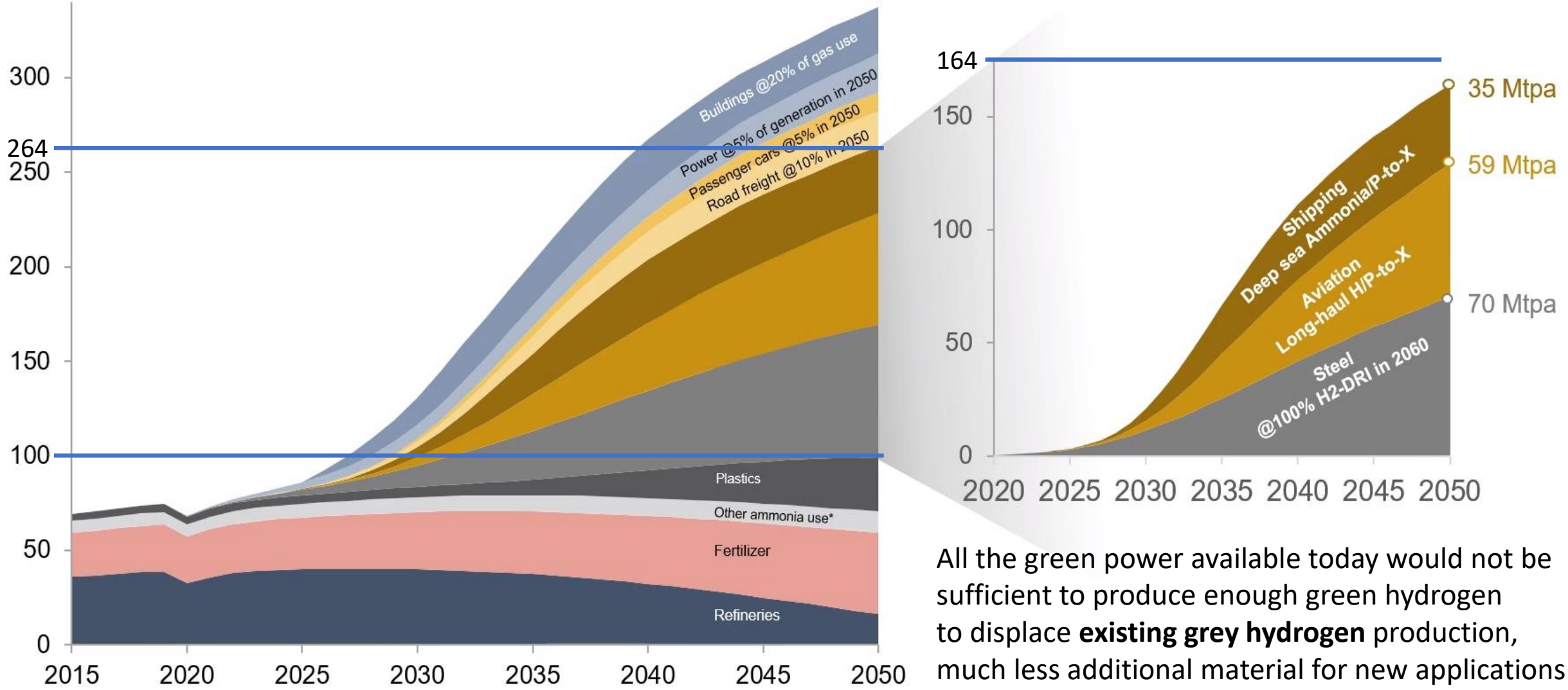
Total primary energy before losses in the US

EJ (blue line is energy service use after losses)



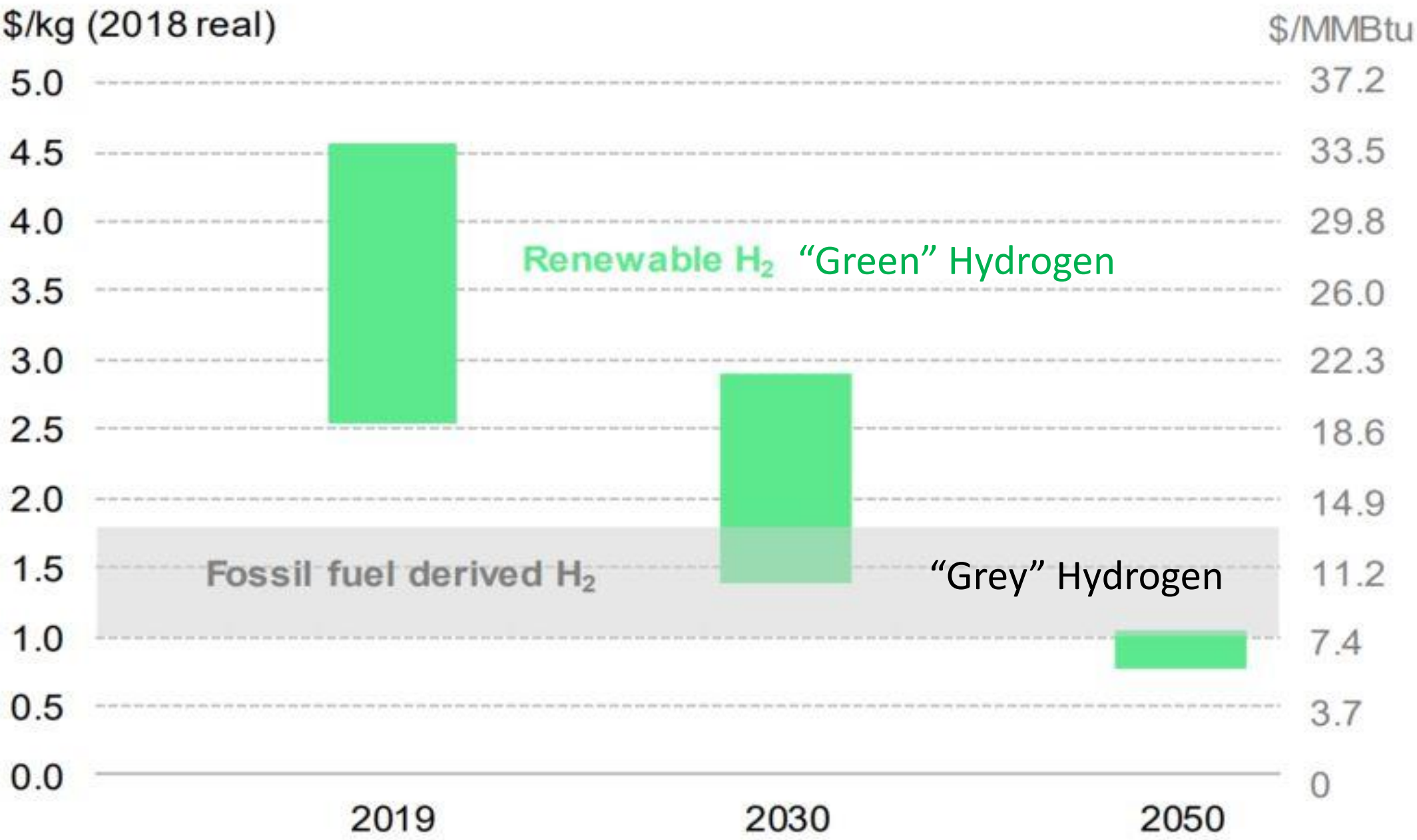
Hydrogen demand to quintuple by 2050, propelled by long distance transport and steel

Global hydrogen demand by sector
Million tonnes per annum (Mtpa)



All the green power available today would not be sufficient to produce enough green hydrogen to displace **existing grey hydrogen** production, much less additional material for new applications.

*Other ammonia includes refrigerants, pharmaceuticals and textiles
Source: Rystad Energy research and analysis, HydrogenCube beta



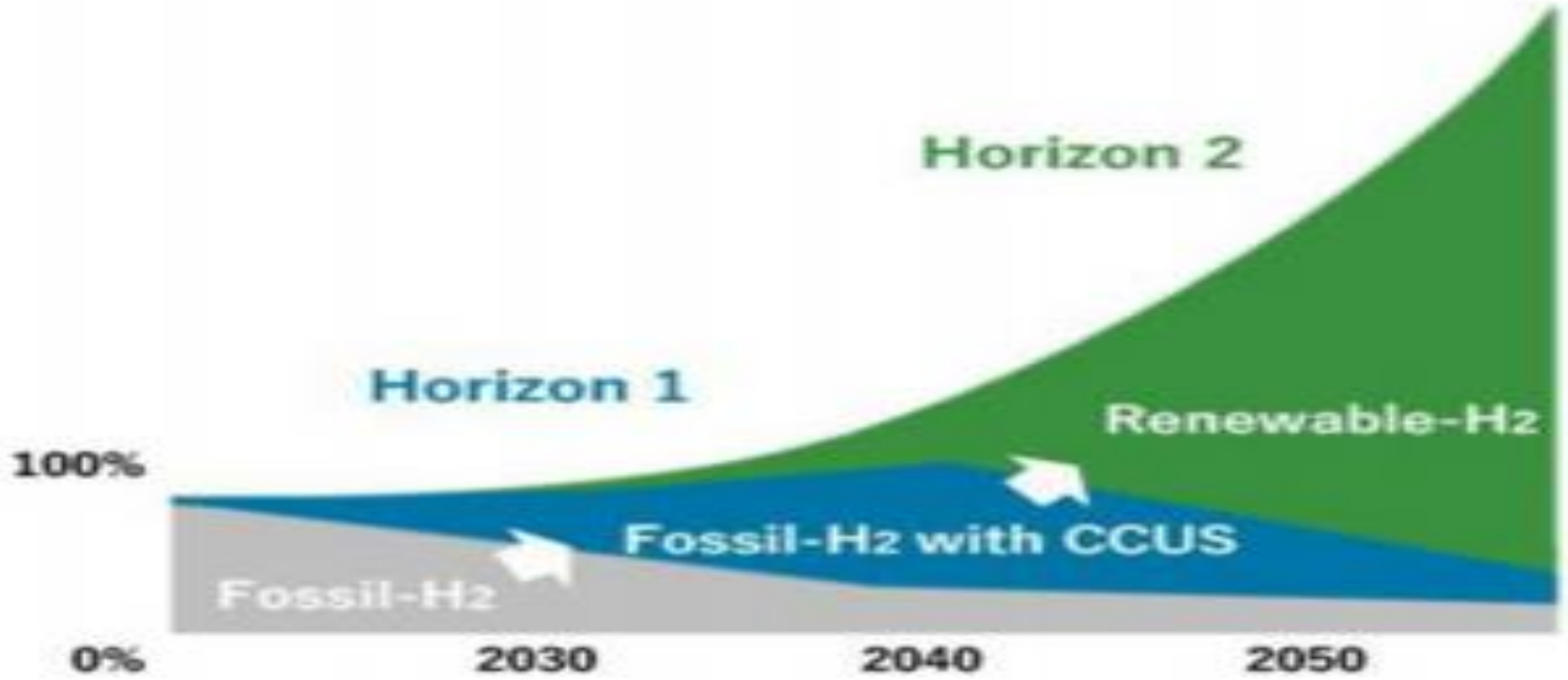
BNEF projections of the cost of producing hydrogen from renewables, when compared with hydrogen derived from natural gas without carbon capture.

Source: BloombergNEF

Grey to Blue to Green: Supply transition

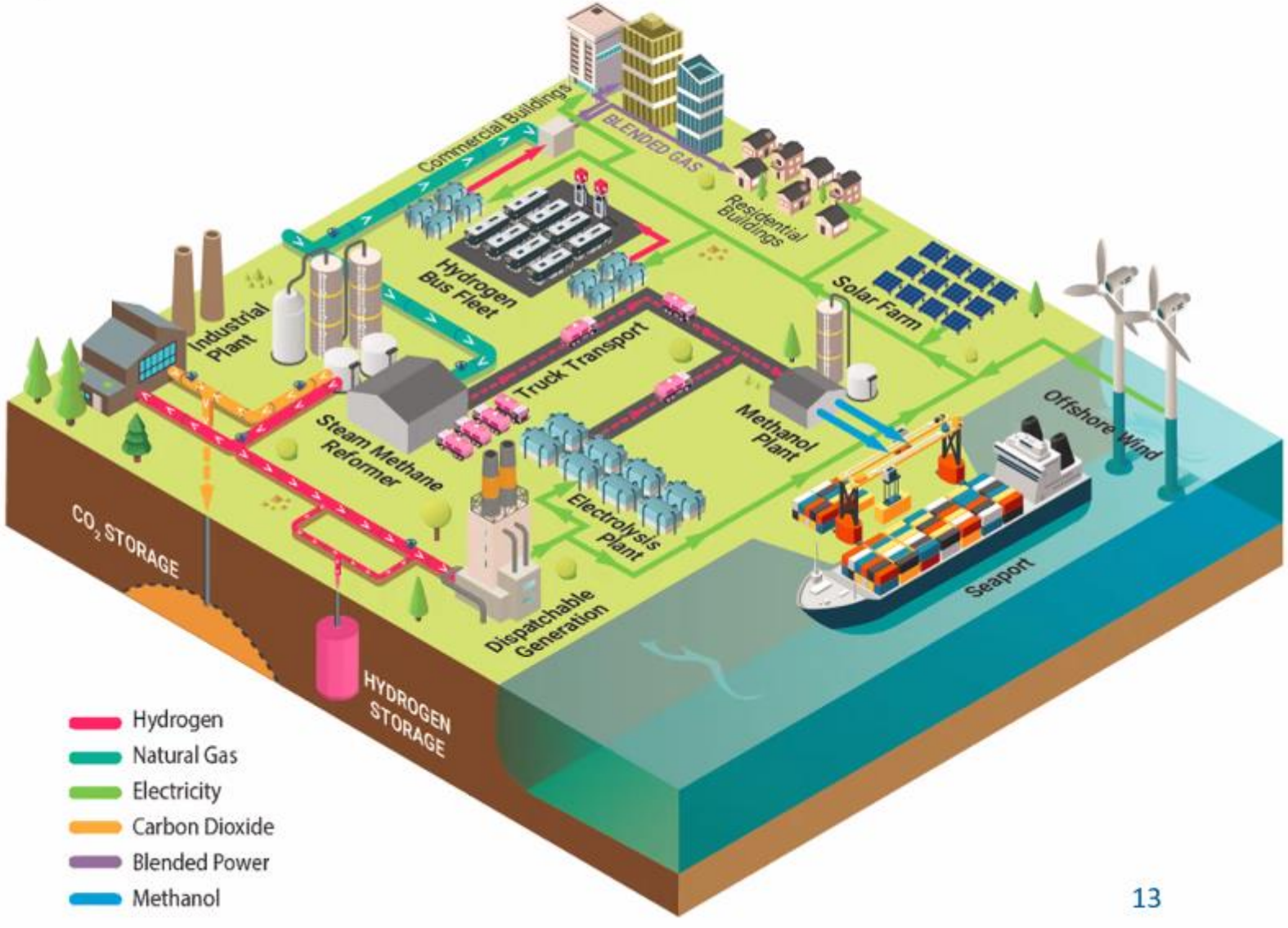
Transformational growth of H_2 use demands low- to no-carbon production

Proposed growth will depend on new supplies being low-carbon



Finding: Regional hubs are major area of focus for investors

- Co-location of production and end-use can accelerate deployment
- Hubs can reduce costs by sharing infrastructure
- Hubs can leverage existing local resources



Finding: Regional hubs are major area of focus for investors

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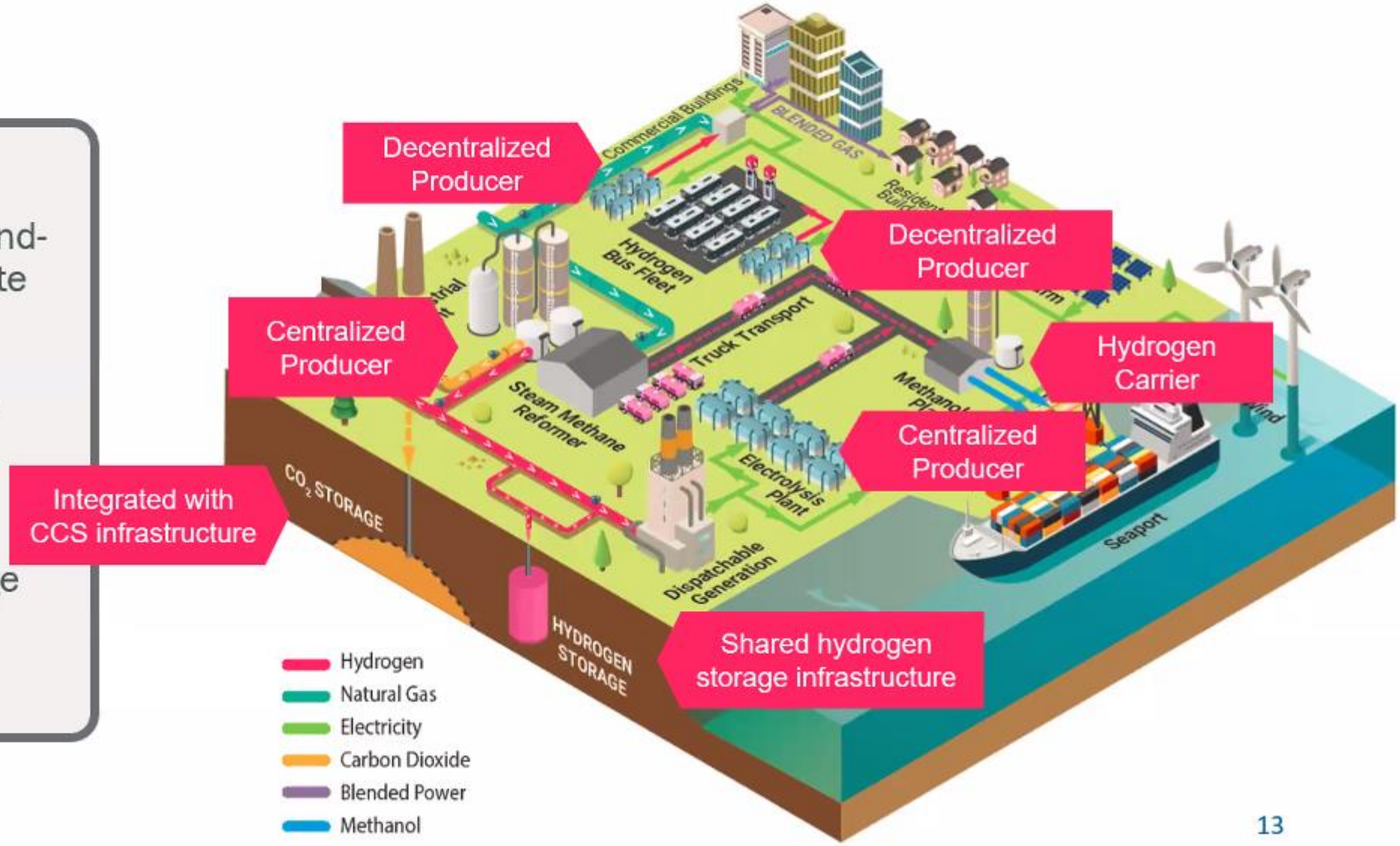

Beware the Black Swan!

Questions?

"The State of the Oil and Gas Industry"

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10/27/2021

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