Federal Reserve
Bank of Dallas

Energy Update

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 Thank you to Dr. Keith Phillips, Laila Assanie, and many others whose work contributed to the content in this presentation.

We need your input!

Be part of a survey that gauges regional business activity and informs monetary policy making.

Texas **Manufacturing** Outlook Survey

Texas **Service Sector** Outlook Survey

Texas **Retail** Outlook Survey

Economic Backdrop

- COVID-19: Global second wave muted 1Q:21; Vaccines improving outlook in race against variants, especially for OECD countries.

- *High degree of uncertainty in any projections: Virus is not done yet.*

- Global GDP up 5.7% y/y in 2021, up 4.3% 2022. (May 2021 Consensus Economics forecast), includes rebound in manufacturing.

- U.S. Real GDP **7%!** in Q4/Q4 in 2021; slow to **3.1%** Q4/Q4 in 2022 (May 2021 Blue Chip Consensus);

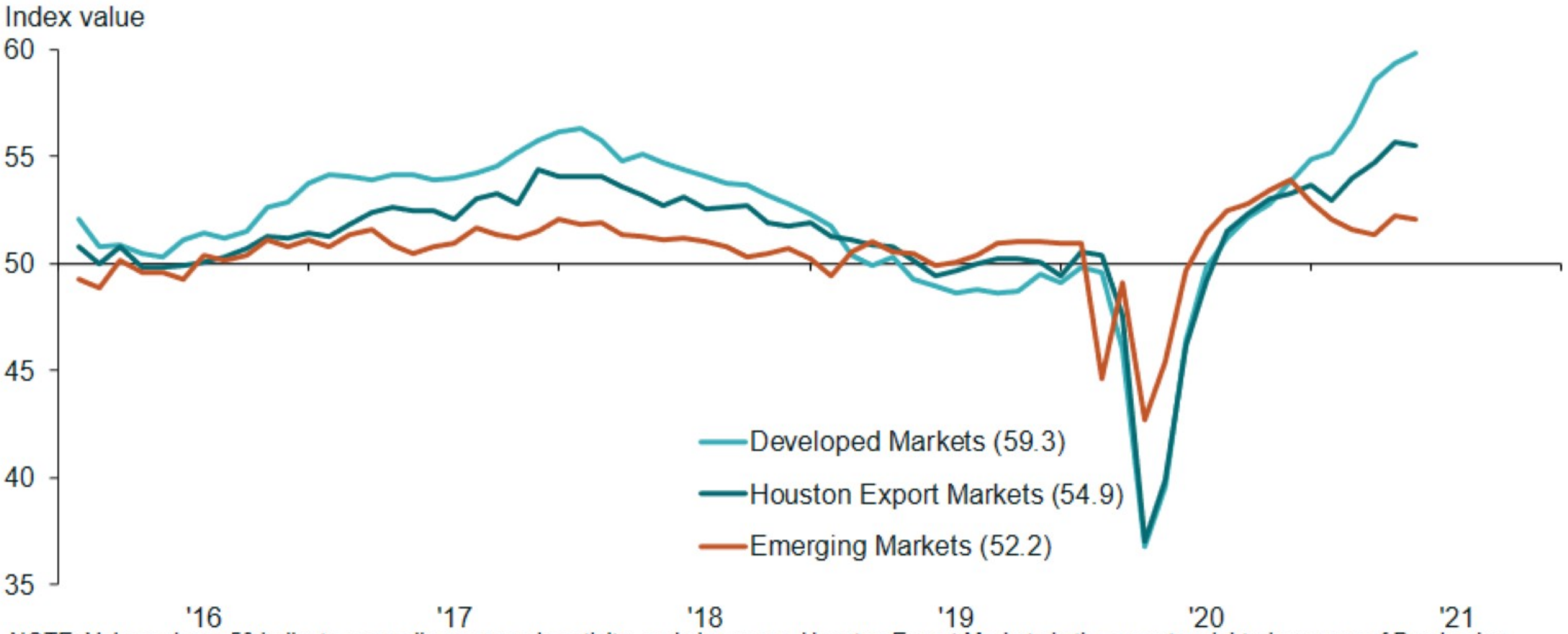
- Capital discipline, focus on ESG, and rising wage and price pressures to temper U.S. upstream growth in remainder of 2021. 2022….

Global Purchasing Managers Index (PMI) and World Trade: Global PMI signals significant trade growth.

NOTE: Index values above 50 indicate expanding economic activity, and vice versa. World exports depicted as 4 month annualized real growth rates, adjusted using U.S. consumer price index.

SOURCE: IHS; Institute for Supply Managment; International Monetary Fund.

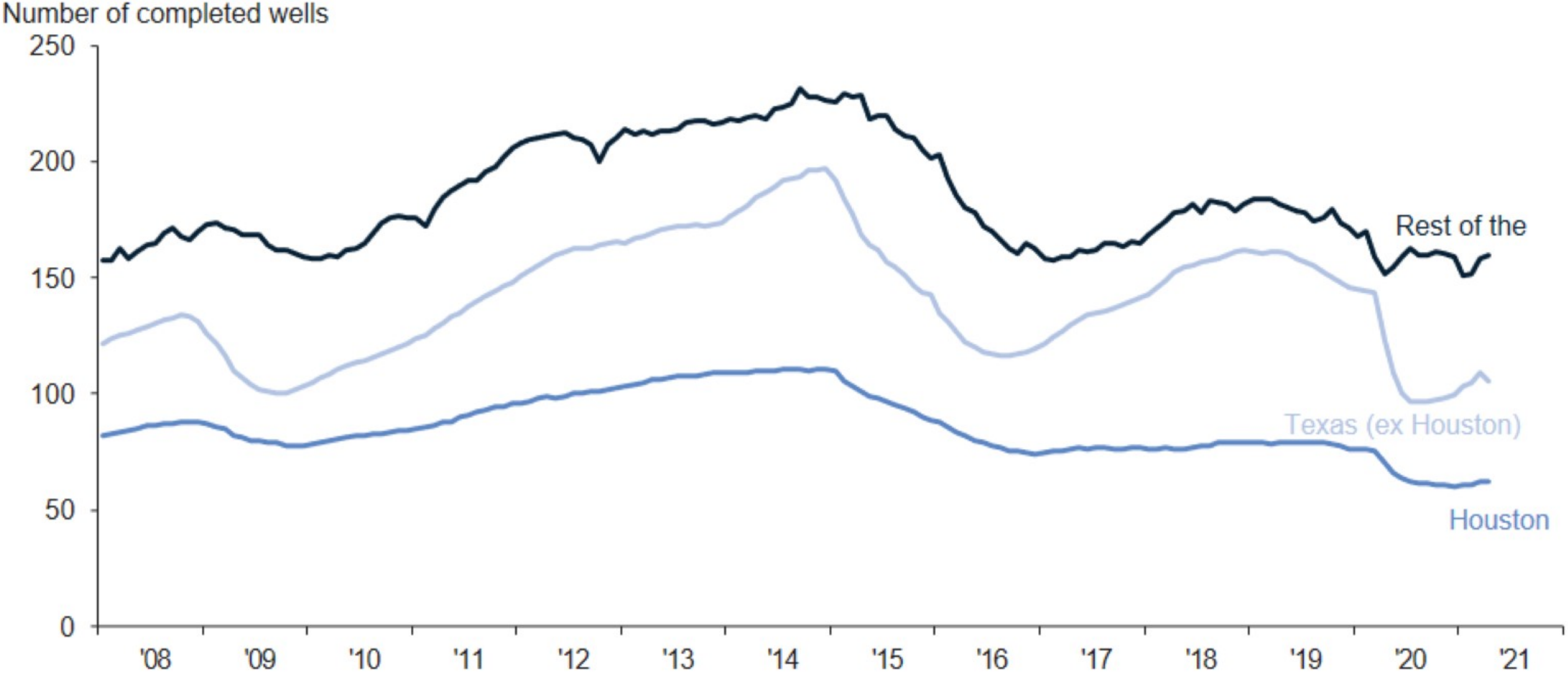
Purchasing Managers Manufacturing Indexes: Global output rebounding.



NOTE: Values above 50 indicate expanding economic activity, and vice versa. Houston Export Markets is the export-weighted average of Purchasing Managers Indexes for 14 of the top countries receiving goods from the Houston-Galveston customs district over the 12 months ending February 2020, and accounting for over 61 percent of the value of total exports over that time.

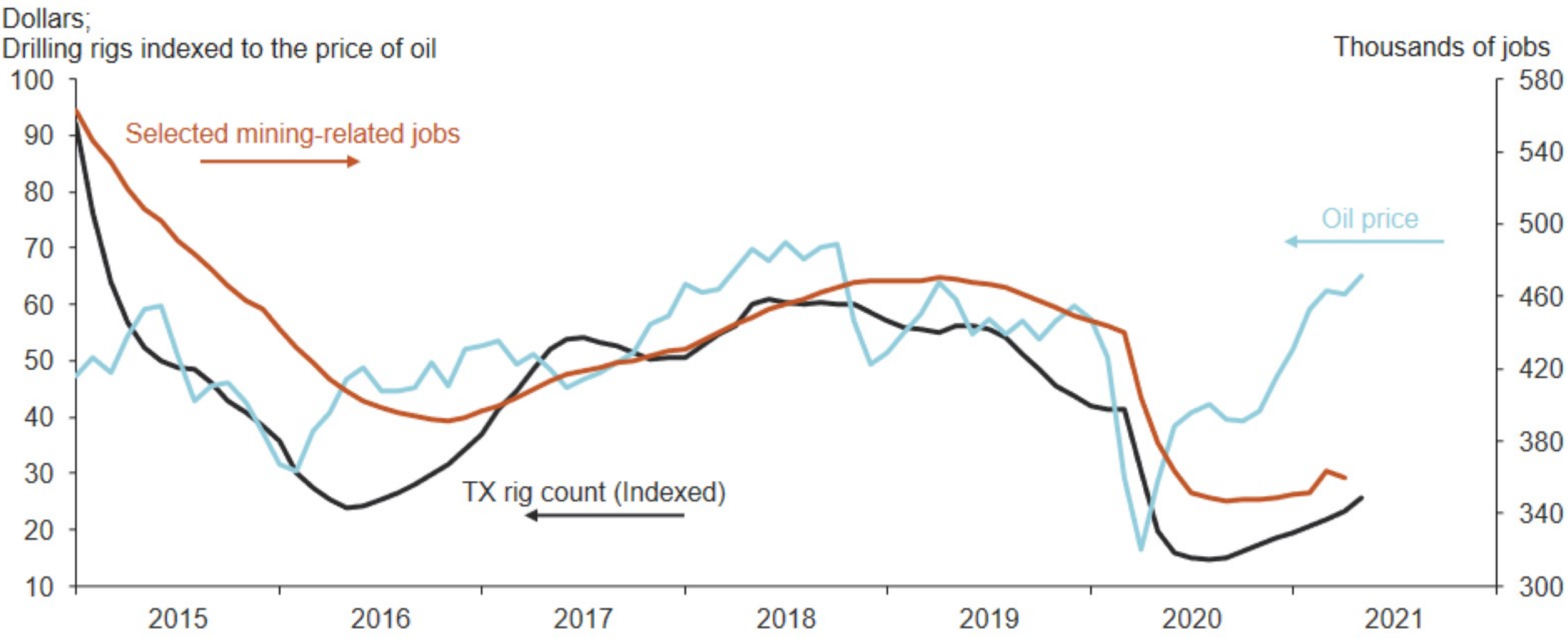
Upstream

U.S. Oil and Gas Jobs: ~$300 billion dollars in bankruptcies: Jobs back to pre-shale levels, production steady at 11mb/d and climbing.



NOTE: Data are the sum of "oil and gas extraction" and "support activities for oil and gas operations". Data seasonally adjusted.
SOURCES: Bureau of Labor Statistics; adjustments by the Dallas Fed

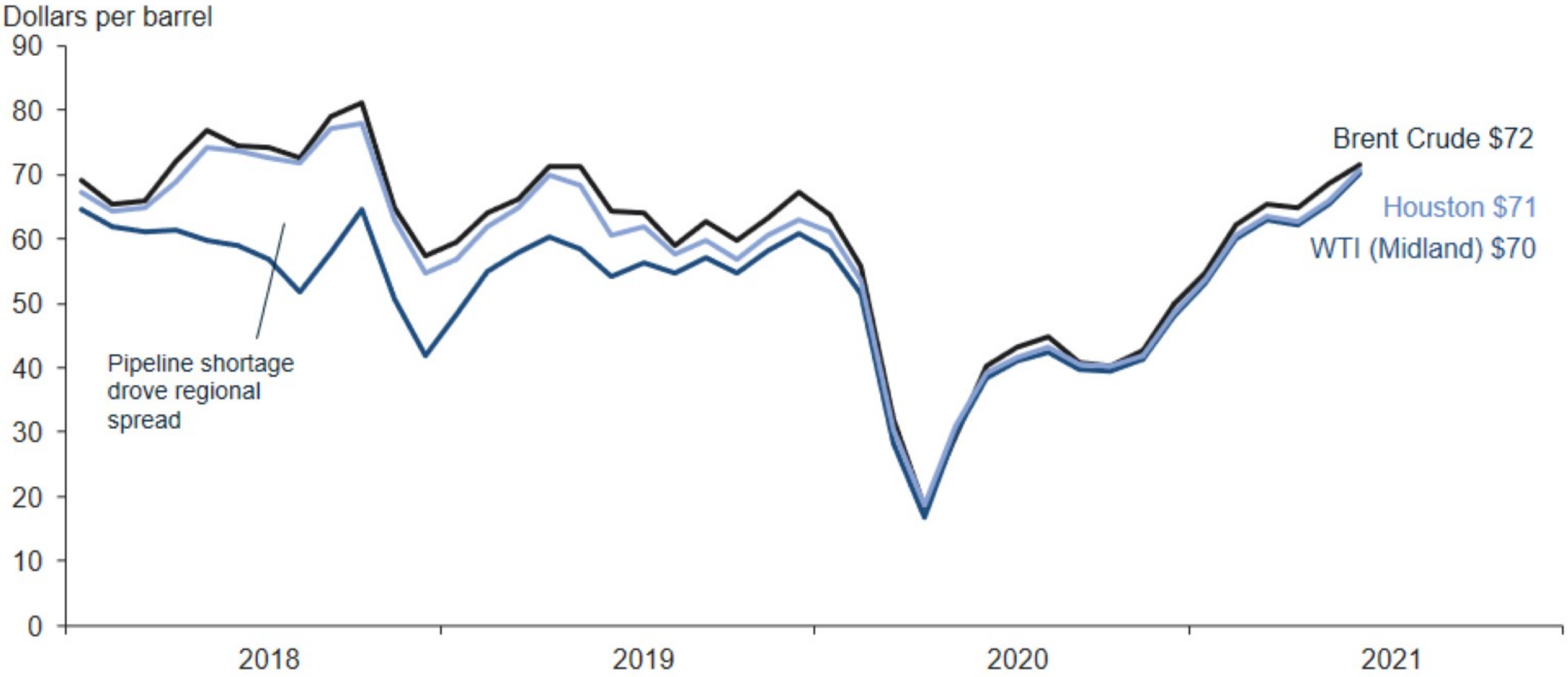
Energy Cycle: Texas oil and gas jobs begin recovery.



NOTE: The U.S. rig count is indexed to the price of oil such that the February 2016 rig count = $30. Mining-related jobs includes oil and gas extraction, support activities for mining, some fabricated metals manufacturing, and 'agriculture, construction and mining' machinery manufacturing.

SOURCE: Baker Hughes; Bureau of Labor Statistics, adjustments by the Dallas Fed; Energy Information Administration.

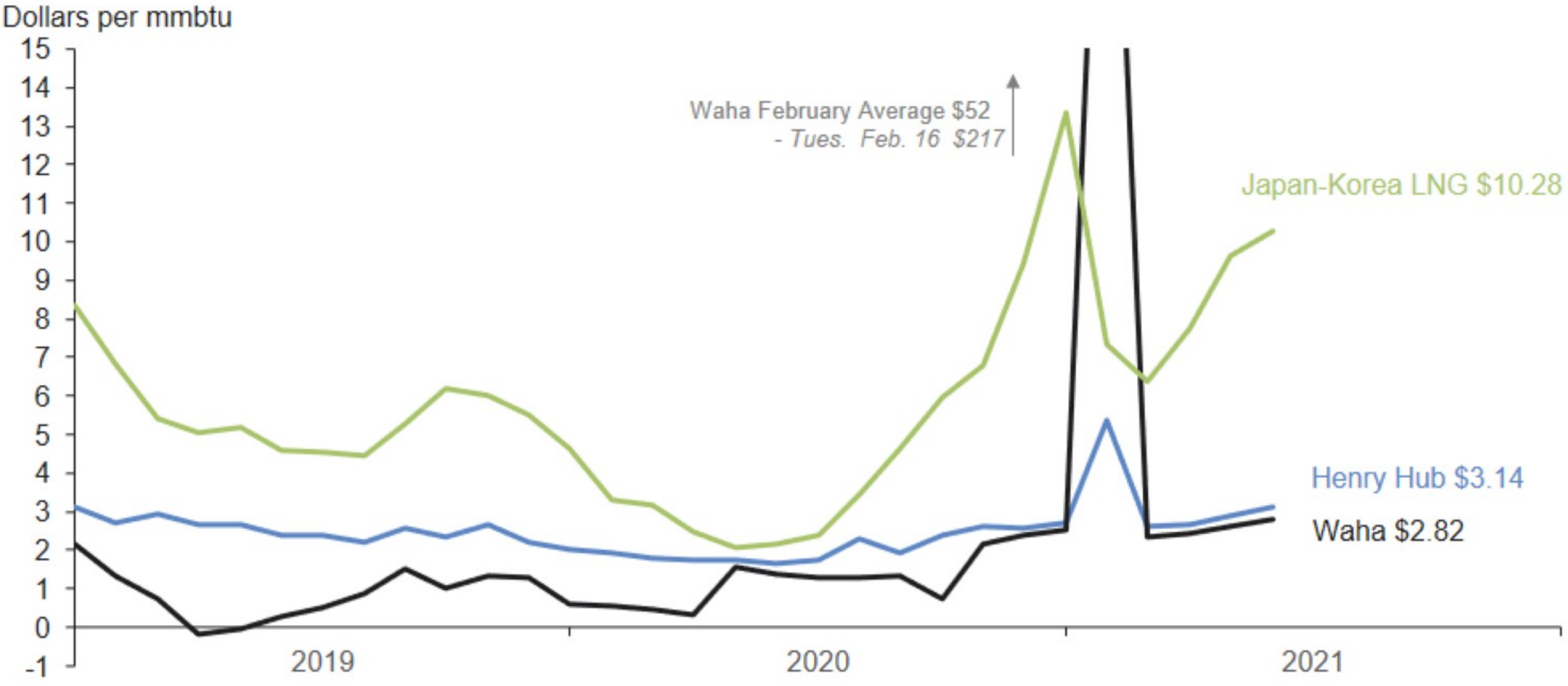
Oil Prices: Brent and Houston at highest levels since early 2019.



NOTE: Prices in labels are the average daily closing price for June 1 through 14, 2021. Houston is the Magellan East pipeline price.

SOURCE: Energy Information Administration; Bloomberg.

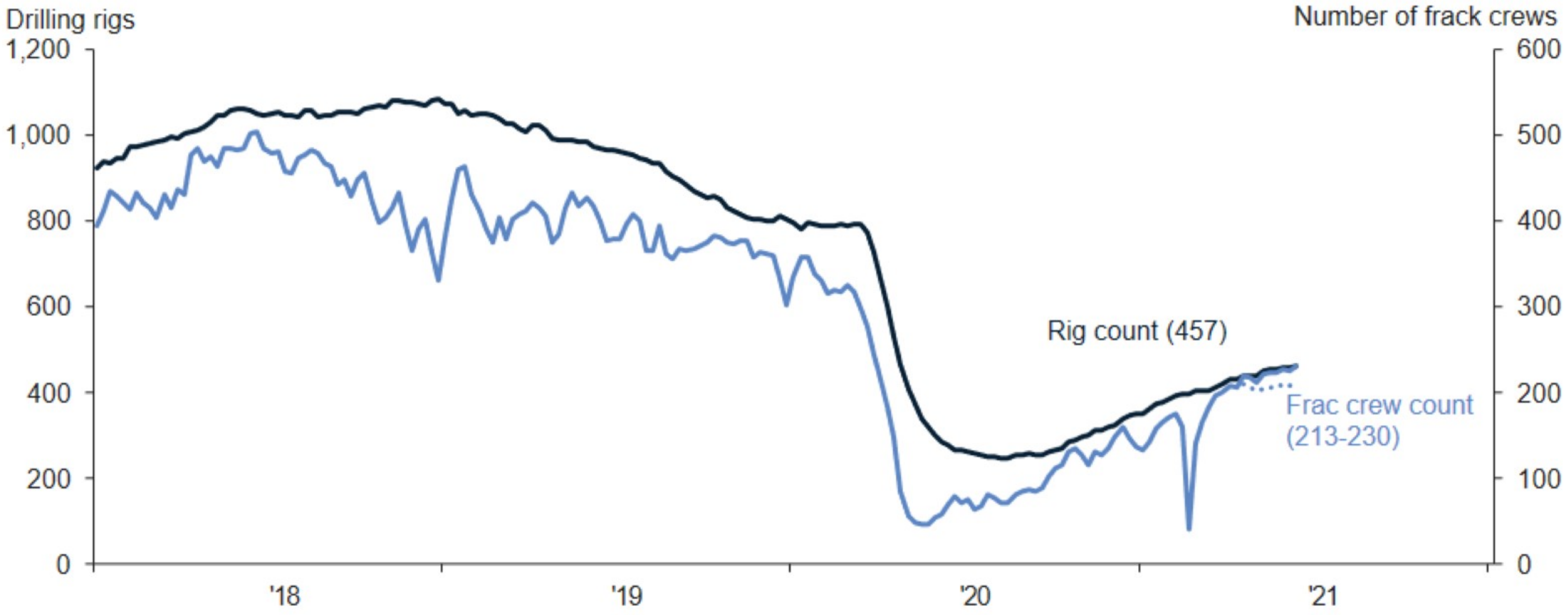
Natural Gas Prices



NOTE: Prices in labels are the average of daily closing prices for June 1 through 14, 2021.

SOURCES: Energy Information Administration; Bloomberg.

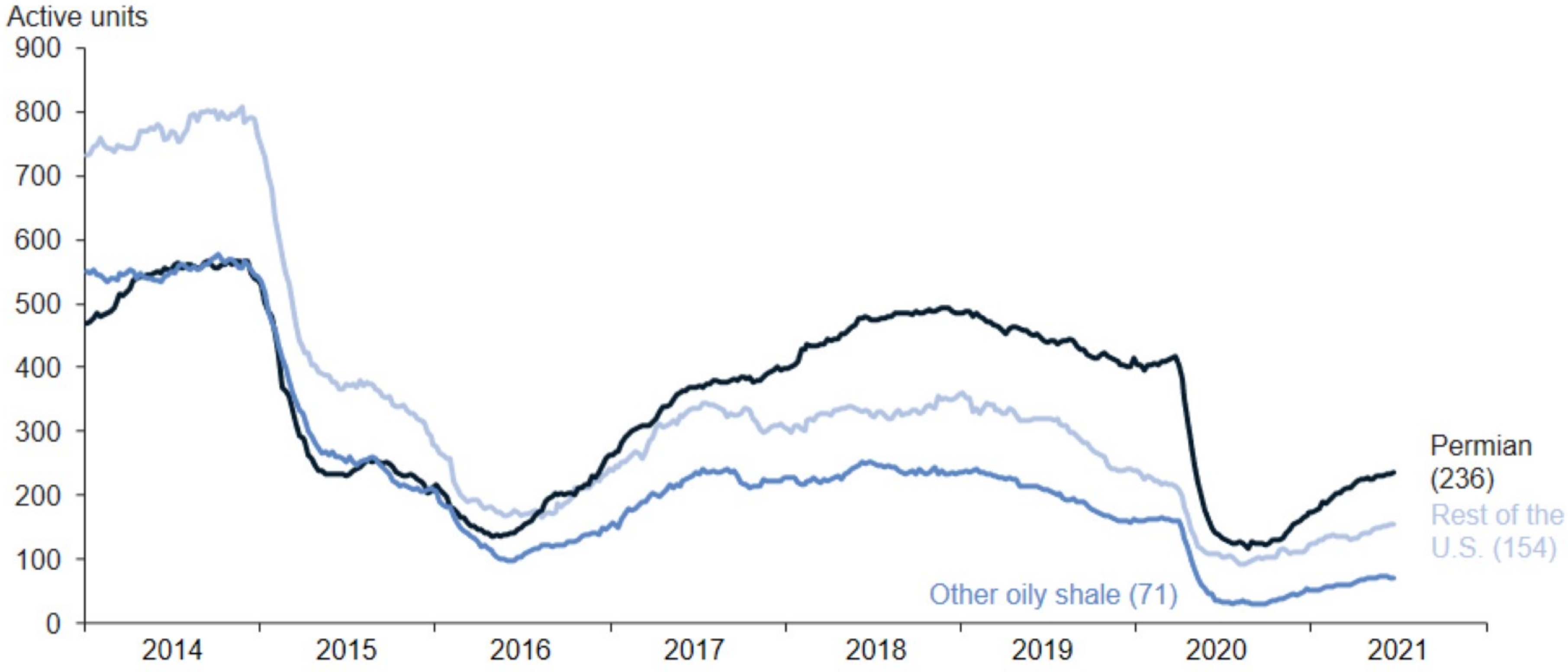
Weekly Oilfield Activity: Incremental gains continue for rigs, some signs of leveling off in Frac Crews deployed.



NOTE: Numbers in parentheses are averages for the week ending June 12, 2021. Dotted line is an adjusted frac crew count based on alternate sources.

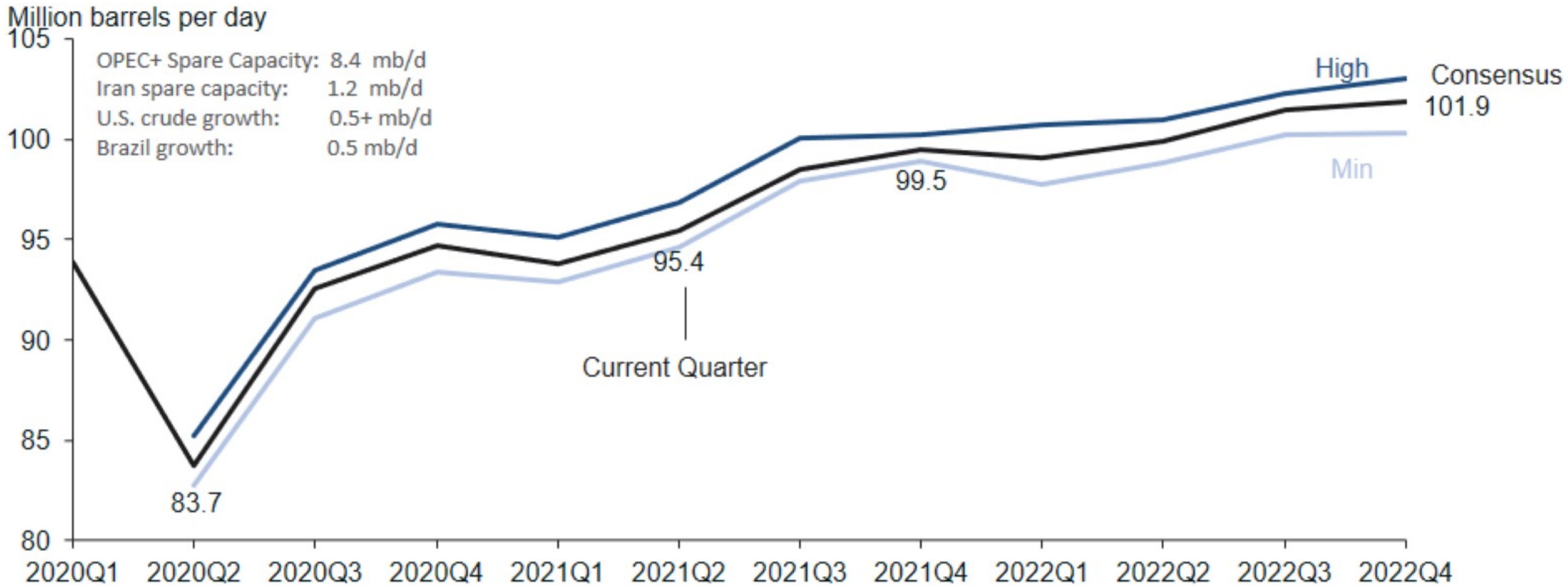
SOURCE: Baker Hughes; Primary Vision; Kayrros, Rystad, Other sources, Author's calculations.

Oilfield Activity: Permian basin leads gains.



NOTE: "Other oil-rich shales" includes the Cana Woodford, DJ-Niobrara, Eagle Ford, Granite Wash, and Williston basins
SOURCES: Baker Hughes, Primary Vision.

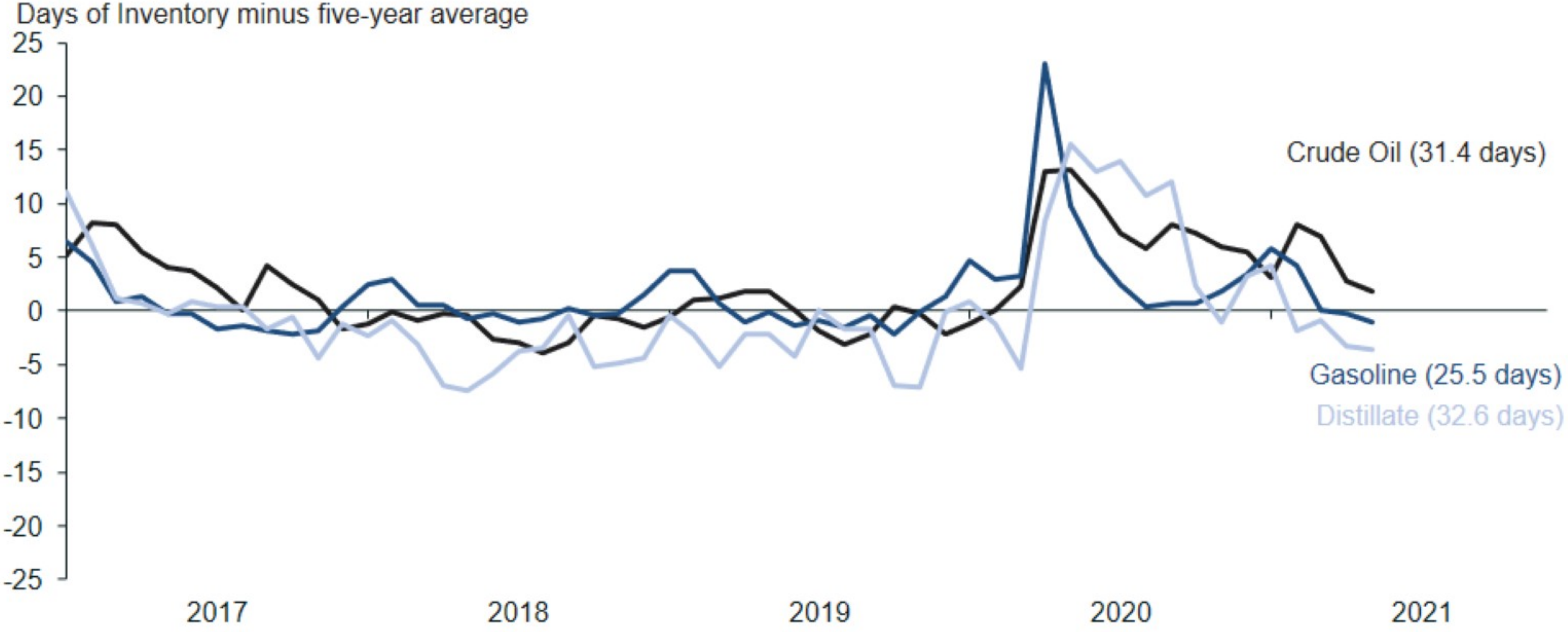
Global Liquids Consumption Projections: ~6.5 mb/d of demand growth from now to 4Q:2022



NOTE: Consensus is an average of forecasts from sources published over from May 13 to June 16, 2021. Sample size drops for 2022 projections. High and low projections for each quarter are marked in blue. IEA data treated as actual after full calendar year.

SOURCE: International Energy Agency, Energy Information Administration, Organization of the Petroleum Exporting Countries, Barclays, Goldman Sachs, JPMorgan, Morgan Stanley, Energy Intelligence, Federal Reserve Bank of Dallas.

U.S. Days of Supply: Days of cover in U.S. inventories are closing in on pre-pandemic norms.

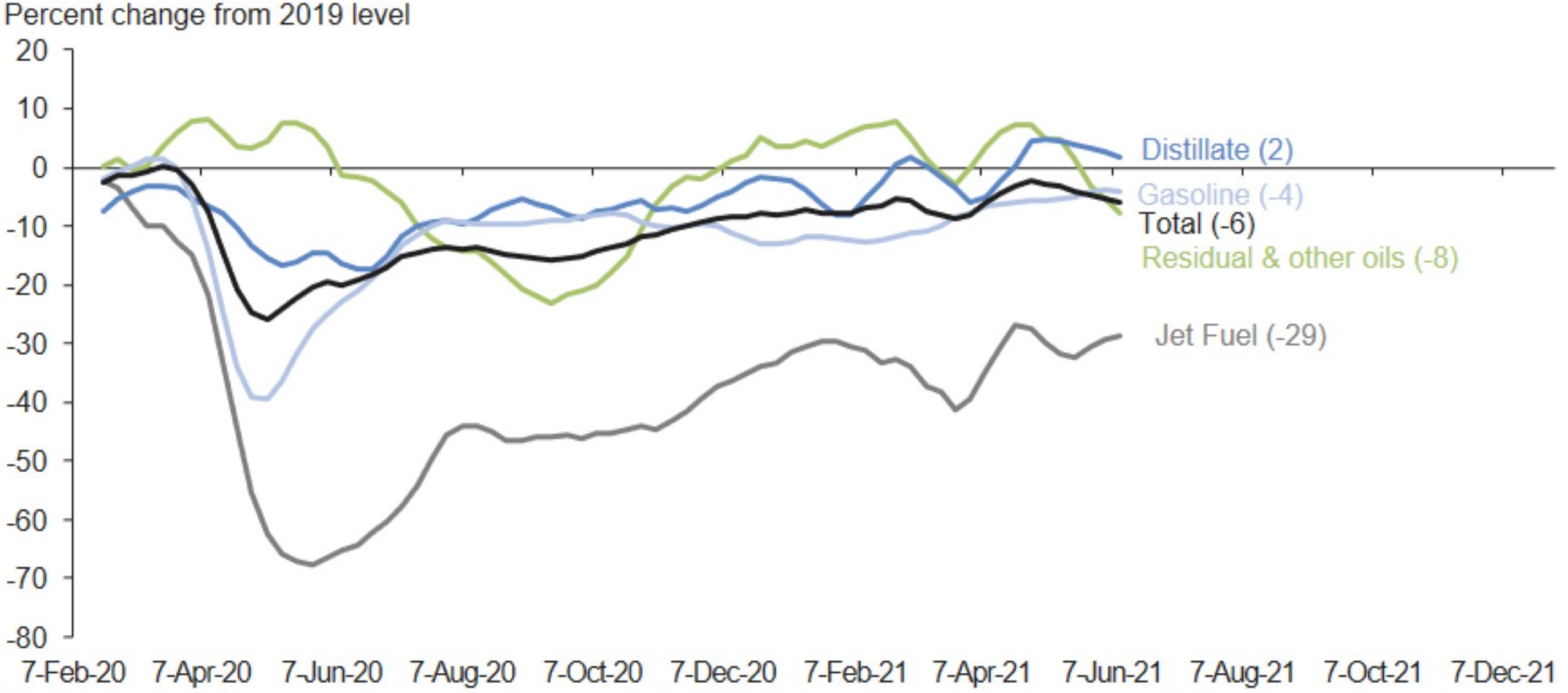


NOTES: Data are monthly averages depicted as the difference between days of supply and the five-year rolling average. Numbers in parentheses are the average days of supply for the two weeks ending October 9th.

SOURCES: Energy Information Administration.

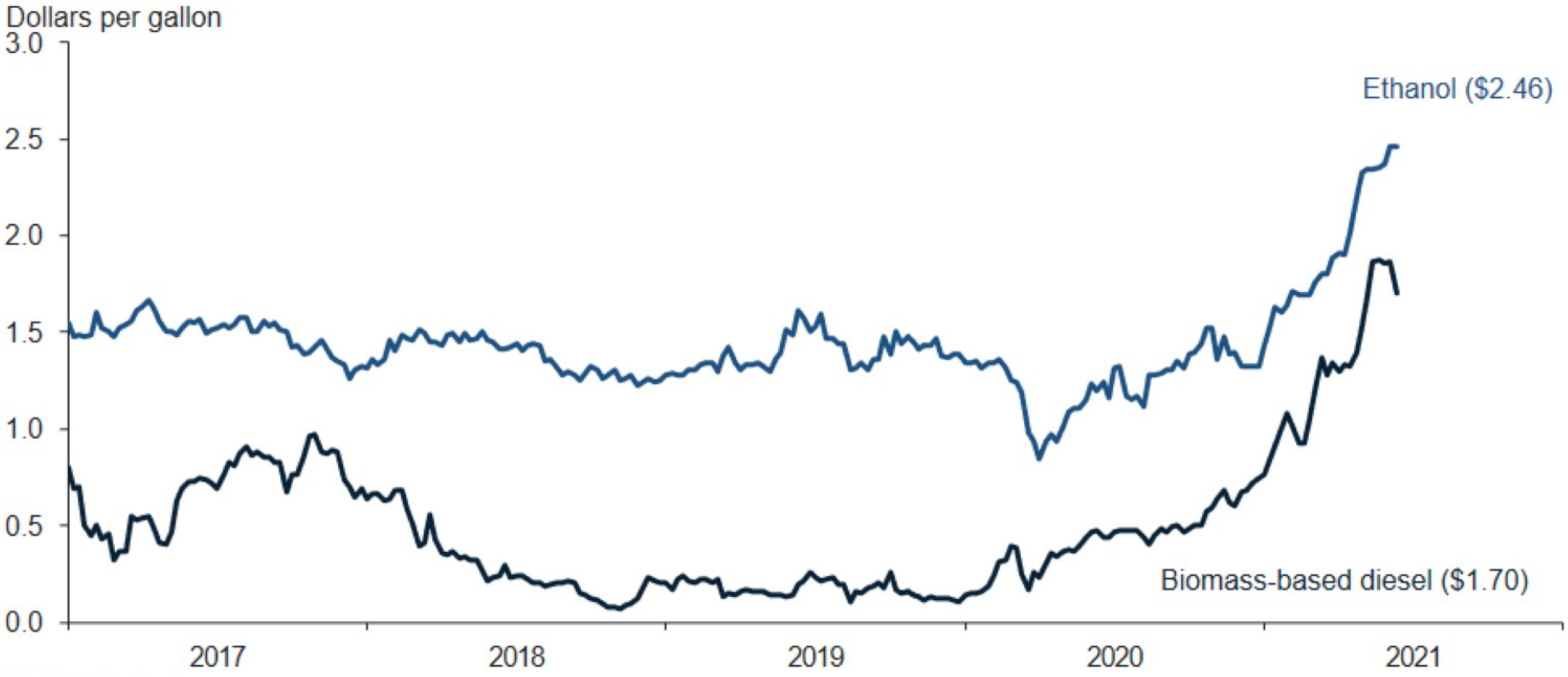
Downstream

Product Supplied: U.S. consumption at 94% of 2019 levels.



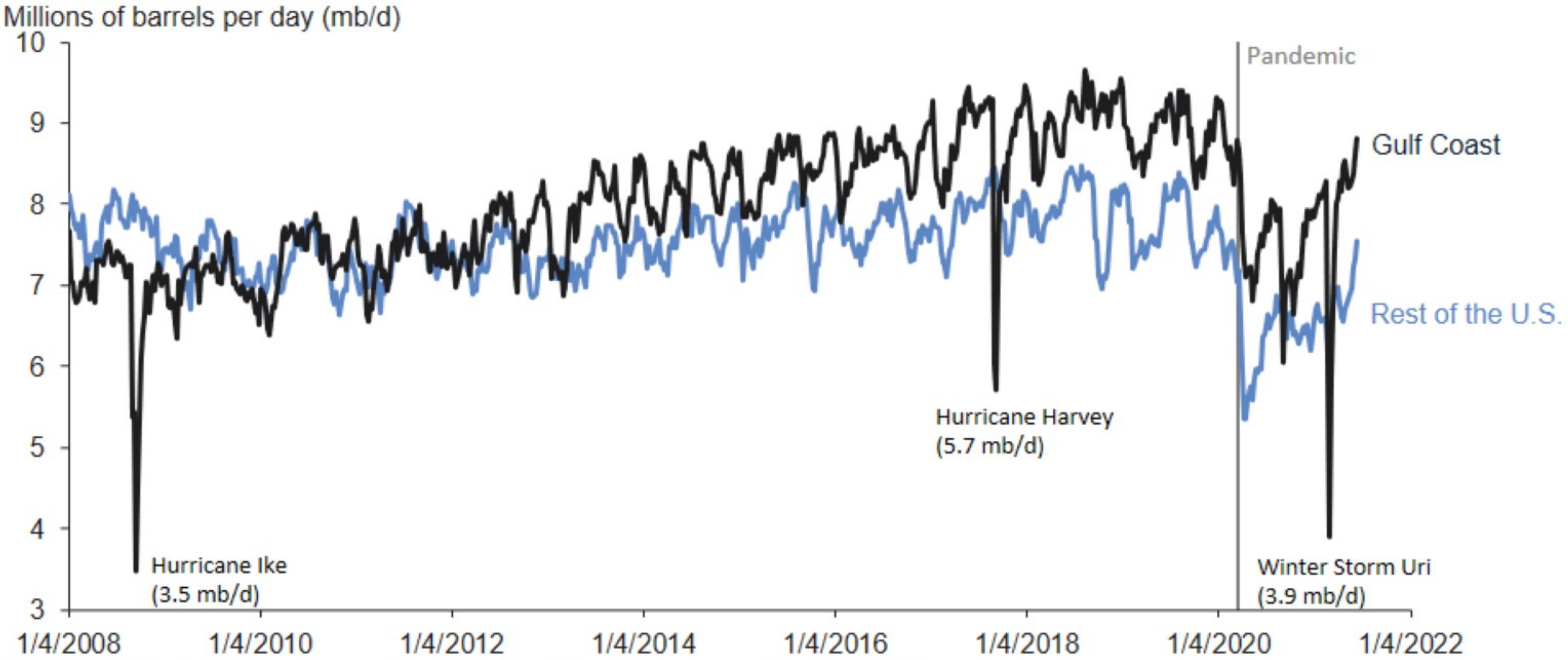
NOTE: Chart shows the percent change from the same period in 2019. Data are four-week moving average. Numbers in parentheses show product supplied over the four-week period ending Apirl 9, 2020 when compared to the same four-week period in 2019.
SOURCES: Energy Information Administration.

U.S. Biofuel Compliance Costs: Total cost



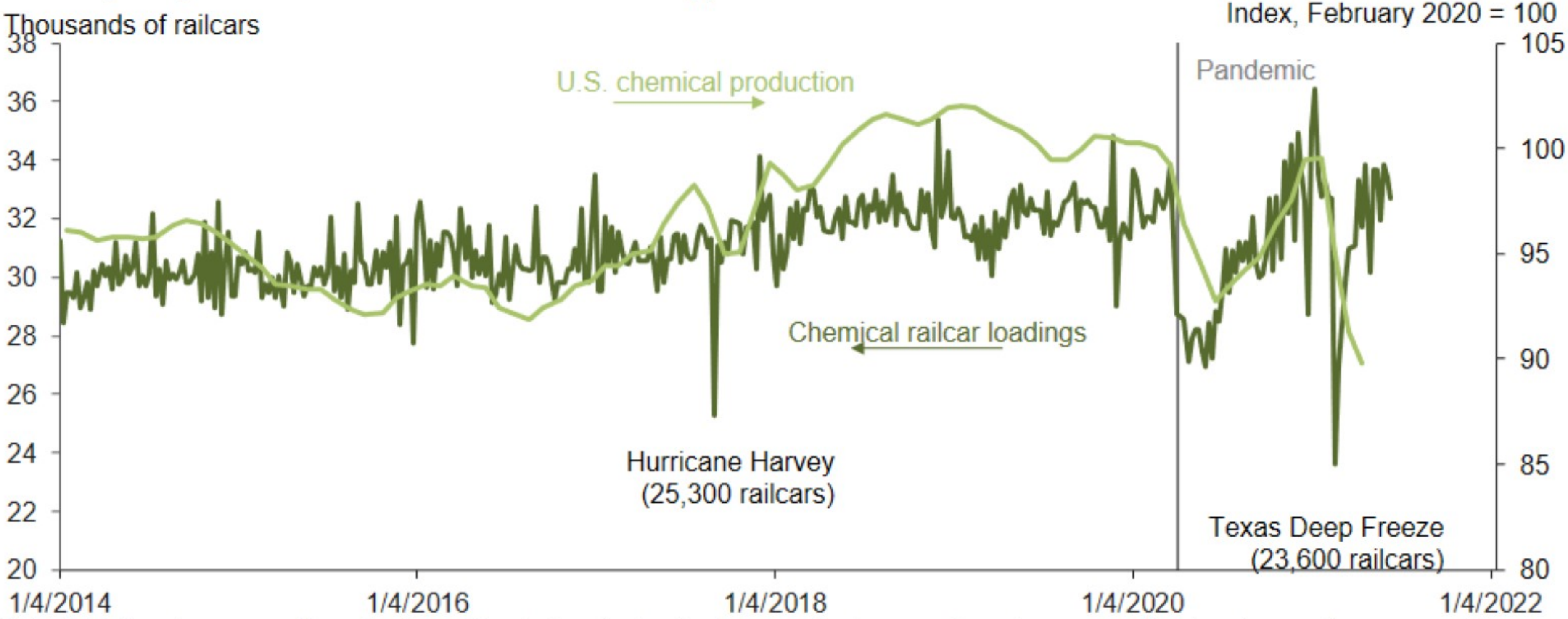
NOTE: Weekly Averages.
SOURCE: Bloomberg.

Crude Inputs to U.S. Refineries: Approaching pre-pandemic levels.



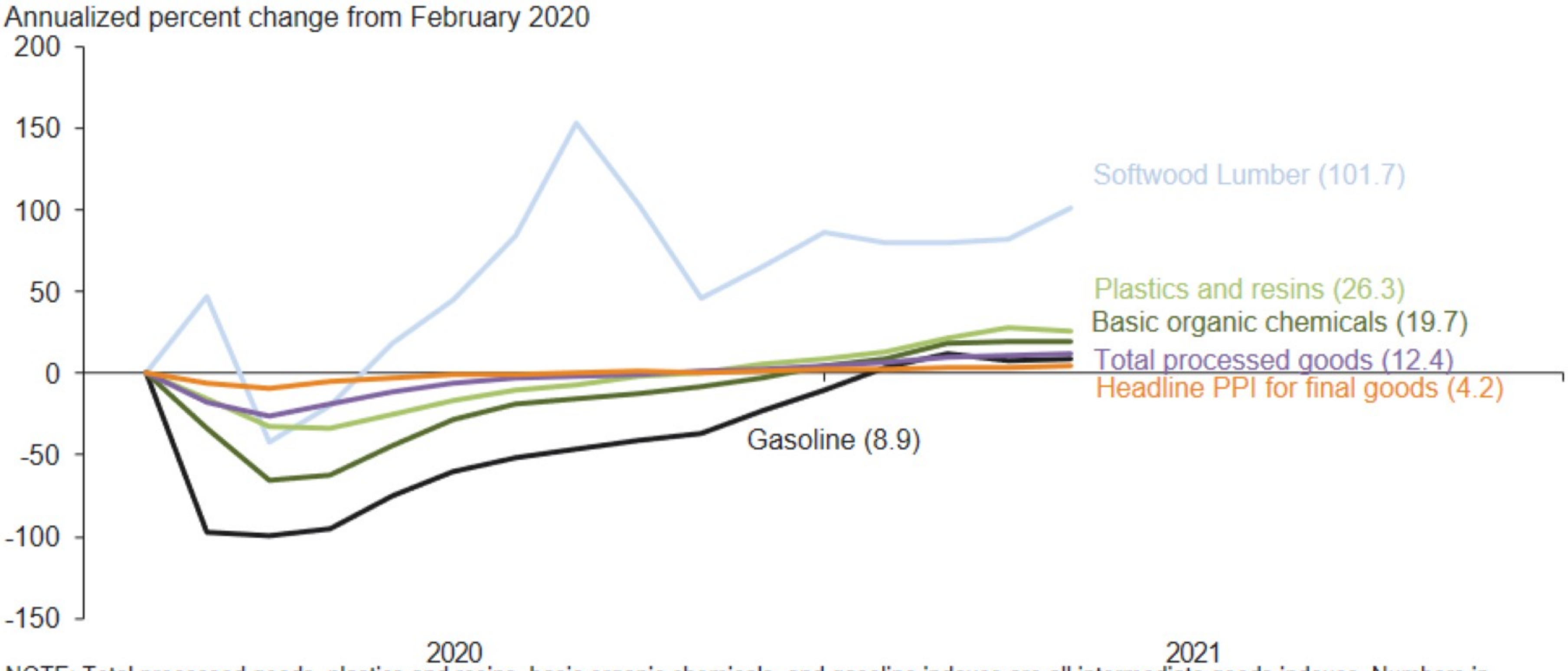
NOTE: Weekly data.Numbers in parentheses are lows driven by severe weather in the Gulf Coast.
SOURCE: Energy Information Administration.

U.S. Chemical Output, Railcar Loadings: Recovery to pre-freeze utilization nearly complete. Supply chain challenged by knock-on effects to intermediate supplies.



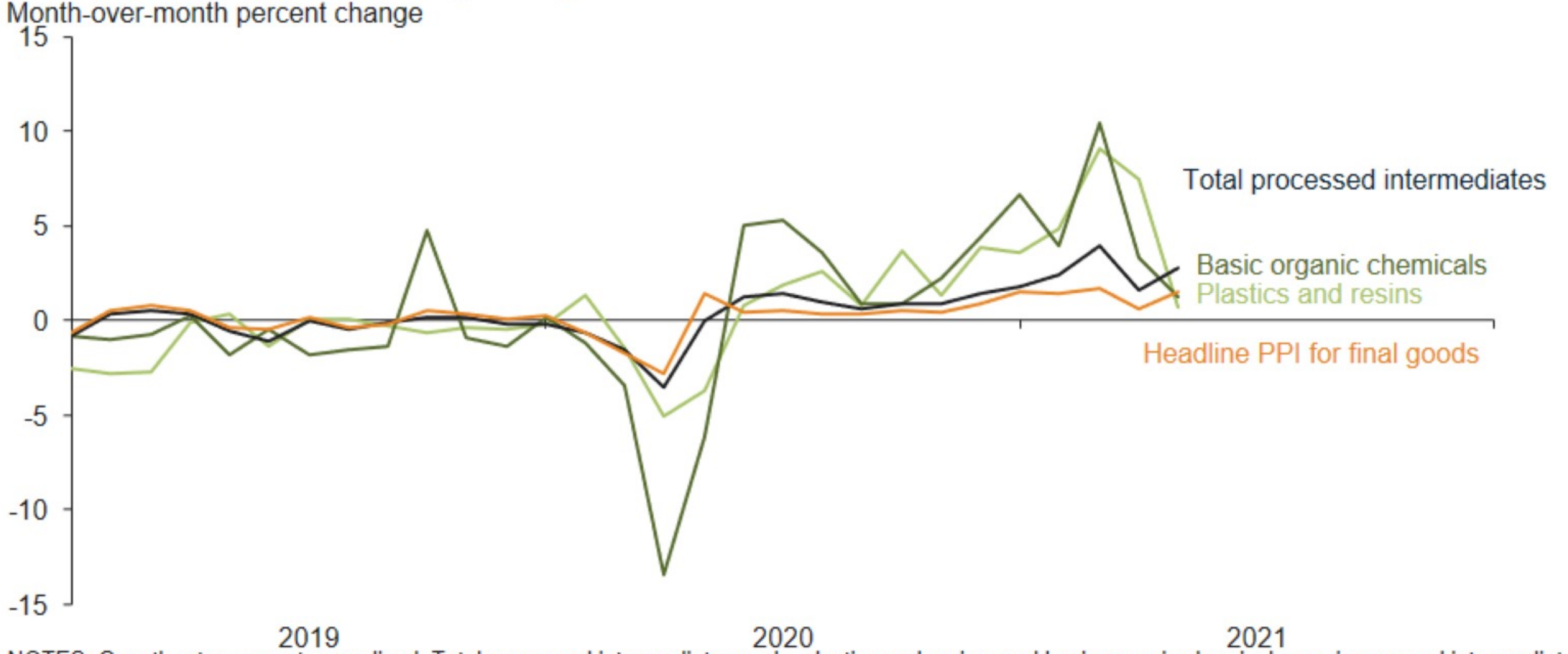
NOTES: Railcar data are weekly car loadings. Chemical production data is a monthly three-month moving average. Numbers in parentheses are weekly railcar lows caused by severe weather along the Gulf Coast.
SOURCES: Association of American Railroads; American Chemistry Council.

Producer Price Inflation (PPI)



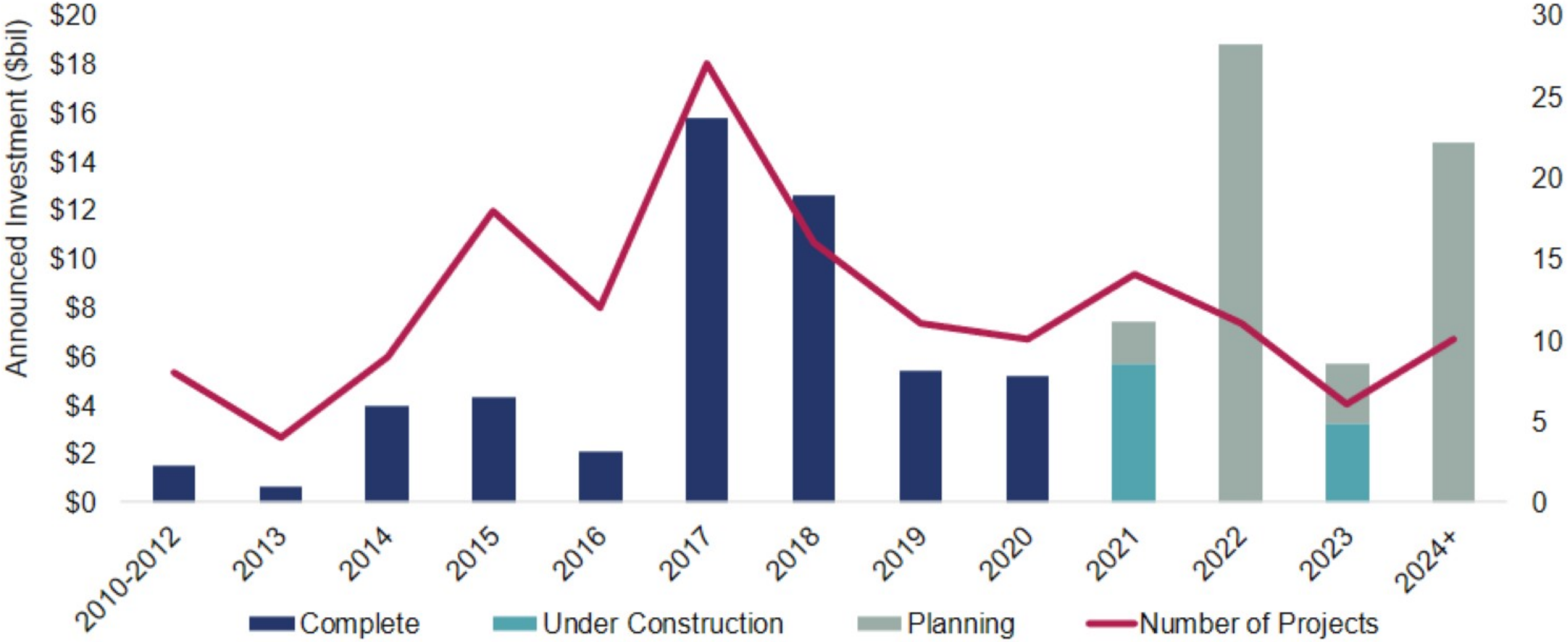
NOTE: Total processed goods, plastics and resins, basic organic chemicals, and gasoline indexes are all intermediate goods indexes. Numbers in parentheses are the annualized growth rates from February 2020 to May 2021.
SOURCE: Energy Information Administration.

Chart 4
Chemical Indexes Contributing Rising Producer Price Inflation



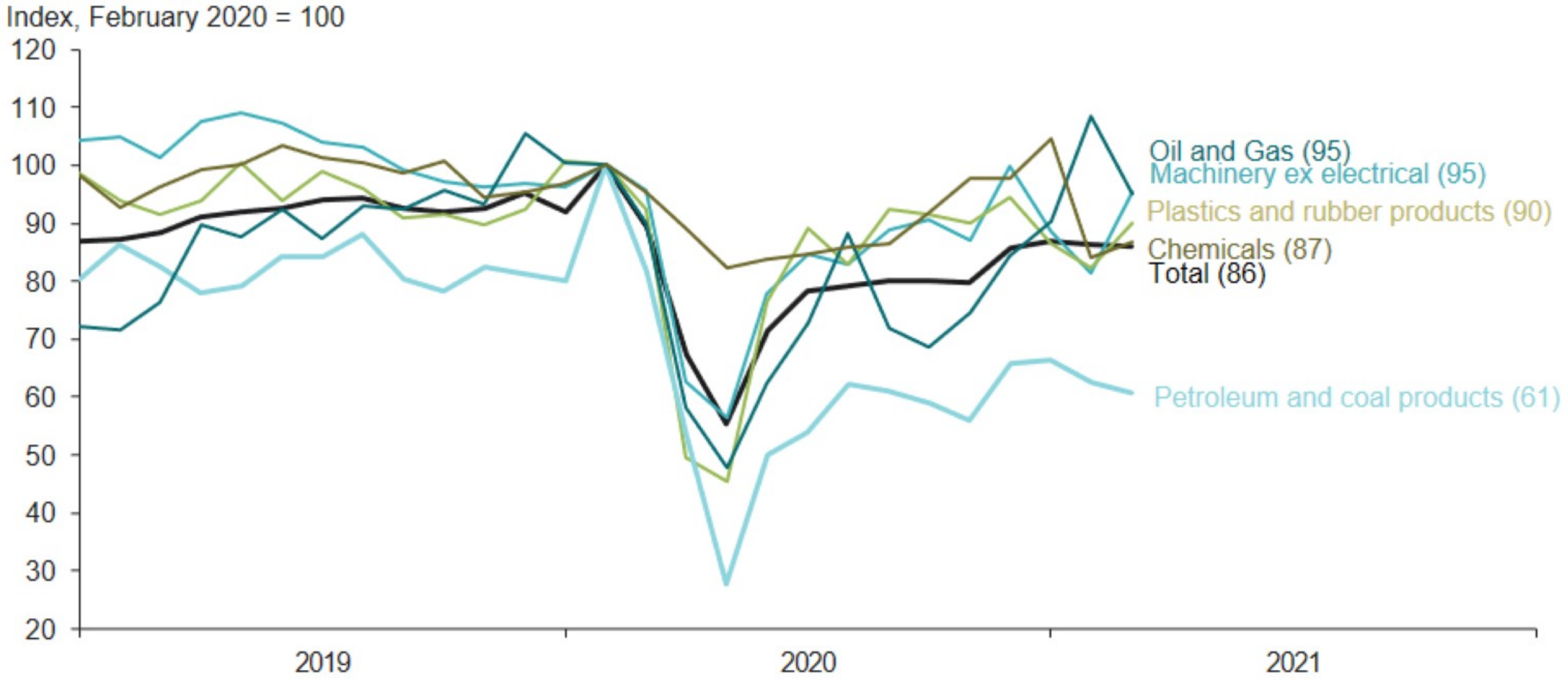
NOTES: Growth rates are not annualized. Total processed intermediate goods, plastics and resins, and basic organic chemicals are 'processed intermediate goods' indexes.
SOURCE: Bureau of Labor Statistics.

Announced Chemical Industry Investment in Texas



SOURCE: American Chemistry Council analysis. NOTE: The data is based on publicly available information, which is believed to be accurate, but have not been independently verified by ACC. Updated 2/24/2021.

Real Texas Exports: Uri blunted exports, global refined product demand still well below pre-pandemic levels.

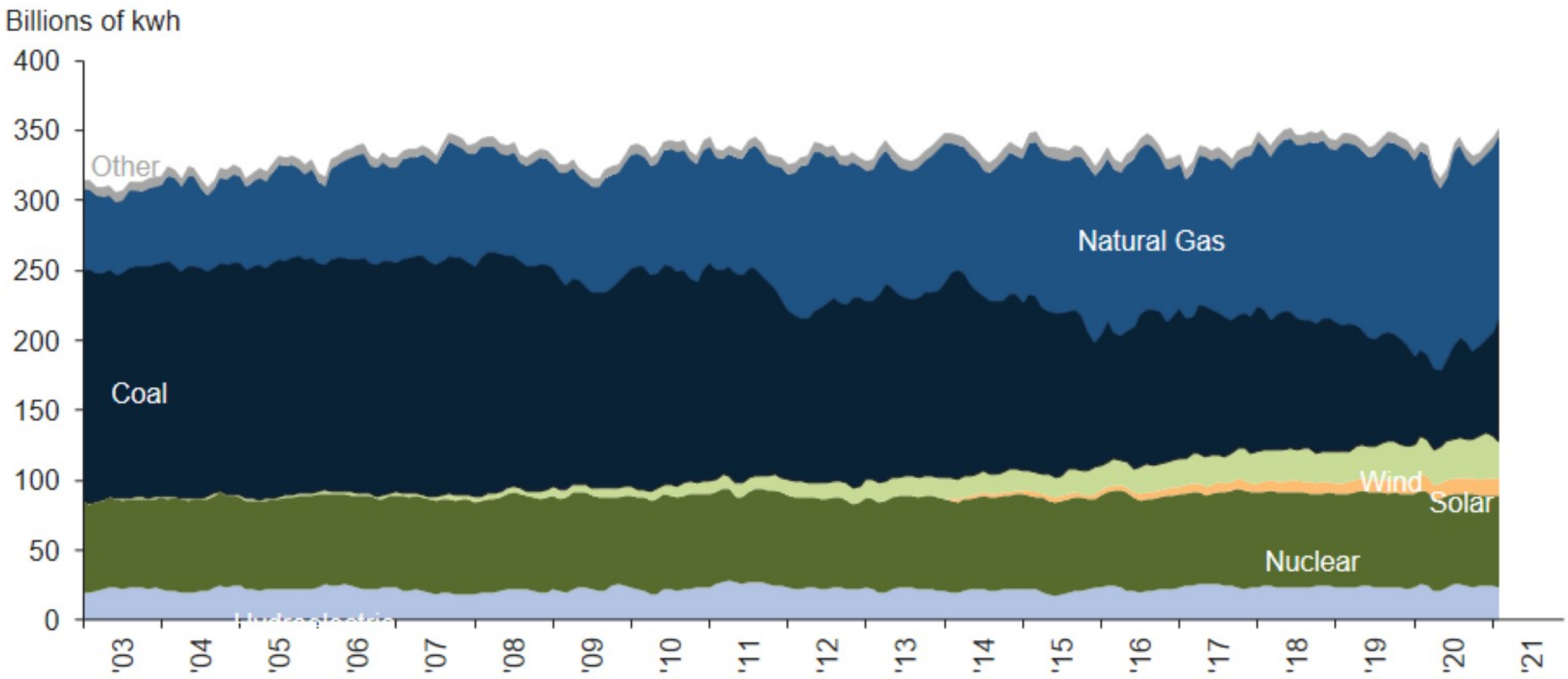


NOTE: Data through March 2021; seasonally adjusted 2018 prices..
SOURCE: Bureau of the Census, Wisertrade; .

Additional Slides

Electricity

U.S. Electricity Generation by Energy Source

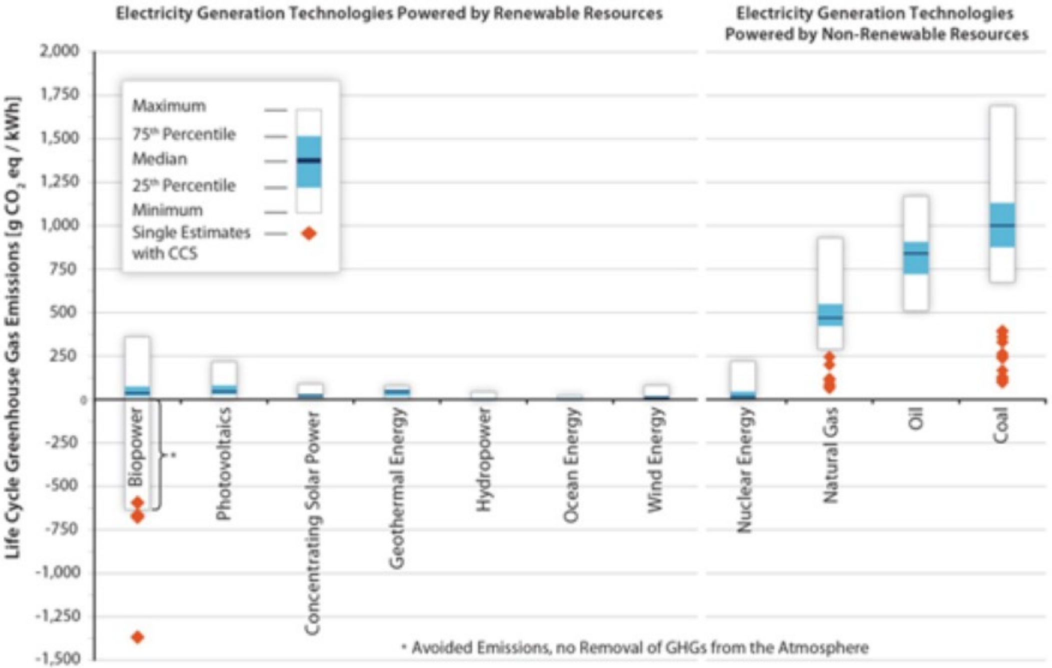


NOTE: Data are seasonally adjusted three month moving averages. Nuclear generation for the month of February 2021 is an estimate.

SOURCE: Energy Information Administration.

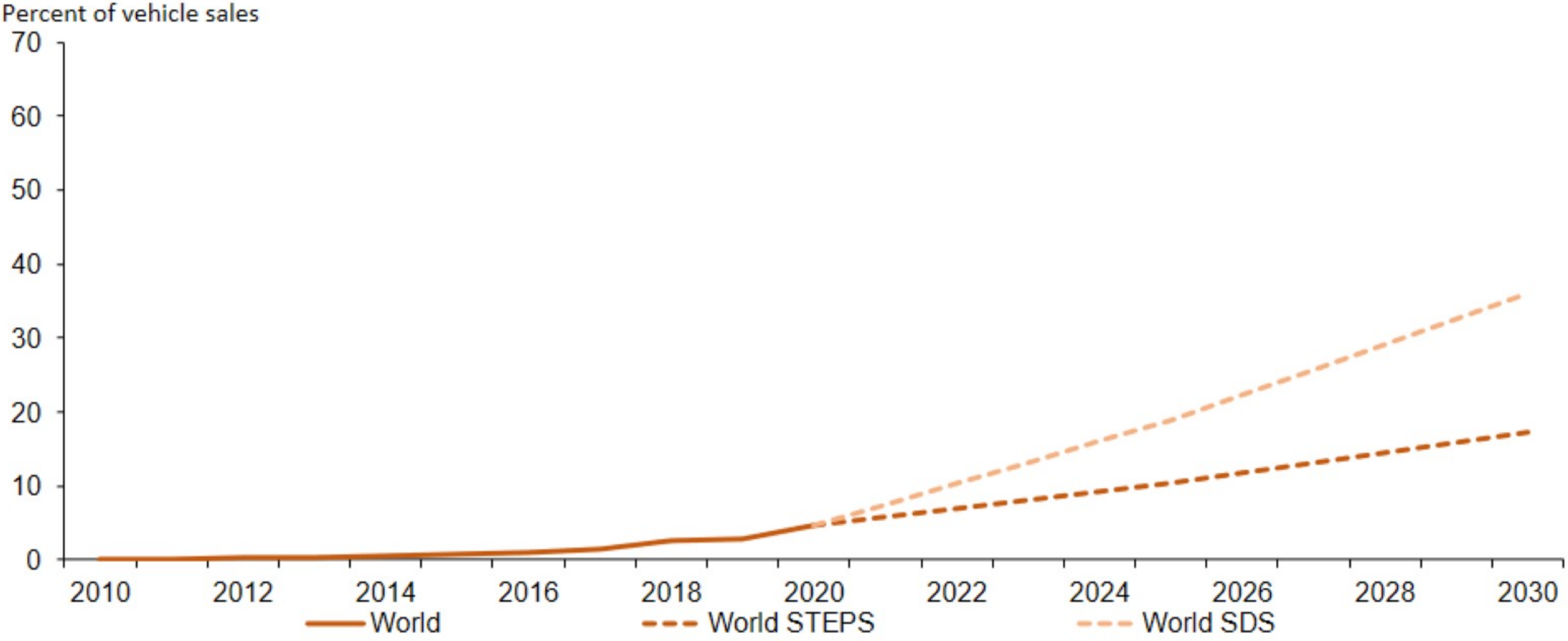
Live Cycle Emissions

- Natural Gas generation produces 10.8 times as much CO2e as Solar PV and Half as much as Coal.
  - Marriage to CCUS substantially narrows gap between fossil fuels and everything else.
  - Accounting for methane emissions increases it.
- PV Solar generation produces 3.7x as much CO2e over its life cycle as Nuclear.



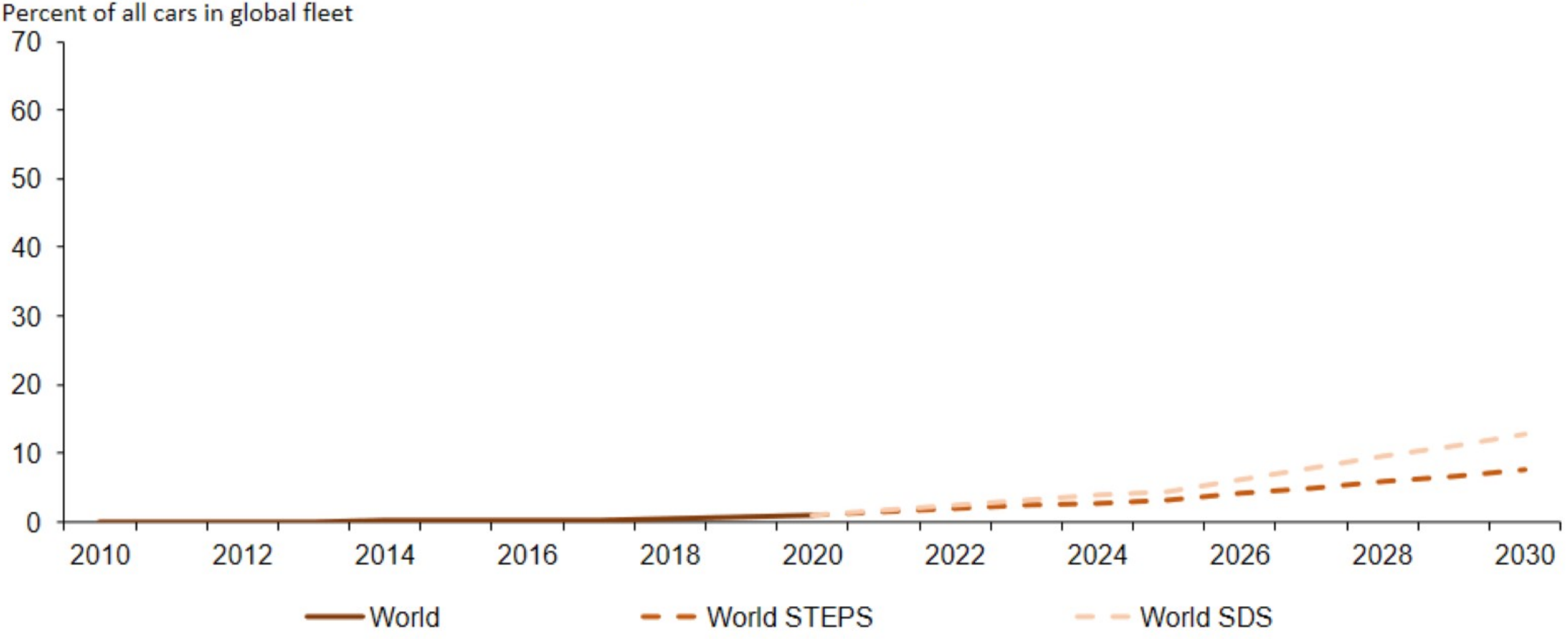
	Biopower	Photovoltaics	Concentrating Solar Power	Geothermal Energy	Hydropower	Ocean Energy	Wind Energy	Nuclear Energy	Natural Gas	Oil	Coal
Count of Estimates	222(+4)	124	36	8	28	10	126	125	83(+7)	24	169(+12)
Count of References	52(+0)	26	10	6	11	5	49	32	36(+4)	10	50(+10)

Battery Electric Vehicles: More agressive electrification scenarios will get break 36% of vehicle sales by 2030.



Note: STEPS stands for Stated Policies Scenario and SDS stands for sustainable development scenario. The STEPS is the baseline scenario.

Battery Electric Vehicles: Even more electrification scenarios will leave most cars needing hydrocarbon fuels. There will be more internal combustion engines on the road in 2030, than in 2020.



Note: STEPS stands for Stated Policies Scenario and SDS stands for sustainable development scenario. The STEPS is the baseline scenario.
Source: IEA (Global EV Outlook 2021).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