Federal Reserve
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The Changing Landscape in Oil and Gas

Kunal Patel
Federal Reserve Bank of Dallas
July 2022

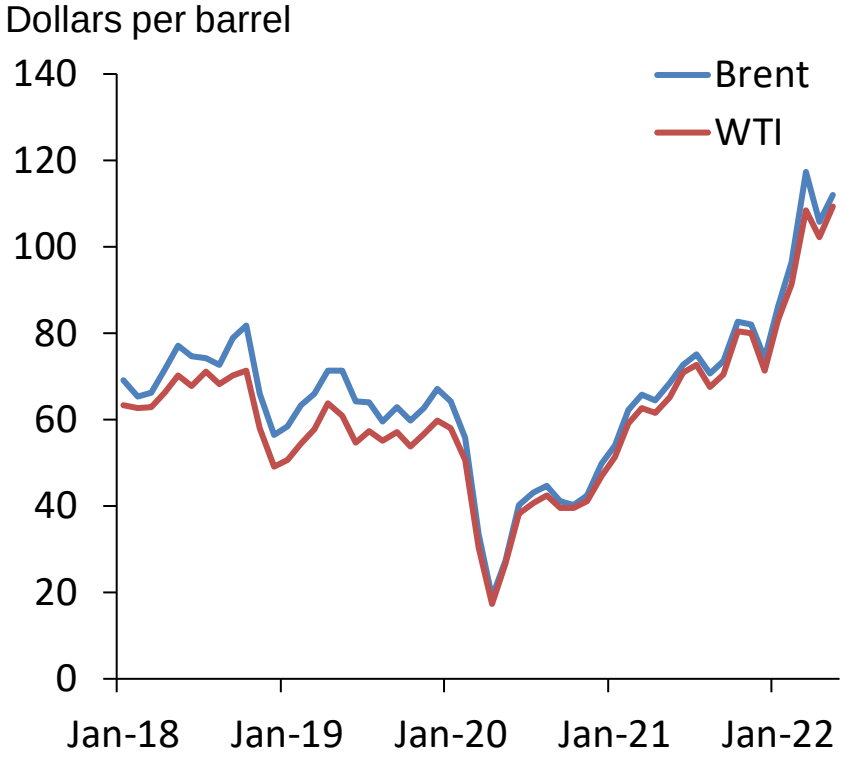
The views expressed in this presentation are strictly those of the presenter and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.

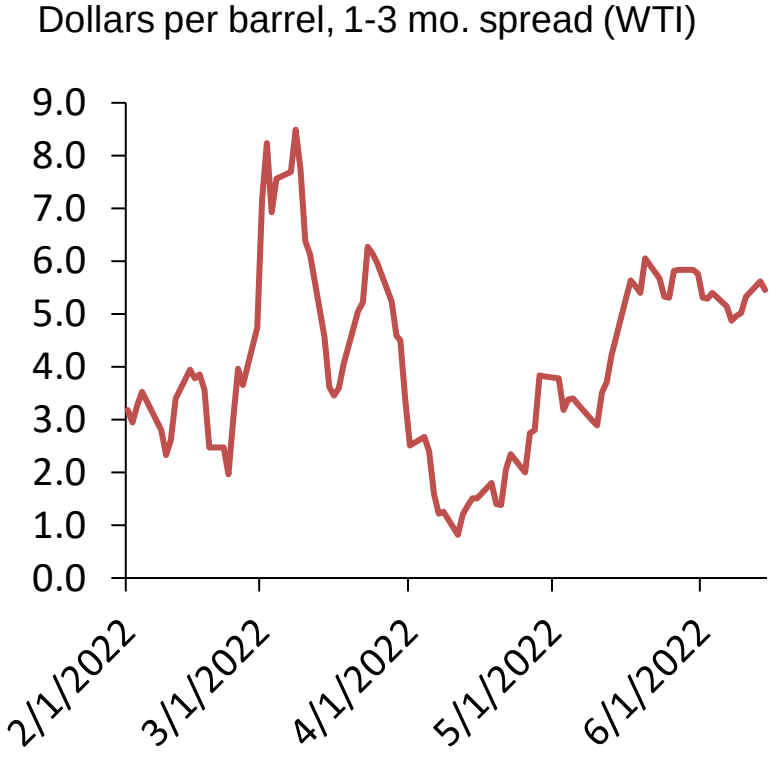
Energy Outlook

- The global market for crude oil remains tight, with oil inventories in OECD markets at levels not seen in nearly a decade.
- Global oil demand continues to rebound, and there are limited signs so far of demand destruction due to higher petroleum product prices.
- Inventories in the global oil market is likely to remains unchanged this year. Backend of WTI futures curve has moved slightly higher than Dallas Fed Energy Survey breakevens.
- U.S. natural gas prices have moved higher, given strong LNG export demand for the global market.
- Solar to lead renewable growth in the power sector, as it has the lowest levelized cost of energy. However, significant investments are needed to get to net-zero emissions by 2050.

GLOBAL OIL MARKET

Crude oil prices near multi-decade highs, with curve backwardation strengthening

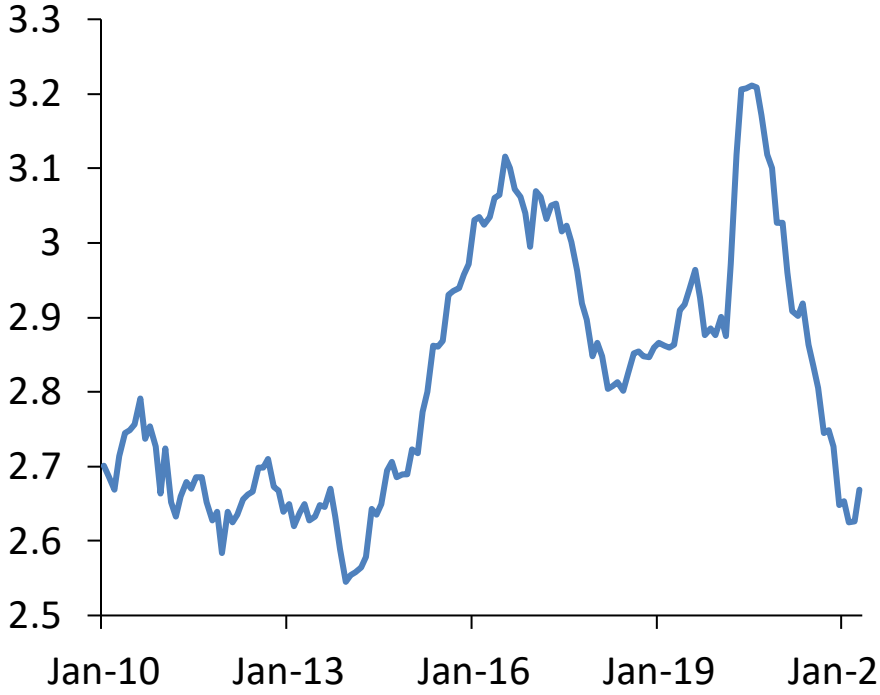




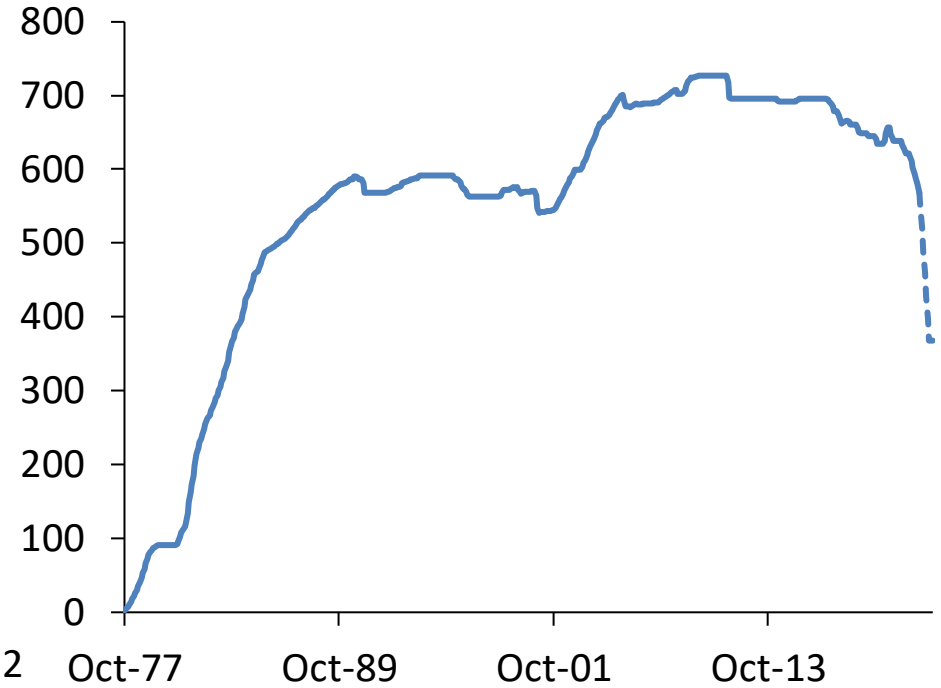
Source: Energy Information Administration.

Underlying is declining inventories, although large SPR release upcoming

OECD inventories in billions

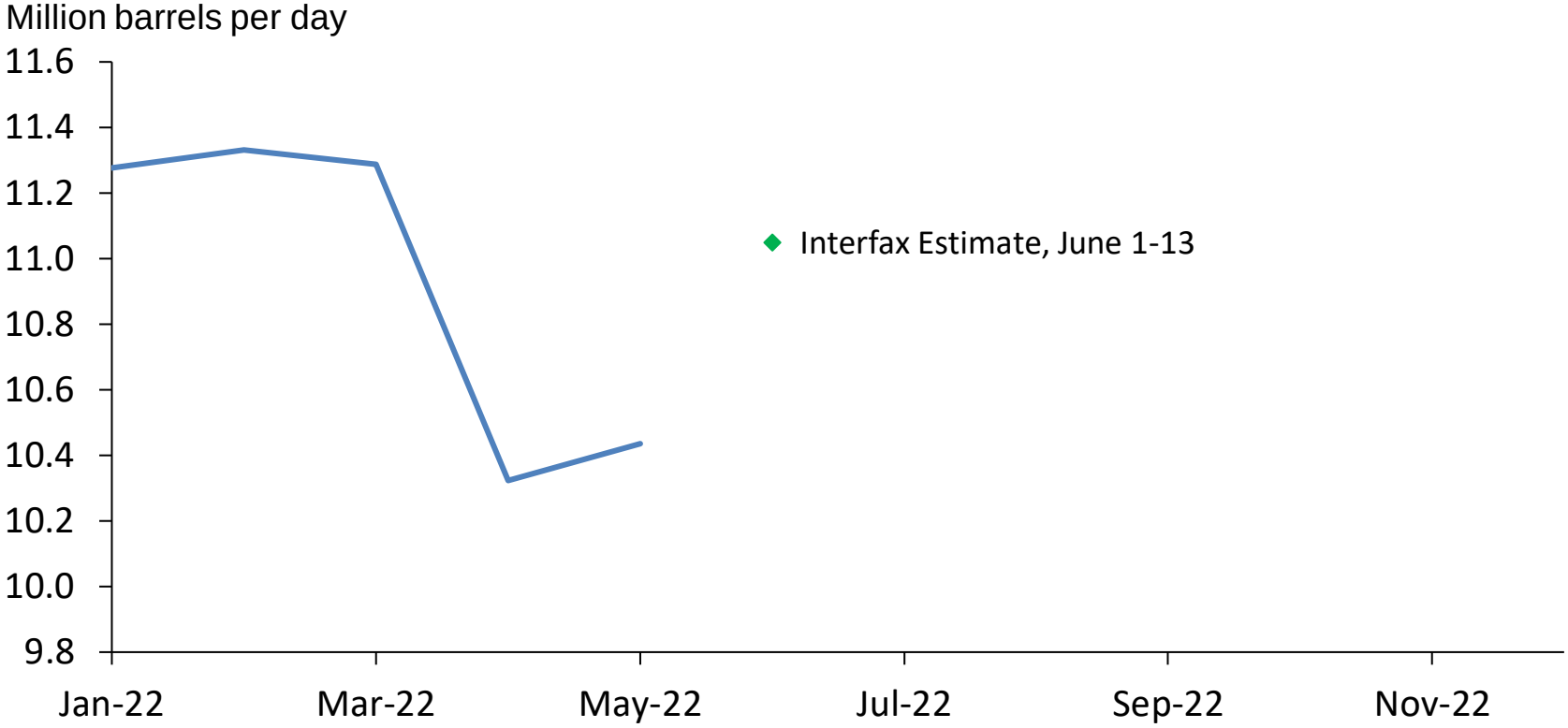


U.S. SPR crude inventories in billions



Source: Energy Information Administration.

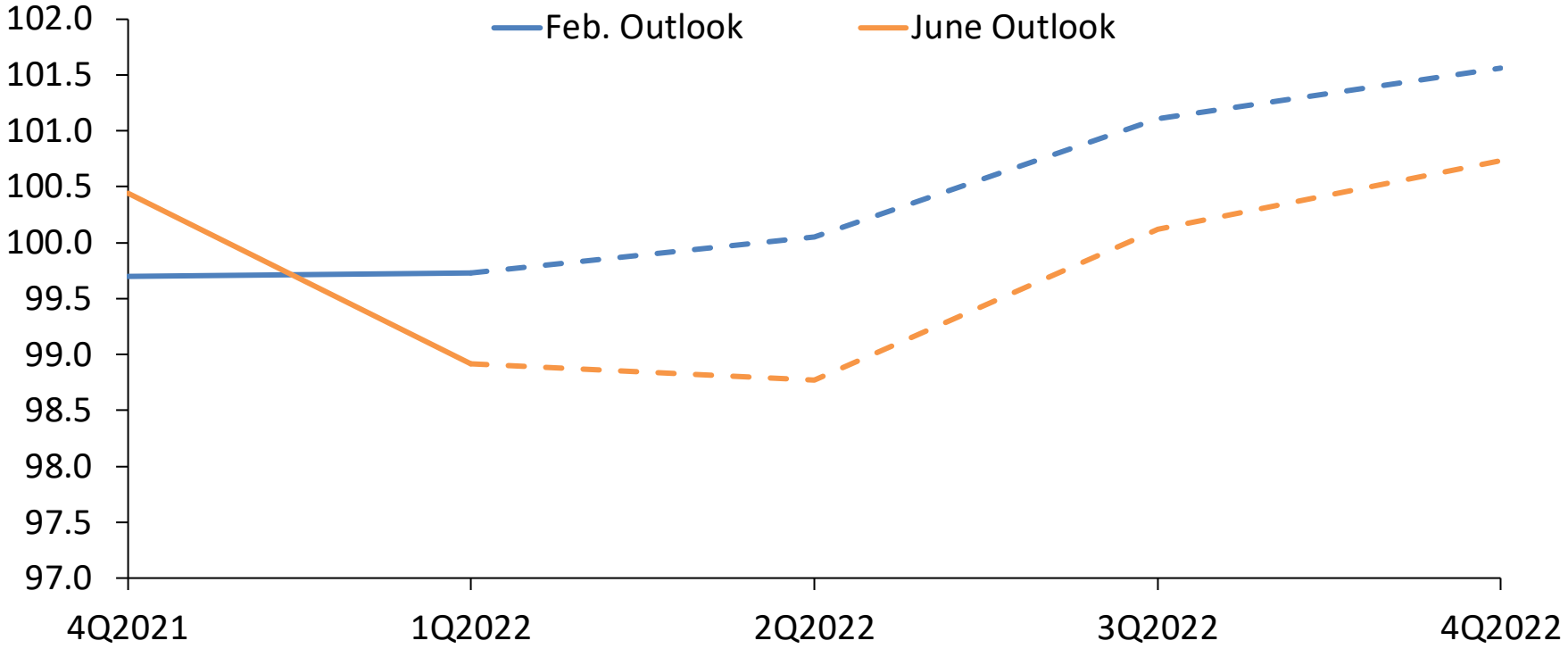
Impact of sanctions on Russia oil production muted so far



Source: Energy Information Administration, Interfax.

Global consumption may be weaker than initially expected due to China and Russia

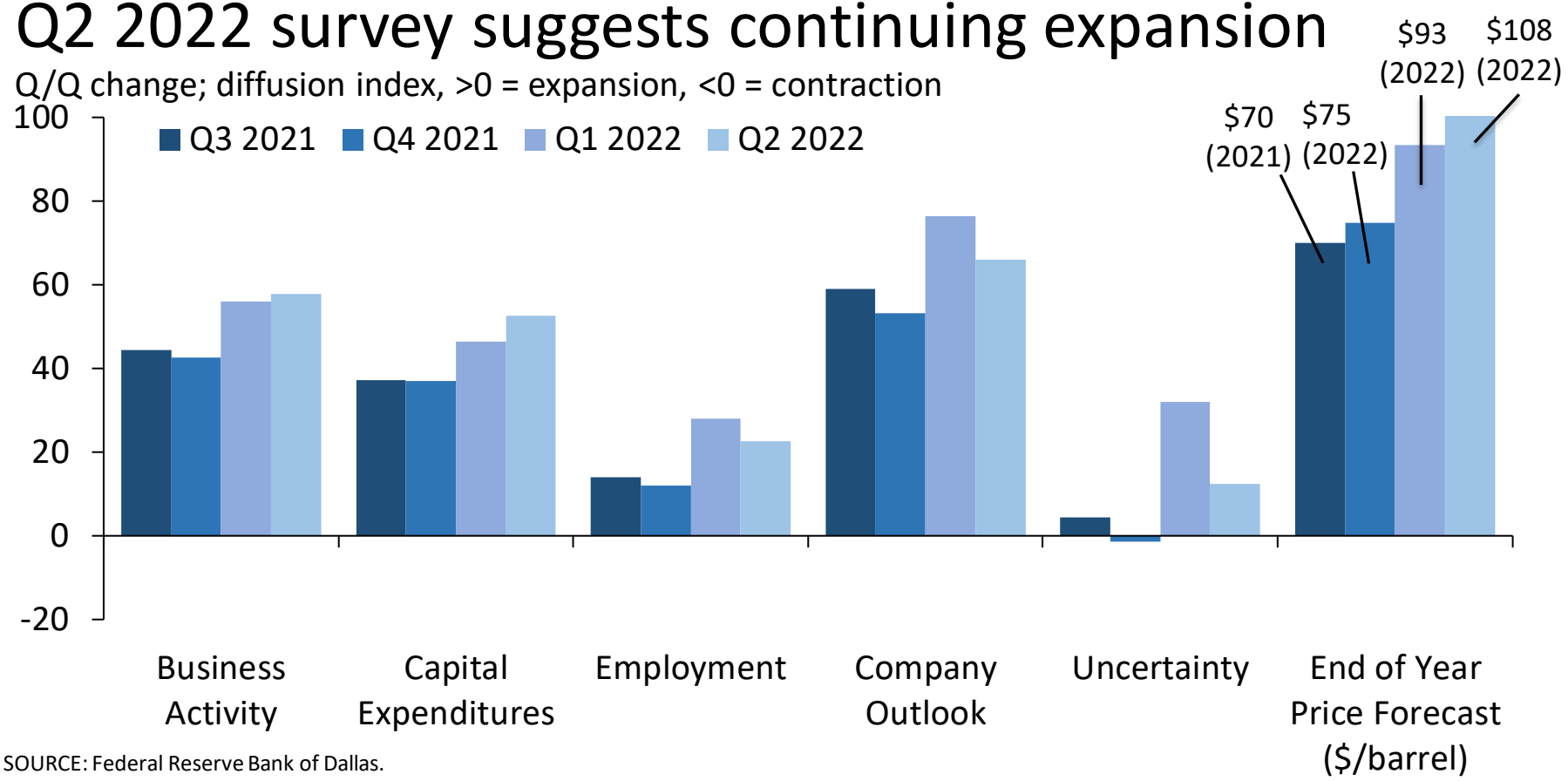
Million barrels per day



Source: Energy Information Administration.

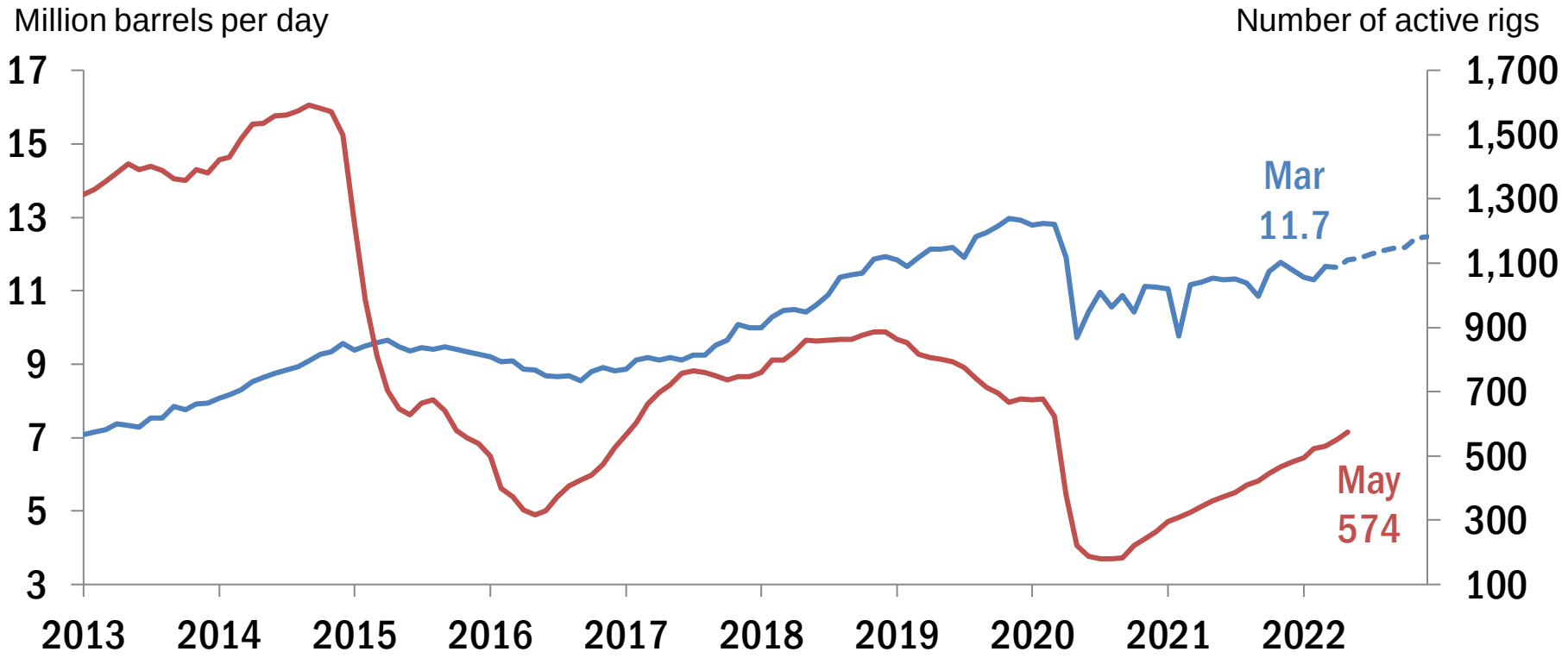
U.S. OIL MARKET

Q2 2022 survey suggests continuing expansion



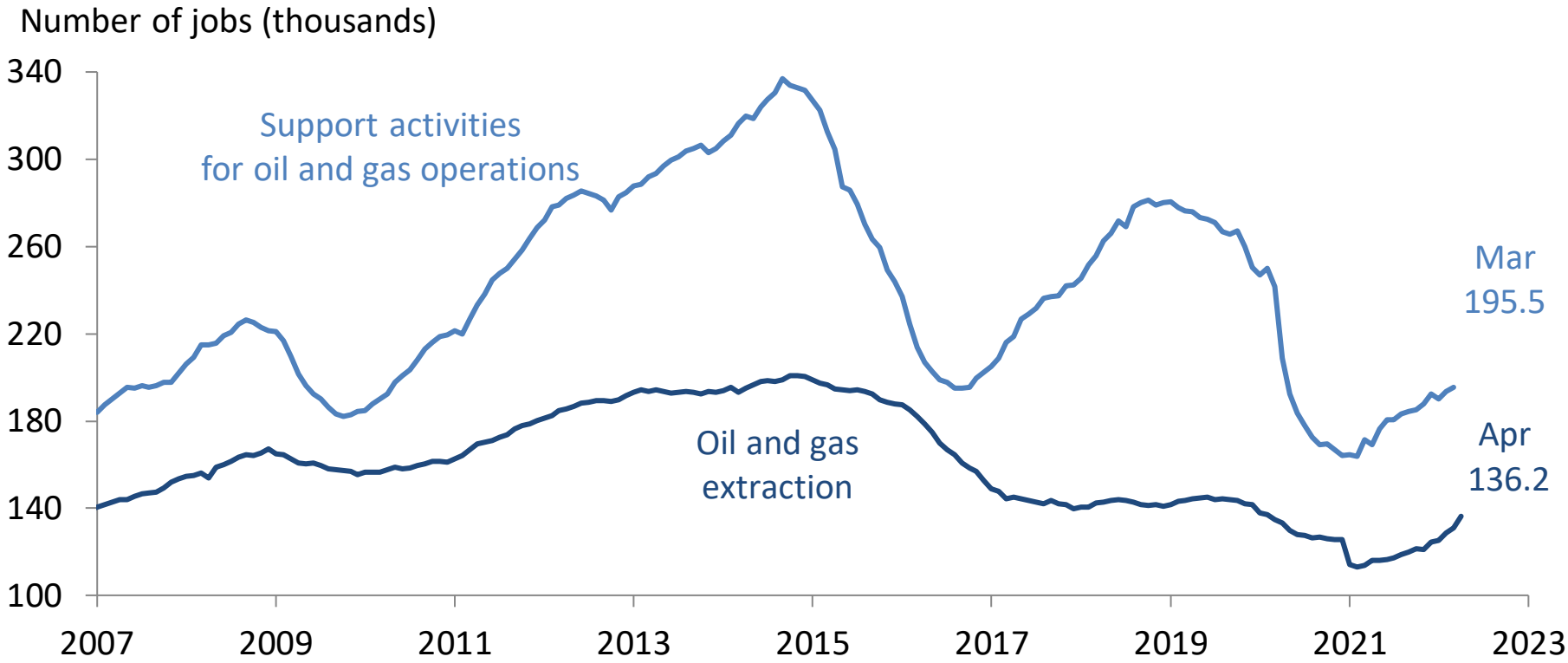
SOURCE: Federal Reserve Bank of Dallas.

U.S. production increasing, despite less rigs than prior upcycles



NOTES: Dashed line shows the forecast as of 5/10/22. Rig count series shows the last weekly count each month.
SOURCES: Baker Hughes; Energy Information Administration.

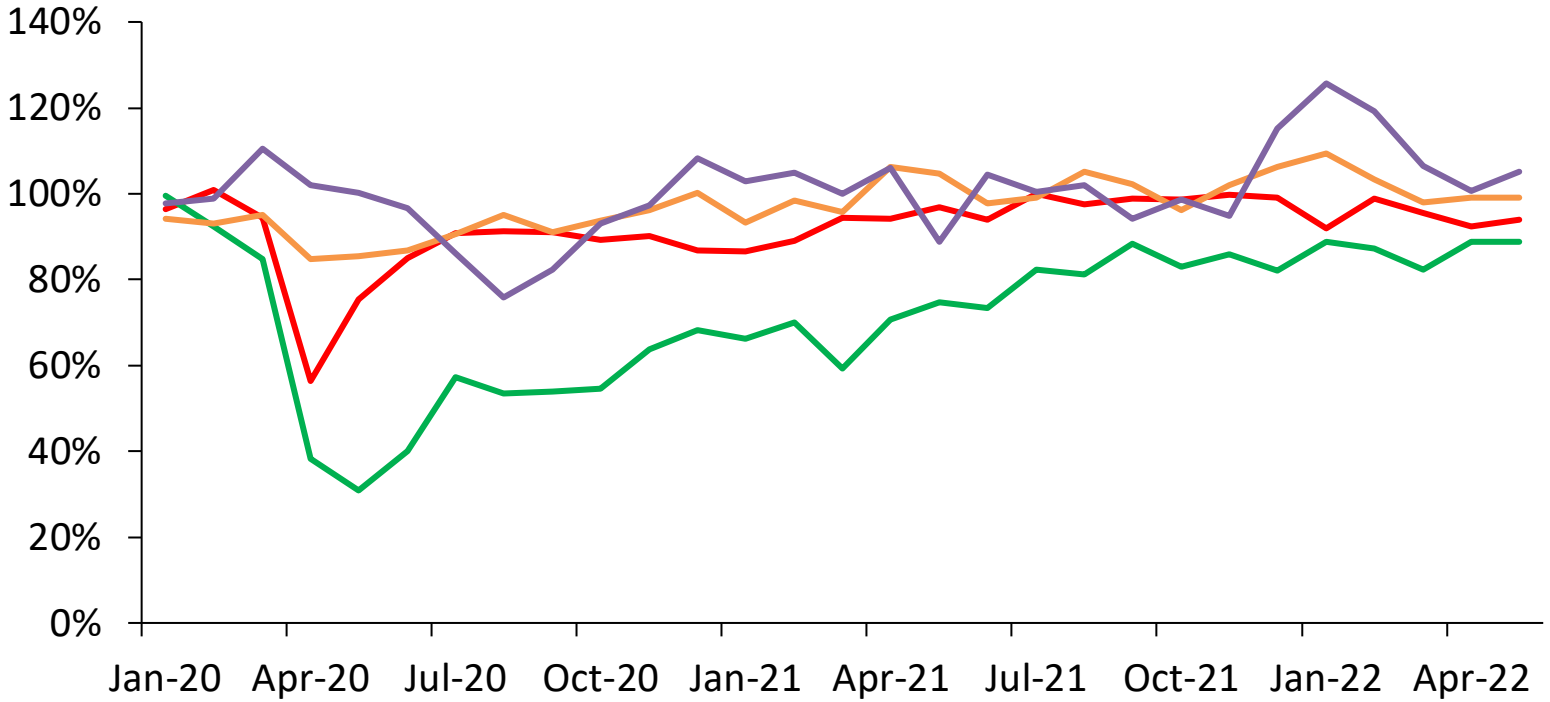
Oil and gas employment trending up



SOURCES: Bureau of Labor Statistics; Federal Reserve Bank of Dallas.

Fuel demand mostly recovered in the U.S.

Percent versus 2019 respective month

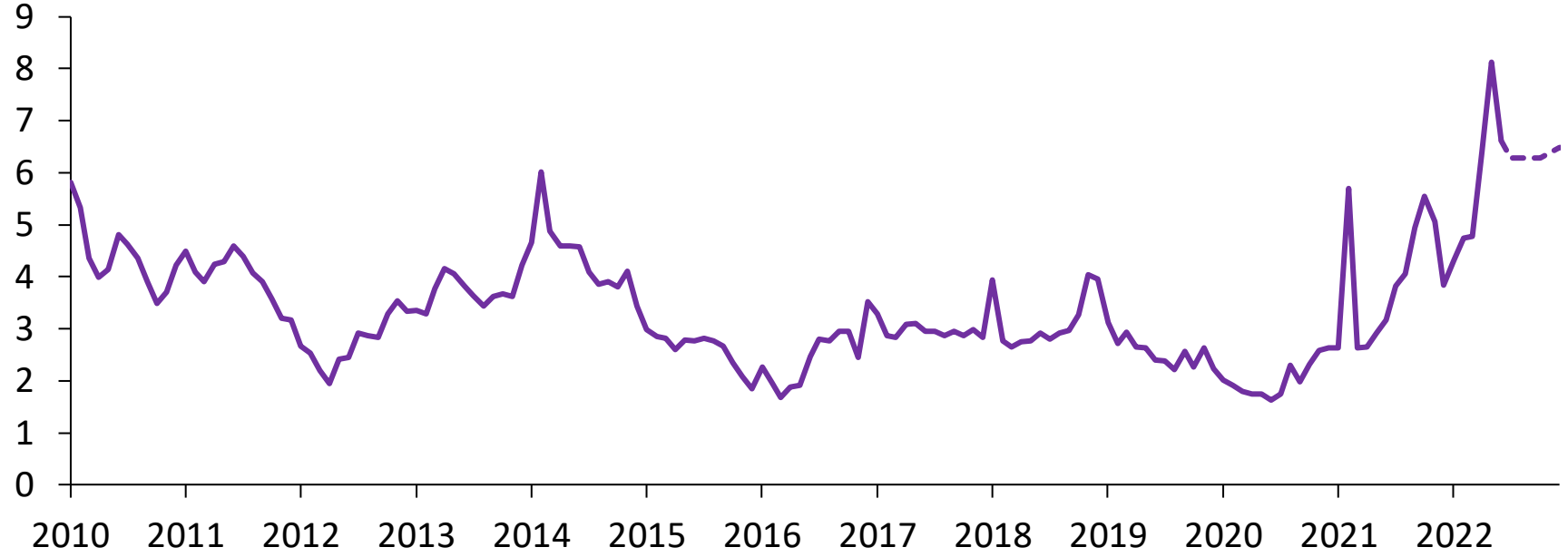


NOTE: Data based on weekly estimates.
SOURCE: Energy Information Administration.

U.S. Natural Gas

Natural gas prices have risen in recent months

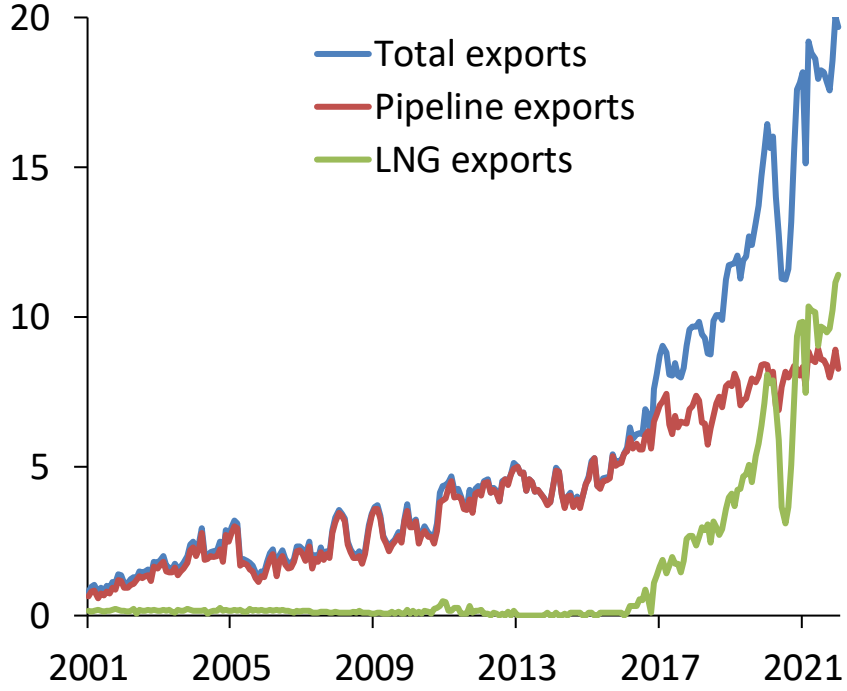
Dollars per million in British thermal units

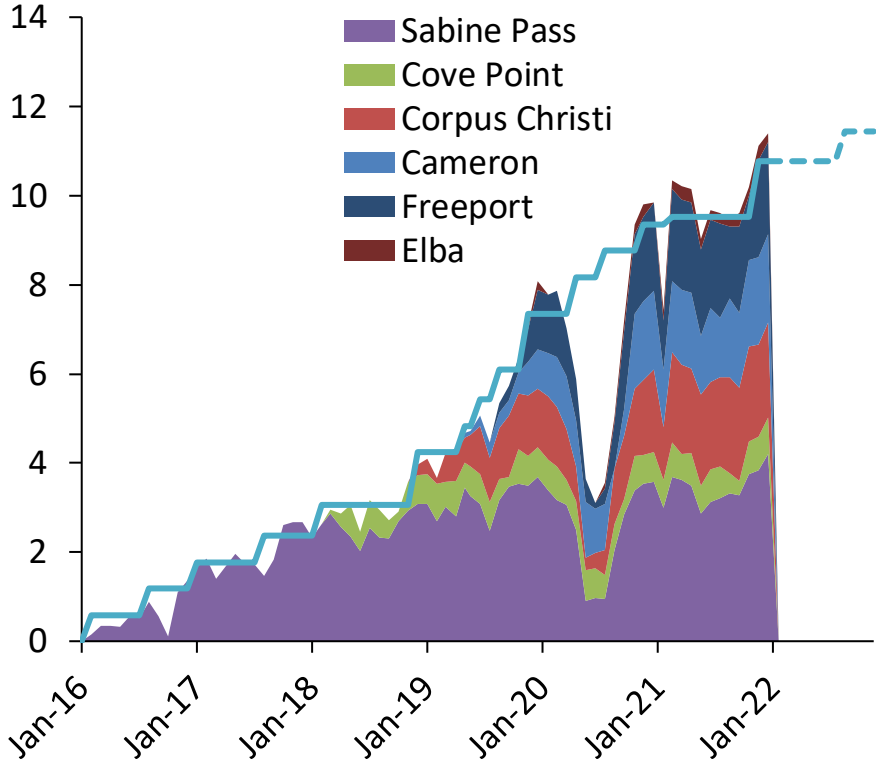


Note: Latest prices are averages for the week ending 4/1/22. Dashed line is a forward curve.
Source: Bloomberg.

Strong natural gas exports demand supporting price

Billion cubic feet per day, Total Exports (left), LNG Exports (right)

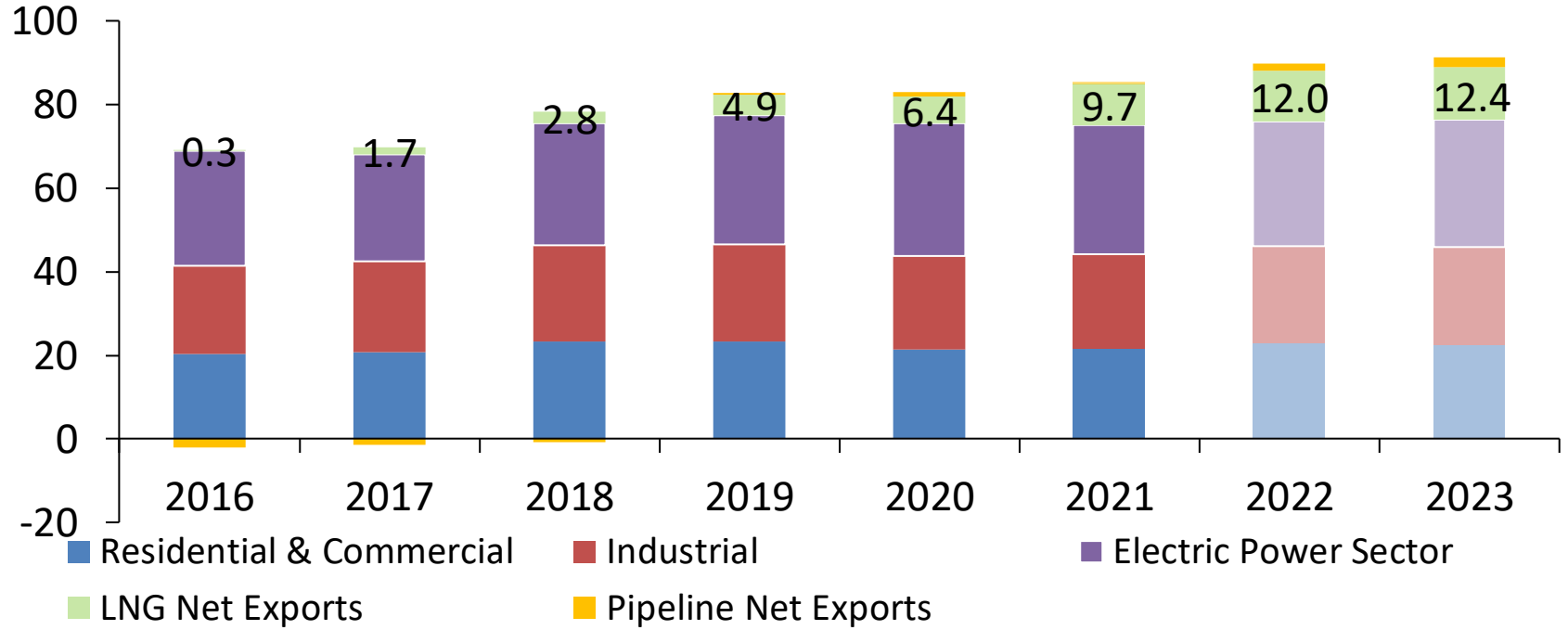




NOTE: Peak capacity ~15% higher than baseload capacity.
SOURCE: Energy Information Administration; Federal Reserve Bank of Dallas.

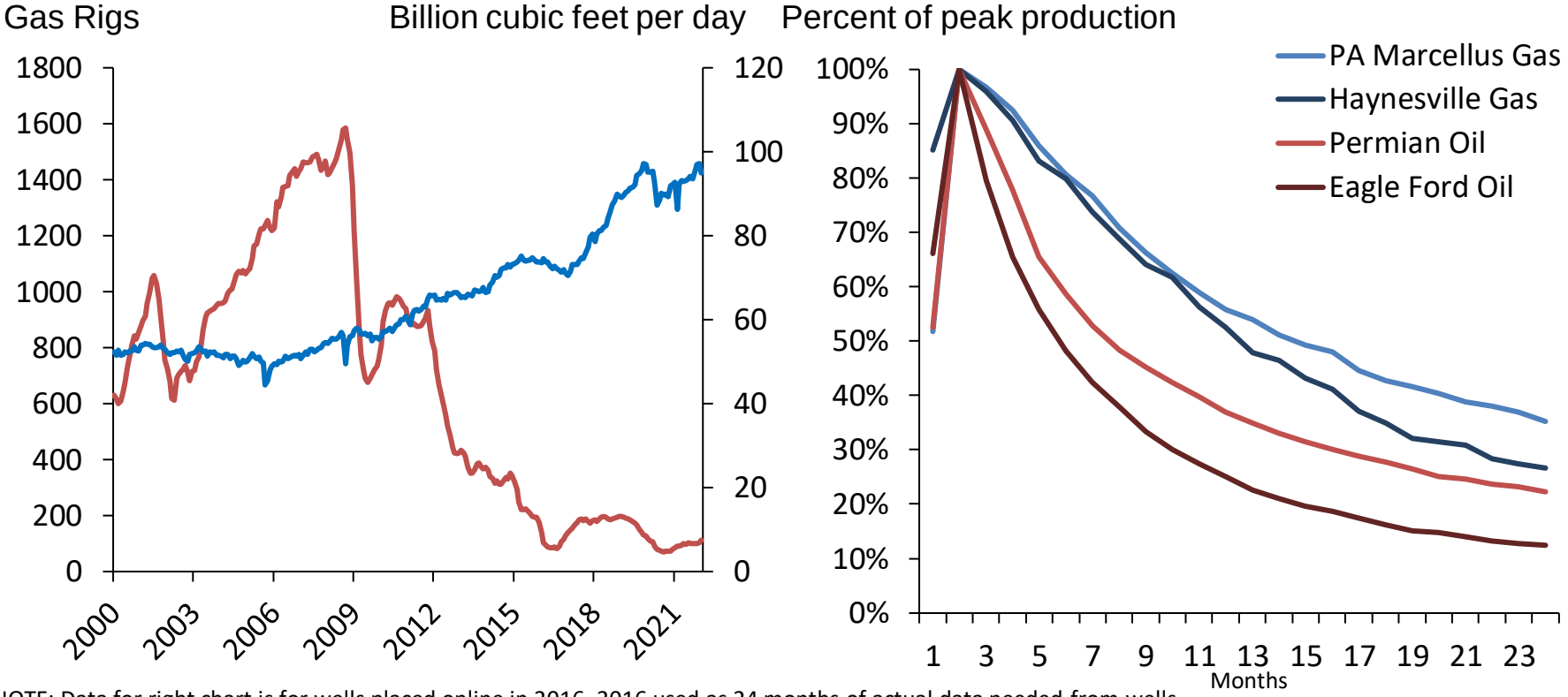
Exports growing, while U.S. consumption in other sectors remains largely stagnant

Billion cubic feet per day



Source: Energy Information Administration.

Production remains robust, despite fewer rigs, due to slower decline rates



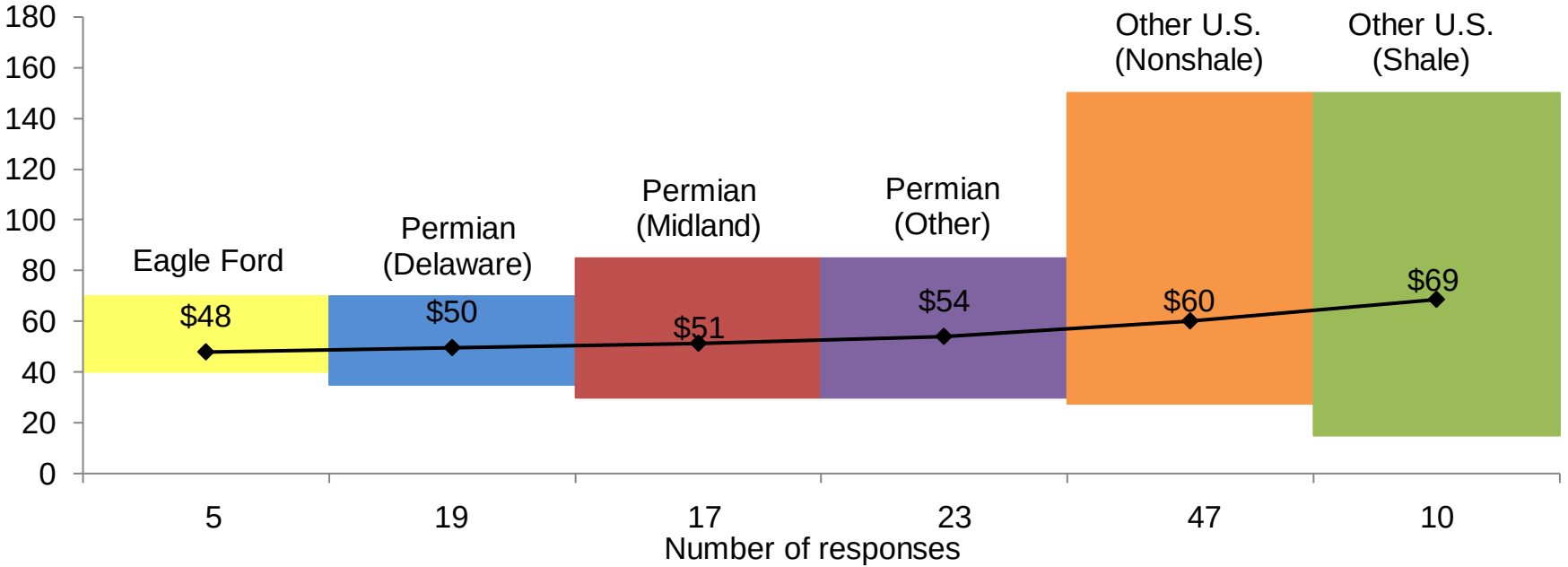
NOTE: Data for right chart is for wells placed online in 2016. 2016 used as 24 months of actual data needed from wells.
SOURCE: Energy Information Administration (Left); WellDatabase (Right).

Oil and Gas Outlook

Firms can profitably drill at current prices

What WTI oil price does your firm need to profitably drill a new well in dollars per barrel?

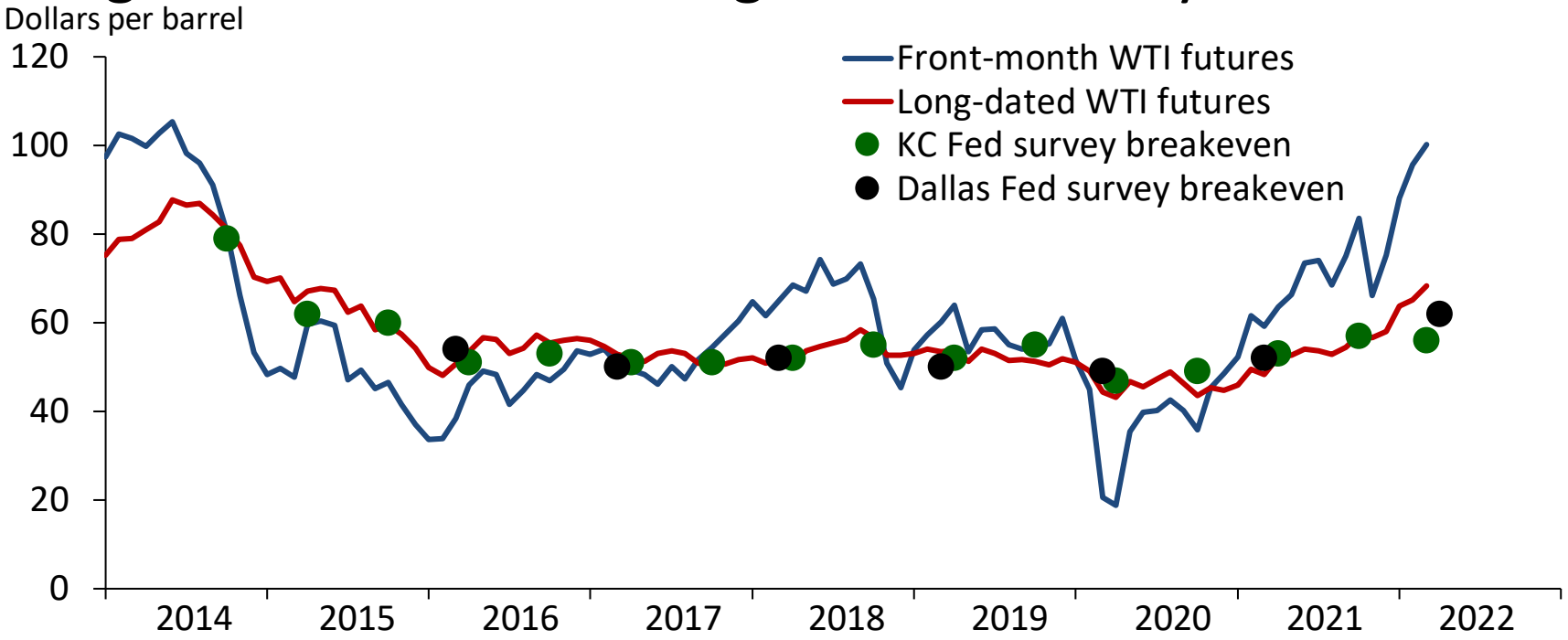
Dollars per barrel



NOTES: Lines show the average, and bars show the range of responses. Executives from 83 exploration and production firms answered this question during the survey collection period, March 9–17, 2022.

SOURCE: Federal Reserve Bank of Dallas.

Long-dated WTI futures slight above survey break-evens



NOTE: The long-dated West Texas Intermediate (WTI) futures price is based off a 60th month contract. All prices are as of end of month.
SOURCES: Bloomberg; Federal Reserve Banks of Dallas and Kansas City.

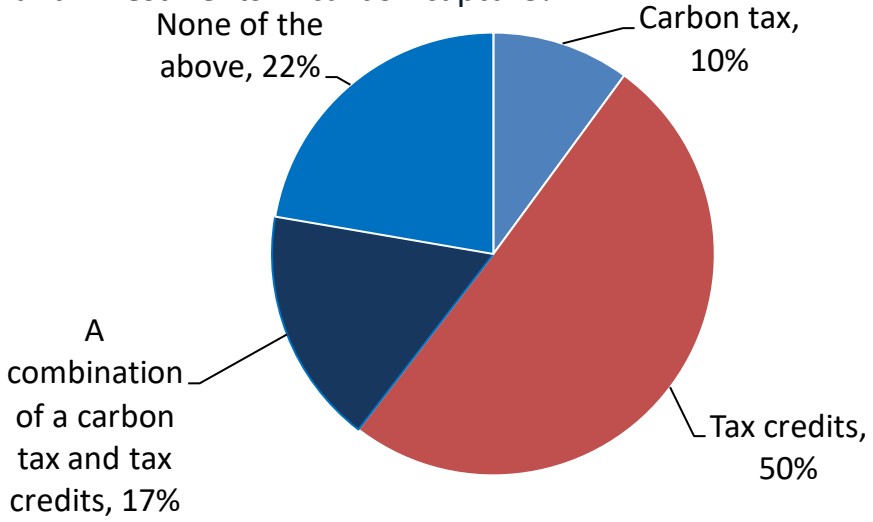
Additional Insight: Breakeven Oil Prices Underscore Shale's Impact on the Market

Renewables

Firms believe tax credits more effective than carbon tax at reducing emissions

Dallas Fed energy survey results (6/23/21)

Question: Which do you believe will be more effective in reducing carbon emissions: a carbon tax or tax credits to fund investments in carbon capture?



NOTE: Executives from 139 oil and gas firms answered this question during the survey collection period, June 9–17, 2021.
SOURCE: Federal Reserve Bank of Dallas.

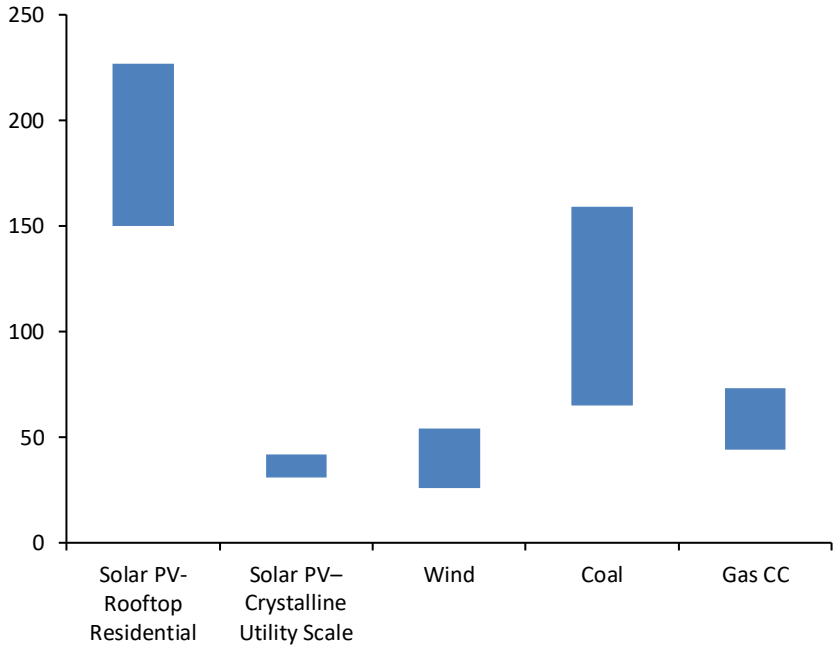
Carbon pricing use not widespread

- Carbon pricing covers roughly 16% of global emissions
- Carbon pricing only exceeds $50/metric ton of CO^2 equivalent in 4 countries: Sweden, Finland, Norway, France
- Carbon is a global emission. Given that emissions from China exceed the U.S. and Europe combined, and given that emissions from China are growing, a coordinated effort is needed for global emissions to decline.

SOURCE: BP Statistical Review; World Bank.

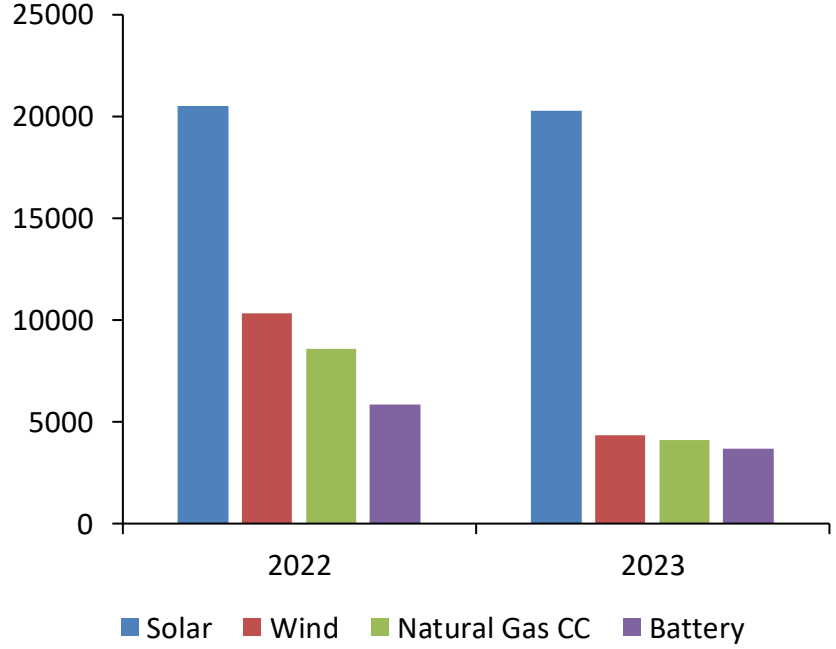
Solar and wind lower cost compared to conventional; leads new builds

LCOE Comparison-Unsubsidized ($/MWh)



NOTE: LCOE stands for levelized cost of energy.
SOURCE: Lazard.

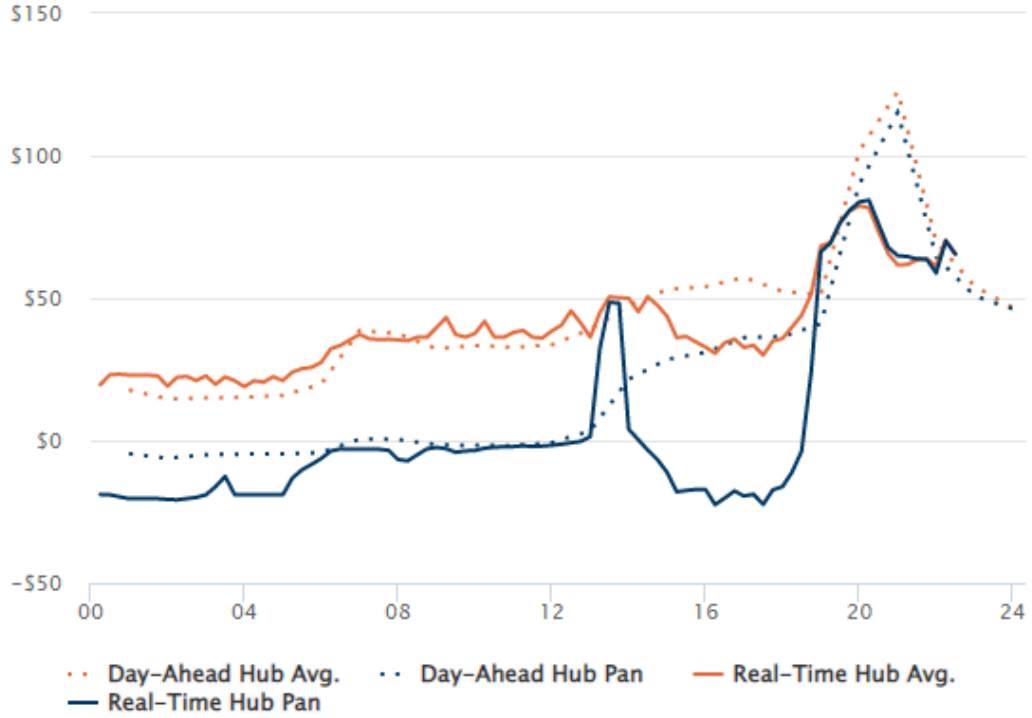
Most U.S. newbuilds are solar and wind (MW)



SOURCE: EIA.

However, transmission is needed to alleviate negative pricing (ex: TX Panhandle)

Dollars per megawatt on 4/15/22



Texas CREZ lines costed $7B in 2014

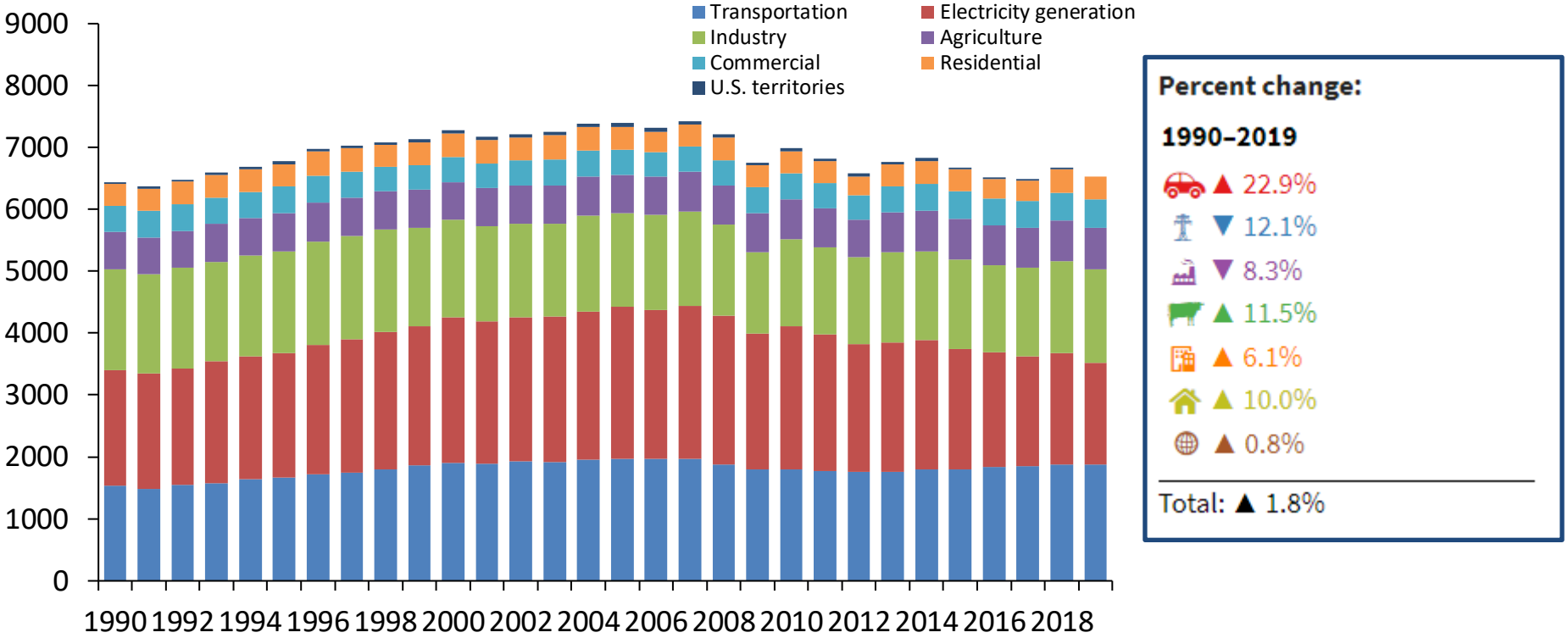
These lines help move wind power from the Texas Panhandle to East and Central Texas

However, renewables have exceeded the transmission capacity throughout the day, causing negative prices

SOURCE: ERCOT.

However, greenhouse emissions come from sectors outside power

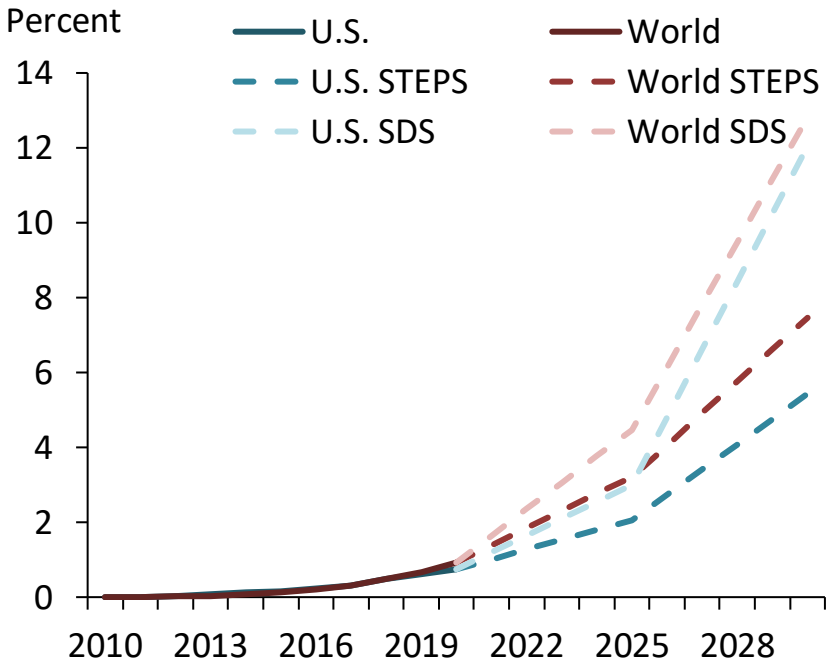
Emissions (million metric tons of carbon dioxide equivalents)



SOURCE: EPA.

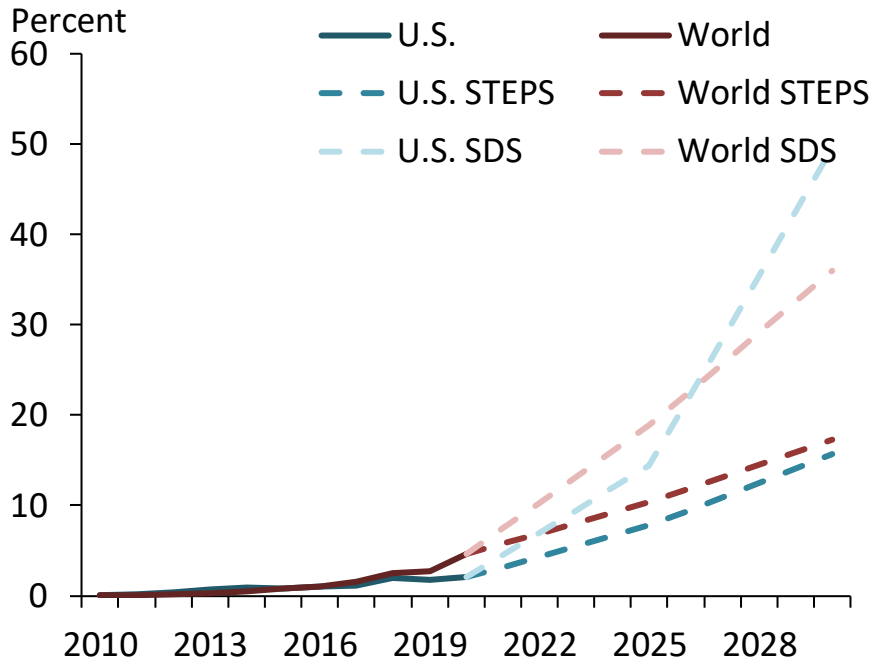
Electric vehicles make up 2% of car sales, 1% of vehicle stock

EV Stock Share, Cars



Note: STEPS stands for Stated Policies Scenario and SDS stands for sustainable developm
SOURCE: IEA (Global EV Outlook 2021).

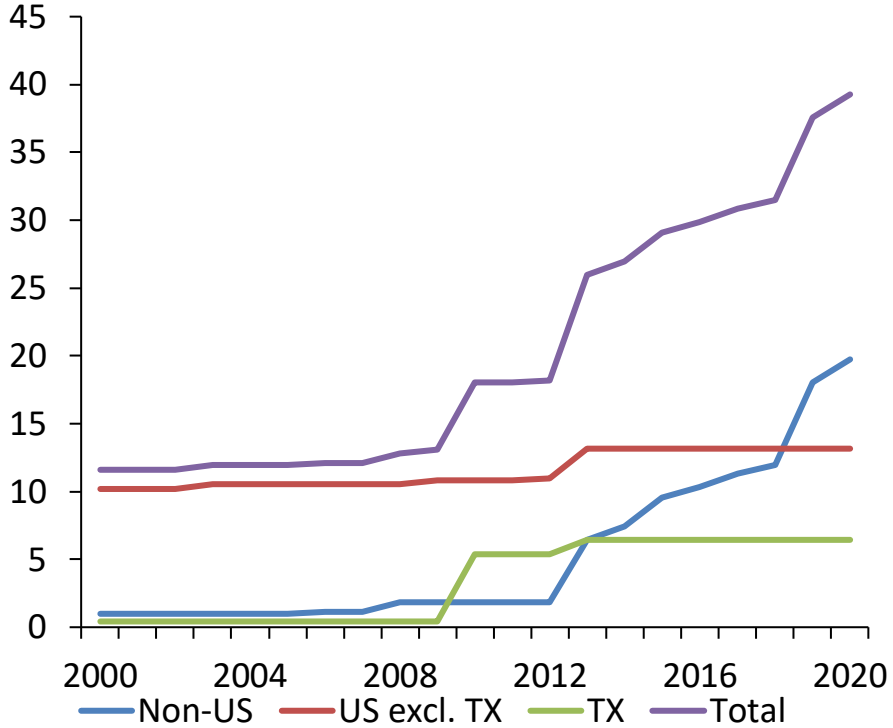
EV Sales Share, Cars



Note: STEPS stands for Stated Policies Scenario and SDS stands for sustainable developmer
SOURCE: IEA (Global EV Outlook 2021).

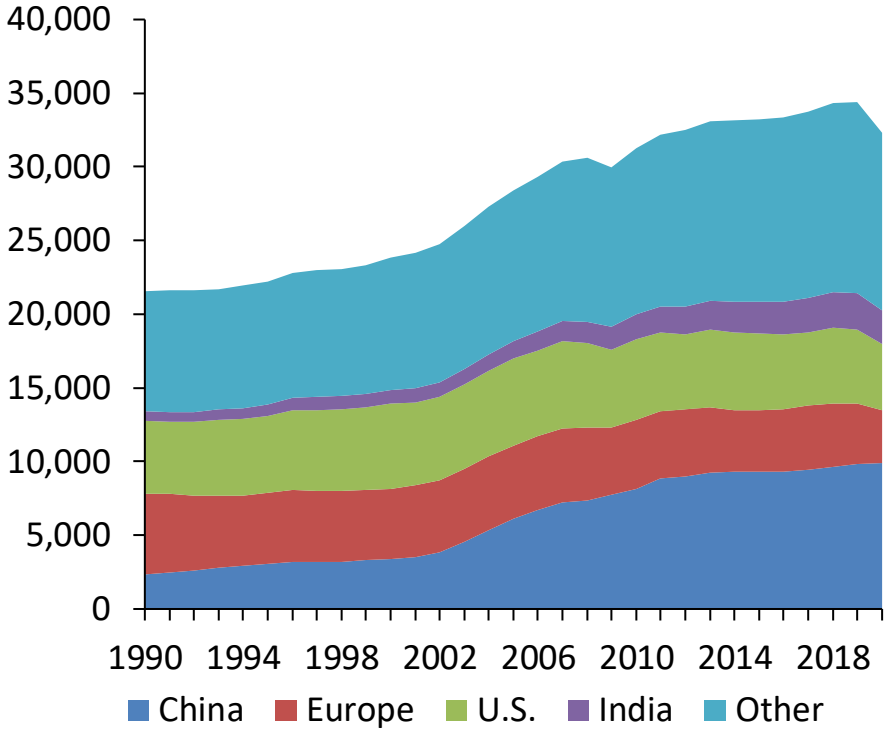
CCUS capacity in operation is limited so far compared to global emissions

Capacity in million tons per annum



SOURCE: Global CCS Institute.

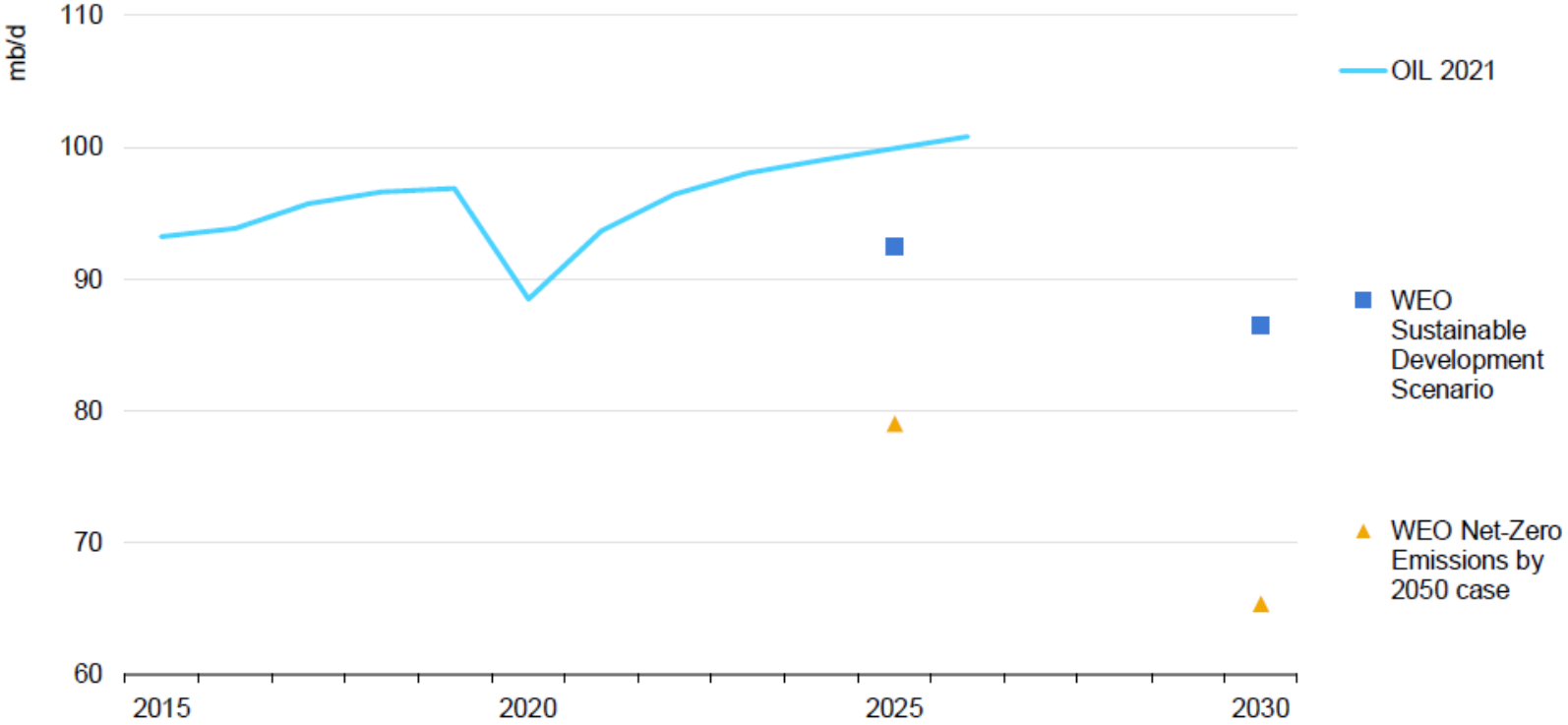
Emissions in million tons per annum of CO_2



SOURCE: BP Statistical Review.

Deeper cuts in demand needed to meet net-zero goals

Global oil demand forecast in Oil 2021, Sustainable Developments Scenario and Net-Zero Emissions by 2050 case



SOURCE: IEA World Energy Outlook.

Questions?