The Changing Landscape in Oil and Gas

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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.
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 remain 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

Global Oil Market

Dollars per barrel

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

Global Oil Market

Million barrels per day

Source: Energy Information Administration, Interfax.

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Global Oil Market

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

Q/Q change; diffusion index, >0 = expansion, <0 = contraction

SOURCE: Federal Reserve Bank of Dallas.
U.S. Oil Market

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

Million barrels per day

Number of active rigs

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.
U.S. Oil Market

Oil and gas employment trending up

Number of jobs (thousands)

Support activities for oil and gas operations

Oil and gas extraction

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Residential &amp; Commercial</th>
<th>Industrial</th>
<th>LNG Net Exports</th>
<th>Pipeline Net Exports</th>
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<td>2023</td>
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</tbody>
</table>

Source: Energy Information Administration.
Production remains robust, despite fewer rigs, due to slower decline rates

Gas Rigs  Billion cubic feet per day  Percent of peak production

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

Dollars per barrel

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?

- Carbon tax, 10%
- Tax credits, 50%
- A combination of a carbon tax and tax credits, 17%
- None of the above, 22%

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.

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

**LCOE Comparison-Unsubsidized ($/MWh)**

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

NOTE: LCOE stands for levelized cost of energy.

SOURCE: Lazard.

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
However, greenhouse emissions come from sectors outside power

Emissions (million metric tons of carbon dioxide equivalents)

Renewables

SOURCE: EPA.

Percent change:
1990–2019

Total: ▲ 1.8%
Electric vehicles make up 2% of car sales, 1% of vehicle stock

Renewables

Note: STEPS stands for Stated Policies Scenario and SDS stands for sustainable development. The STEPS is the baseline scenario, while the SDS is a more optimistic scenario.

SOURCE: IEA (Global EV Outlook 2021).
CCUS capacity in operation is limited so far compared to global emissions

Capacity in million tons per annum

Emissions in million tons per annum of CO$_2$

SOURCE: EPA.

SOURCE: Global CCS Institute.

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

Questions?