Key points

Economy

- Recently lowered economic expectations still reflect above-average rates
  - Russia’s war in Ukraine advanced the economic consensus’ expectations for higher price inflation and slower global GDP growth
  - Bloomberg consensus and IMF downgraded 2022 global growth by 0.8% y/y to 3.1% y/y
  - Uncertainties: geopolitics, price inflation, U.S. dollar exchange value, global debt

Oil

- As solid global oil demand is expected to reach record highs in 2023 per EIA, supply challenges have persisted for oil and natural gas production
  - Global demand of 98.8 million barrels per day (mb/d) in Q2 2022, projected to grow to a record high 102.7 mb/d in Dec. 2023 per EIA
  - Headwinds: lower U.S. rig productivity and fewer drilled but uncompleted wells in Q2 2022 per EIA; cost escalation per BLS
  - Protracted workforce, supply chain, financial, and adverse energy policies
  - Uncertainties: Effective Russian production losses; potential OPEC and U.S. growth

- U.S. petroleum net exports reached a record high 1.4 mb/d in April 2022

- U.S. refining activity has risen to meet demand
  - Weekly capacity utilization rates in June as high as 94.3%, 7.3% above its 5-year average

Natural gas

- Global natural gas prices rose in Q2 2022 to around $9 per million Btu (mmBtu) in the U.S. and remained over $20 per mmBtu in Asia and Europe

- EIA projects natural gas to remain competitive in U.S. power because coal prices could remain elevated

First Quarter 2022 by the numbers

- Benchmark price averages
  - Brent crude oil: $101.17 per barrel
  - WTI crude oil: $95.18 per barrel
  - NGL composite: $11.05 per mmBtu
  - Natural gas (Henry Hub): $4.84 per mmBtu

- U.S. petroleum demand: 21.2 mb/d
- U.S. drilling activity: 636 rigs
- U.S. refinery throughput: 16.0 mb/d
- U.S. oil & gas production: 33.0 mb/doe
- U.S. petroleum demand: 21.2 mb/d
- U.S. refining activity: 636 rigs
- U.S. refinery throughput: 16.0 mb/d
- U.S. oil & gas production: 33.0 mb/doe

- Financial compilation based on API 200 companies with shares listed on U.S. stock exchanges.
- Sources: EIA; API Monthly Statistical Report; Bloomberg and company reports; Baker Hughes; API Team analysis
Key implications

For consumption
- A technical global recession – that is, economic contraction – could be uneven across economies and elevate systemic risks.
- The pulse of energy demand, including oil and natural gas, depends on the level of overall growth, which appears historically strong.
- A recurrent theme: a combination of demand outpacing supply, low inventories and higher imports has historically been a recipe for upward price pressures.
- U.S. monitoring of short-term trends, especially distillate inventories on the East Coast.

For production
- With workforce, supply chain, financial and policy headwinds, accelerated rig activity has not yet significantly raised U.S. oil and natural gas production.
- If 2022 demand remains near its 2019 levels, greater drilling activity is likely to be needed given EIA’s estimated decreases in rig productivity and lower inventories of drilled but uncompleted wells.
- While most focus is on elevated commodity prices, the key to a successful supply response could hinge on factors that enable capital project execution, including lower steel trade/tariffs, increased labor mobility, and renewed North American energy relationships.

For economics and energy policies
- Currently with the lowest commercial U.S. oil inventories since 2014 and SPR since 1987 – and global inventories below their 5-year range – U.S. economic and energy security requires a laser focus on policies to support healthy production, pipeline infrastructure, and trade.
In Q1 2022, the natural gas and oil industry had capital expenditures of $44.6 billion, and the backlog of U.S. projects under construction shrank.

- The industry invested $44.6 billion in Q1 2022, compared with $35.7 billion in Q1 2021.
- Across the energy value chain, API is monitoring 102 oil & gas-related projects currently under construction worth $145 billion.

### Capital expenditures by industry segment

<table>
<thead>
<tr>
<th>Industry Segment</th>
<th>Capital Expenditures (Billion dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream and Petrochemical</td>
<td>$24 B</td>
</tr>
<tr>
<td>Midstream</td>
<td>$20 B</td>
</tr>
<tr>
<td>Equipment &amp; Services</td>
<td>$80 B</td>
</tr>
<tr>
<td>Upstream</td>
<td>$21 B</td>
</tr>
<tr>
<td>Facilities (Terminals, Storage)</td>
<td>$104 M</td>
</tr>
</tbody>
</table>

### $145 billion in current U.S. energy infrastructure investments

- 6 LNG (Global integrated) $80 B
- 14 Refinery expansions $20 B
- 52 Pipelines $24 B
- 7 Facilities (Terminals, Storage) $104 M

Sources: S&P Market Intelligence; Oil & Gas Journal; American Chemistry Council; API Team calculations as of Mar. 2022.
Global drilling activity has continued to lag its 2019 levels and historical price responsiveness.

- In May 2022, global oil & gas drilling activity was down by 27.3% compared with May 2019. Changes vs. 2019 by segment:
  - U.S. oil drilling (-29.1%)
  - U.S. natural gas drilling (-19.1%)
  - International oil drilling (-20.9%)
  - International natural gas drilling (-47.0%)

Global oil drilling activity and Brent crude oil prices, monthly

Sources: Baker Hughes; Bloomberg; CME Group
Upstream cash flow constraints and high indebtedness are two likely reasons why drilling has been less responsive than it historically has been.

Q4 2014 and Q1 2022 had similar oil prices when adjusted for price inflation.

Comparing company financials in 2014 versus 2022:

### Upstream free cash flow constraints

<table>
<thead>
<tr>
<th></th>
<th>Q4 2014</th>
<th>Q1 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% of upstream companies outspent their cash flows</td>
<td>84% of upstream companies operated within their cash flows</td>
<td></td>
</tr>
</tbody>
</table>

### Upstream indebtedness rose

<table>
<thead>
<tr>
<th></th>
<th>Q4 2014</th>
<th>Q1 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>The median upstream company’s debt equaled 67% of its total equity</td>
<td>The median upstream company’s debt equaled 80% of its total equity</td>
<td></td>
</tr>
</tbody>
</table>
Global Economy
What we’re watching now – Consider the possibility of an economic recession to above-average global growth levels

Key themes this quarter are: 1) forward-looking macroeconomic risks, particularly to emerging markets; 2) a critical debate over GDP growth projections; and 3) prospects for global oil demand growth amid low inventories and a loss of supplies

World Economic Outlook
Several priority areas for action:
• Early detection of significant financial risks that may be hidden
• “The biggest challenge is sovereign debt restructuring. The absence of a predictable, orderly, and rapid process for sovereign debt restructuring is costly, dampening recovery prospects and creating uncertainty”
• The corporate–government nexus is another potential source of contingent liabilities and hidden debt

“Emerging economy firm surveys reveal that many businesses expect to be in payment arrears in the coming months, and so private debt could suddenly become public debt as in past crises”

World Bank Warns of Global Recession, Stagflation
• The World Bank projected global real GDP growth of 2.9% y/y in 2022, which is above the long-run historical average rate

“The war in Ukraine, lockdowns in China, supply-chain disruptions, and the risk of stagflation are hammering growth. This is the sharpest slowdown in 80 years…and it’s really hitting the poorer countries hard”

• “Markets look forward, so it is urgent to encourage production and avoid trade restrictions. Changes in fiscal, monetary, climate and debt policy are needed to counter capital misallocation and inequality”

World Bank, June 2022

Oil Market Report, May 2022
• 2022 “world oil demand growth is...expected to increase by 1.8 mb/d on average to 99.4 mb/d

• “Despite mounting international pressure and falling oil production, Russian exports have so far held up by and large. But now major trading houses are winding down deals ahead of a 15 May deadline to halt all transactions with state-controlled [entities]. Following a supply decline of nearly 1 mb/d in April, losses could expand to around 3 mb/d during the second half of the year

• Global observed oil inventories declined by a further 45 mb during March and are now a total 1.2 billion barrels lower since June 2020

International Energy Agency, May 2022
Consensus expectations are for elevated price inflation and progressively slower global growth, with Russia’s war on Ukraine clipping 0.8% off 2022 growth.

- IMF and consensus estimates have increased their expectations for protracted consumer price inflation:
  - Global consumer price inflation estimates rose by 3.5% for 2022, 1.5% for 2023 and 0.8% for 2024.
- As price inflation has persisted and economic stimulus wears off, the consensus expects economic slowing through 2024.

**Consumer price inflation**

y/y%

- Global (Q2 2022)
- U.S. (Q2 2022)
- Global (Q4 2021)
- U.S. (Q4 2021)

**Real GDP growth**

y/y%

- Global
- U.S.

sources: IMF; Bloomberg

* Market exchange rate basis aggregated for 204 countries, compiled May 2022

sources: IMF; Bloomberg; API Team calculations
Oil Markets
Despite downward revisions, global oil demand could near a record high in 2023 per EIA.

- Despite slower expected economic growth, EIA expects global oil demand of 99.6 mb/d in 2022 (up by 2.3 mb/d from 2021) and a record-high of 101.3 mb/d in 2023.
- Balancing global oil markets could require supply growth of 2.6 mb/d by OPEC and 1.3 mb/d from the U.S. per EIA.

**Global oil demand and GDP**

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP (Trillion 2010$)</th>
<th>Global oil demand (mb/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>2011</td>
<td>85</td>
<td>95</td>
</tr>
<tr>
<td>2012</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>2013</td>
<td>95</td>
<td>105</td>
</tr>
</tbody>
</table>

**Global oil production**

- EIA estimates (June 2022)
- 2022 change (mb/d): OPEC (2.6), Russia (-0.4), United States (+1.3), Other Non-OPEC (+1.0)

*Market exchange rate basis, sources: EIA, Bloomberg, IMF, API Team calculations.*
EIA expects the global oil supply/demand balance to support prices of $107 per barrel in 2022 and $97 per barrel in 2023.
U.S. refiners have stepped up to the global need for petroleum fuels

- The U.S. had returned to being a petroleum net importer in Jan. and Feb. 2022, but the global response to Russia’s war on Ukraine increased the pull for U.S. petroleum net exports a record 1.4 mb/d in April 2022 per API.
- U.S. refinery throughput has remained historically strong with relatively fewer refiners utilizing over 90% of their capacity in Q2 2022.

### U.S. crude oil production and net imports (exports)

- **Million barrels per day**
  - Crude oil production
  - Total petroleum net imports (exports)

### U.S. refinery capacity and throughput

- **Million barrels per day**
  - Refinery throughput
  - Operable capacity

**Sources:** EIA, API MSR™
Historically low oil inventories persisted before Russia’s war in Ukraine

- Global and U.S. commercial oil inventories decreased by about 10% y/y and remained below their 5-year ranges so far in 2022, before Russia’s war in Ukraine escalated at the end of February.
- Year-to-date through April, U.S. crude oil inventories fell by 3.4 million barrels – far below the historical average of more than 40 million barrels (2005 to 2021) – in advance of refining activity for the summer driving and winter fuels seasons.

**OECD commercial oil inventories (crude and products)**

Billion barrels

- 3.3

**U.S. commercial oil inventories (crude and products)**

Billion barrels

- 1.6

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**Sources:** OPEC Argus; EIA; Euroilstock; IEA; METI.
Oil and natural gas rig productivity has decreased by EIA estimates

- EIA estimated oil well productivity fell in the Permian (-18% y/y), Bakken (-25% y/y) and DJ Niobrara (-26% y/y) as of May 2022
- For dedicated dry gas drilling, rig productivity slipped 12% y/y in Q2 2022 as drilling activity expanded per EIA

**U.S. oil well productivity – new production per rig**

<table>
<thead>
<tr>
<th>Year</th>
<th>Bakken</th>
<th>Permian</th>
<th>Eagle Ford</th>
<th>DJ Niobrara</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>2.5</td>
<td>3.0</td>
<td>2.2</td>
<td>1.8</td>
</tr>
<tr>
<td>2018</td>
<td>2.3</td>
<td>2.8</td>
<td>2.0</td>
<td>1.6</td>
</tr>
<tr>
<td>2019</td>
<td>2.1</td>
<td>2.6</td>
<td>1.8</td>
<td>1.4</td>
</tr>
<tr>
<td>2020</td>
<td>1.9</td>
<td>2.4</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>2021</td>
<td>1.7</td>
<td>2.2</td>
<td>1.4</td>
<td>1.0</td>
</tr>
<tr>
<td>2022</td>
<td>1.5</td>
<td>2.0</td>
<td>1.2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**Natural gas well productivity – production per rig**

<table>
<thead>
<tr>
<th>Year</th>
<th>Appalachia</th>
<th>Haynesville</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>2018</td>
<td>28</td>
<td>8</td>
</tr>
<tr>
<td>2019</td>
<td>26</td>
<td>6</td>
</tr>
<tr>
<td>2020</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>2021</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>2022</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>

source: EIA Drilling Productivity Report (May 2022)
Drilled but uncompleted wells (DUCs) have contributed minimally to U.S. well completions so far in 2022

- In 2021, 30% of U.S. well completions were from wells that were previously drilled by uncompleted (EIA)
- As the DUC inventory has been drawn down, only 4% of U.S. well completions relied on DUCs in April 2022

U.S. oil and natural gas well completions from DUCs, by basin in April 2022

Drilled by uncompleted wells, by basin

- **Oil basins**
  - Bakken: 5% in Apr. 2021, 0% in Apr. 2022
  - DJ Niobrara: 4% in Apr. 2021, 3% in Apr. 2022
  - Permian: 5% in Apr. 2021, 0% in Apr. 2022
  - Eagle Ford: 2% in Apr. 2021, 2% in Apr. 2022
  - Anadarko: 9% in Apr. 2021, 9% in Apr. 2022

- **Natural gas basins**
  - Appalachia: 0% in Apr. 2021, 0% in Apr. 2022
  - Haynesville: 0% in Apr. 2021, 0% in Apr. 2022

Source: EIA
Despite elevated prices, U.S. liquid fuels consumption could reach record levels in 2023 per EIA

- High-frequency indicators of industrial activity remained solid through April, but transportation flattened along with slower economic activity and increased fuel prices
- EIA projects U.S. annual oil consumption growth of 3.8% (0.8 mb/d) y/y in 2022 and 1.0% y/y (0.2 mb/d) in 2023, which could tie the 2005 record

### U.S. demand indicators, y/y%
- **Total Flights**
  - May 2022 vs. May 2021: +19%
- **Plastics & Rubber**
  - Apr. 2022 vs. Apr. 2021: +7%
- **Manufacturing**
  - Apr. 2022 vs. Apr. 2021: +6%
- **Traffic Volume**
  - Mar. 2022 vs. Mar. 2021: +3%
- **DAT Spot Truck Posts**
  - May 2022 vs. May 2021: +17.7%

### U.S. liquid fuel consumption by fuel
- Million barrels per day
- Sources: EIA; API

**Sources:** FlightRadar24; FRB; FHA; DAT Trendlines
Distillates/diesel fuel fundamentals have generally tightened so far in 2022

- In the first five months of 2022, U.S. refinery distillates’ production varied in its five-year range, while demand downshifted to the middle of it after exceeding the historical range to start the year.
- Distillate exports doubled between January and April, and inventories remained below their five-year range.
Motor gasoline fundamentals have similarly tightened so far in 2022

- In the first five months of 2022, U.S. refinery motor gasoline production remained strong within its five-year range, and motor gasoline demand flattened within the historical range
- Motor gasoline exports have nearly doubled since January, and inventories fell to the bottom of their five-year range

**Motor gasoline production**
- Million barrels per day
- 5-year range
- 2022
- 2021

**Motor gasoline demand**
- Million barrels per day
- 5-year range
- 2022
- 2021

**Motor gasoline exports**
- Million barrels per day
- 5-year range
- 2022
- 2021

**Motor gasoline inventories**
- Million barrels

sources: EIA; API MSR™
Gasoline prices have historically reflected those of oil, which remained relatively low since 2015 but recently climbed to their highest levels since 2014.

Refiner acquisition cost of crude oil prices versus U.S. average gasoline prices, adjusted for price inflation

Dollars per gallon (2022$)

- Refiner acquisition cost of crude oil (EIA)
- U.S. avg. gasoline price (AAA, regular gasoline)

Sources: Bloomberg; EIA; AAA; Bureau of Labor Statistics; API Team analysis
Natural Gas
Historically strong global natural gas prices have spurred U.S. natural gas exports via liquefied natural gas (LNG) and pipeline have achieved record levels.

As natural gas prices in Europe and Asia rose to unprecedented levels, U.S. natural gas exports via liquefied natural gas (LNG) and pipeline have achieved record levels.

Global natural gas prices

$2022 per mmBtu, monthly

- Asian Benchmark (JKM)
- UK Benchmark (NBP)
- Dutch Benchmark (TTF)

source: Bloomberg

U.S. natural gas exports

Billion cubic feet per day

- U.S. pipeline natural gas exports
- U.S. LNG exports

EIA estimates

source: EIA
EIA expects natural gas production growth of 3.0 bcf/d in 2022 and 5.1 bcf/d in 2023 could support increased exports and more than 36% of U.S. electricity net generation.

EIA expects natural gas to represent more than 36% of U.S. net electricity generation despite increases by other sources.

### Natural gas consumption and production by sector

**Dry natural gas production**

- **Net Exports:** 13.4 Bcf/d in 2021, 14.8 Bcf/d in 2022, and 14.8 Bcf/d in 2023.
- **Industrial:** 22.8 Bcf/d in 2021, 22.9 Bcf/d in 2022, and 22.9 Bcf/d in 2023.
- **Res / Comm:** 22.6 Bcf/d in 2021, 22.6 Bcf/d in 2022, and 22.6 Bcf/d in 2023.

### Electricity net generation by sector

**Net Exports**

- **Petroleum and other:** +79 in 2022, +2 in 2023.
- **Renewables:** +99 in 2022, +59 in 2023.
- **Natural gas:** +13 in 2022, -26 in 2023.
- **Coal:** -30 in 2022, -40 in 2023.
- **Nuclear:** +11 in 2022, -11 in 2023.

Source: EIA (June 2022)
Historically low natural gas inventories have spurred higher prices that EIA expect could persist through the 2022-2023 winter.

- Natural gas net injections into underground storage were 18% below those last year as of May 27 per EIA, resulting in storage at the bottom of its five-year range and recent price increases.
- Natural gas prices through the value chain have risen so far through 2022, and EIA expects these changes to persist into 2023.

**U.S. working gas in underground storage**

Billion cubic feet

- 2022
- 2021
- 5-year range

**EIA natural gas prices by end-use sector**

Dollars per thousand cubic feet (2022$)

- Henry Hub spot price
- Industrial
- Commercial
- Residential

Sources: EIA; EIA STEO (June 2022)
U.S. propane fuel supply has been historically strong, but propane demand and strong exports kept inventories towards the bottom of the 5-year range.

Though propane production has been steady above its 5-year range, historically strong demand to start the year and increased exports coincided with inventories near the bottom of their 5-year range through May 2022.
Global naphtha and crude oil prices have historically moved together, while those of ethane and propane have depended on both global petrochemical prices and regional market conditions.

Ethane has been the largest growing component of natural gas liquids production, and prices for it exceeded $0.60 per gallon in late May 2022 – up over 130% y/y to its highest since 2012.

Although the prices of ethane, propane and naphtha each rose, naphtha and ethane prices increases relative to propane in Q2 2022.
API economics resources available at www.api.org