Key points – Q3 2021

**Economy**

- Global and U.S. GDP growth consensus estimates to 2023 rose from last quarter despite myriad uncertainties (pandemic, price inflation), which appear they could lower but not de-rail prospects.

- Industry capital investment fell in Q2 2021 to its lowest on record.

**Oil**

- Global demand growth of 3.5 million barrels per day (mb/d) between Q3 2021 and Q4 2022 -- a record high in the second half of 2022 -- per EIA projected to be met with supply increases by the U.S. (+1.8 mb/d), OPEC (+1.7 mb/d), and Russia (+1.4 mb/d).

- U.S. demand of 20.1 mb/d in Q2 was 2.0% below its Q2 2019 level, but approached 21.0 mb/d in Q3 and projected by EIA to exceed 2019 levels in 2022.

- Potential supply pressure. Global oil & gas drilling activity in Q3 down by more than 40% versus Jul. 2019, but drilling for U.S. oil and international gas down by more than 50%.

**Natural gas**

- Global demand of 376.6 billion cubic feet per day (bcf/d) in 2021 is expected to grow and reach record levels beginning in 2022, per IEA.

- U.S. natural gas consumption and production stand to resume growing in 2022, per EIA.
Key implications – Q3 2021

For consumers
- Provided that the economy remains on track, demand for oil and natural gas appears likely to grow.
- A combination of demand outpacing supply, lower inventories and higher imports has historically been a recipe for higher prices.

For natural gas and oil industry producers
- Delays and cancellations of many drilling programs and major capital projects could take considerable time to rebound.
- Financial, workforce, supply chain and policy uncertainties have muted the historical responsiveness of activity to higher prices – and raised potential cost escalation if and when activities resume.
- Weaker domestic oil production contributed to higher U.S. imports and narrower crude price differentials, which can influence trade and investments.
- International natural gas demand, which has grown despite historically high prices, implies a two-speed U.S. natural gas market: one for producers that predominantly serve domestic markets and another for those which can export.

For policymakers
- Abundant domestic production has historically helped keep downward price pressure, and cogent policies are needed to support it.
- Infrastructure is essential, but large spending now could magnify existing supply chain issues and spur price inflation.
- Those who believe most recent price inflation is temporary may misunderstand the time required for oil and natural gas investments.
Industry capital expenditures fell to $37.4 billion – lowest on record for any quarter since 2008, but the backlog of U.S. projects under construction edged up to $178 billion

- The industry invested $37.4 billion in Q2 2021, compared with $68.7 billion in the same quarter of 2019
- Across the energy value chain, API is monitoring 114 oil & gas-related projects currently under construction worth $178 billion

### Capital expenditures by industry segment

<table>
<thead>
<tr>
<th>Industry Segment</th>
<th>Billion Dollars (2021$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream and Petrochemical</td>
<td>150</td>
</tr>
<tr>
<td>Equipment &amp; Services</td>
<td>125</td>
</tr>
<tr>
<td>Midstream</td>
<td>100</td>
</tr>
<tr>
<td>Upstream</td>
<td>75</td>
</tr>
<tr>
<td>Global integrated</td>
<td>50</td>
</tr>
</tbody>
</table>

### $178 billion in current U.S. energy infrastructure investments

- **8 LNG**
  - $63 B
- **28 PetChem**
  - $66 B
- **22 Refinery expansions**
  - $20 B
- **45 Pipelines**
  - $29 B
- **11 Facilities**
  - (Terminals, Storage)
  - $157 M

### Sources
- S&P Market Intelligence; Oil & Gas Journal; American Chemistry Council; API Team calculations as of May 2021
- *All other oil & gas industry companies sources: Bloomberg; publicly-available company reports, BLS*
Global Economy
What we’re watching now

Key themes this quarter are 1) global unevenness of the pandemic and therefore economic recovery and 2) debates about how much price inflation is likely to be temporary.

Fault Lines Widen in the Global Recovery

- **Offsetting GDP growth revisions.** Upgraded advanced economies; downgraded emerging economy prospects
- **Pandemic paths / vaccinations** drive the outlook, and risks around the global IMF baseline are to the downside
- **Price inflation** is expected to return to its pre-pandemic ranges in most countries in 2022.... though uncertainty remains high

International Monetary Fund, Jul. 2021

Global Reflation?

- **Concern** has risen that the low price inflation of recent decades could be nearing its end, but BIS analysis suggests medium-term inflation could return to central bank targets
- **Data** reveal that the rise in inflation can be ascribed largely to base effects, increases in the prices of a small number of pandemic-affected items and higher energy prices -- likely temporary
- **A persistent increase** in inflation would require a material pickup in labor costs and an unmooring of inflation expectations. However, wage growth remains contained and the medium-term inflation expectations of professional forecasters and financial markets show little sign of de-anchoring.

Budianto et. al., Bank for International Settlements (Jul. 2021)

Oil Market Report, August 2021

- **Global oil demand growth** downgraded by 0.1 mb/d to 5.3 mb/d in 2021, but raised by 0.2 mb/d to 3.2 mb/d in 2022
- “Global oil inventories have been falling sharply....but global oil supply is ramping up fast” with an increase of 1.7 mb/d in July; expected OPEC+ increases; and another 1.7 mb/d of non-OPEC growth in 2022 (including about 1.0 mb/d from the U.S.)

The Bloomberg consensus expects the global economy to sustain above-average growth through 2023, but price inflation could present a challenge

- Consensus expectations for 2021 and 2022 global GDP growth have risen, assuming price inflation remains muted.
- However, U.S. producer prices have escalated, and many of the oil & gas sector changes could be “sticky.”

### Global GDP outlook

<table>
<thead>
<tr>
<th>Year</th>
<th>OECD</th>
<th>Non-OECD</th>
<th>Average 2000-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>5.0</td>
<td>0</td>
<td>-3.8</td>
</tr>
<tr>
<td>2021</td>
<td>4.3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td>3.1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Sources: IMF, Bloomberg

* Market exchange rate basis

### U.S. producer price inflation

<table>
<thead>
<tr>
<th>Industry</th>
<th>Percent change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGL extraction</td>
<td>83.5</td>
</tr>
<tr>
<td>Oil &amp; gas extraction</td>
<td>47.4</td>
</tr>
<tr>
<td>Petroleum refining</td>
<td>31.7</td>
</tr>
<tr>
<td>Natural gas distribution</td>
<td>24.6</td>
</tr>
<tr>
<td>Chemical mfg.</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Source: BLS

### Consumer price inflation

- World: 5.0, 4.3, 3.1
- Advanced economies: 5.0, 4.3, 3.1
- Emerging economies: 4.3, 3.1, 3.1

Sources: IMF

* Market exchange rate basis
Led by emerging economies, global oil demand could near its record highs by the end of 2022 per EIA

Global oil demand and GDP

- Million barrels per day
- 100
- 90
- 80
- 70
- 60
- 50
- 40
- 2000
- Great Financial Crisis (2008-2009)
- 2020 COVID-19 recession
- 2021
- 2022
- EIA estimates

Real GDP (Trillion 2010$)

*Market exchange rate basis

sources: EIA; Bloomberg; IMF; API Team calculations

Global oil demand by region

- Million barrels per day
- 100
- 75
- 50
- 25
- 0

- OECD (Developed economies)
- Non-OECD (Emerging economies)

source: EIA STEO (Sep. 2021)

Global oil demand has historically changed in tandem with the economy, and this relationship remained intact through the 2020 COVID-19 recession.
Although global drilling activity increased from historic lows, crude oil futures prices for a year ahead have generally risen.

- In July 2021, global oil & gas drilling activity was down by 41.7% compared with July 2019.
- Since 2019, U.S. oil drilling has fallen by significantly more than international oil drilling.

Global oil drilling activity and Brent crude oil prices, monthly

- Brent crude oil futures prices (12-months ahead, 3-mo. avg.) right axis

sources: Baker Hughes; Bloomberg; CME Group
Global oil production could reach a record 102.7 mb/d in Q4 2022 per EIA

- EIA projects the U.S. (+1.8 mb/d), OPEC (+1.7 mb/d) and Russia (+1.4 mb/d) will lead global production growth through 2022.
- Norway (+0.2 mb/d) and Canada (+0.2 mb/d) grow; Mexico (-0.2 mb/d) and Brazil (-0.2 mb/d) declines partially offset by other Central/S. Am. increases (+0.2 mb/d).

source: EIA STEO (Sep. 2021)
EIA expects that global oil demand could continue to exceed supply through 2021 and support oil prices of about $65 per barrel in 2022.

EIA global supply/demand and Brent price estimates as of September 2021

Million barrels per day (mb/d)

Supply less demand
Brent crude oil prices

EIA estimates

Sources: EIA STEO (Sep. 2021); Bloomberg
As U.S. oil well productivity edged down from record levels in Q2 2021, estimated breakeven prices have diverged by region

- EIA reported oil well productivity fell by more than 6% year-to-date in the Permian and DJ Niobrara basins
- BTU Analytics’ estimated breakeven prices by basin stood below recent market prices

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakken</td>
<td>0.5</td>
<td>0.6</td>
<td>0.8</td>
<td>2.0</td>
<td>3.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Eagle Ford</td>
<td>1.5</td>
<td>1.8</td>
<td>2.0</td>
<td>2.5</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>DJ Niobrara</td>
<td>1.0</td>
<td>1.2</td>
<td>1.5</td>
<td>1.8</td>
<td>2.0</td>
<td>2.2</td>
</tr>
</tbody>
</table>

**Source:** EIA Drilling Productivity Report

### Oil estimated breakeven prices*

<table>
<thead>
<tr>
<th>Basin</th>
<th>July 2020</th>
<th>July 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakken</td>
<td>$30.00</td>
<td>$25.00</td>
</tr>
<tr>
<td>Eagle Ford - West</td>
<td>$25.00</td>
<td>$20.00</td>
</tr>
<tr>
<td>Eagle Ford - East</td>
<td>$27.00</td>
<td>$22.00</td>
</tr>
<tr>
<td>DJ Niobrara</td>
<td>$28.00</td>
<td>$23.00</td>
</tr>
<tr>
<td>Permian - Delaware</td>
<td>$29.00</td>
<td>$24.00</td>
</tr>
<tr>
<td>Permian - Midland</td>
<td>$30.00</td>
<td>$25.00</td>
</tr>
</tbody>
</table>

*Half cycle breakevens assuming 10% discount factor. Sources: BTU Analytics; CME Group

**WTI month-ahead futures price $70.46/Bbl. Sep. 14, 2021**
In 2022, U.S. liquid fuels consumption could exceed its 2019 levels per EIA

- High-frequency indicators of transportation and industrial activity have continued to improve through July 2021
- EIA projects U.S. oil consumption growth of 4.4% (0.9 mb/d) to 20.6 mb/d in 2022, led by jet fuel, gasoline and other oils

**Refined product key U.S. demand indicators, July 2021 avg. ytd**

- Passenger VMT: +5%
- Truck VMT: +21%
- Total Flights: +16%
- Manufacturing: +1%
- Apple Mobility: +44%
- DAT Spot Loads: +18%
- TSA Passengers: +65%
- Chemicals: +4%

**U.S. liquid fuel consumption by fuel**

- Million barrels per day
- 25

- Jet fuel
- Distillates/diesel fuel
- Motor gasoline
- Other (naphtha/gasoil; HGLs)
- Residual fuel oil

**Sources:** EIA; API MSR

**Sources:** U.S. Federal Highway Administration; FlightRadar24; ISM PMI; ACC; TSA; Apple; DAT
Global natural gas has rebounded along with the economy per IEA

- Global natural gas demand has historically grown nearly one-to-one with the economy, and this relationship generally remained intact despite the 2020 COVID-19 recession.

**Global natural gas demand and GDP**

- Billion cubic feet per day
- 2000 COVID-19 recession
- 2021
- 2022

**Global natural gas demand by region**

- Billion cubic feet per day
- IEA estimates

**Sources:** BP Statistical Review; IEA; Bloomberg; IMF; API Team calculations.
Global and U.S. natural gas production appears poised for growth despite historically low drilling activity

- Since 2010, the U.S. was the fastest growing natural gas producer.
- U.S. natural gas marketed production returned to 101 bcf/d in Q2 2021 and is expected by EIA to grow despite employing roughly one tenth the drilling rigs required in 2010.

Global natural gas production by region

- Billion cubic feet per day
- IEA / U.S. EIA estimates

U.S. natural gas drilling and production

- Rigs
- Billion cubic feet per day
- EIA estimates

Sources: BP Statistical Review (2021); IEA; EIA; Baker Hughes.
U.S. exports could motivate domestic natural gas production growth as the power sector readjusts per EIA

- In 2022, EIA expects 1.6% y/y growth of domestic natural gas consumption but 12.7% y/y growth of net exports
- Less natural gas has been consumed in U.S. power generation through August 2021, particularly in regions with strong coal availability

Natural gas consumption and production by sector

<table>
<thead>
<tr>
<th>Source</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Exports</strong></td>
<td>11.0</td>
<td>12.4</td>
<td></td>
</tr>
<tr>
<td><strong>Electric Power</strong></td>
<td>29.5</td>
<td>30.3</td>
<td></td>
</tr>
<tr>
<td><strong>Industrial</strong></td>
<td>27.9</td>
<td>28.2</td>
<td></td>
</tr>
<tr>
<td><strong>Res / Comm</strong></td>
<td>22.5</td>
<td>22.5</td>
<td></td>
</tr>
</tbody>
</table>

source: EIA

2021 U.S. power sector gas consumption

August 2021 year-to-date, year-on-year changes

- ISO-NE +7.0
- ISO-NY +11.6%
- CAISO +17.0%
- SWP -22.6%
- MISO -14.3%
- PJM -3.4%
- ERCOT -6.3%
- Southeast -9.9%
- Northwest +8.7%
- Southwest -10.6%
- Southeast -9.9%

sources: EIA; FERC
Historically strong global natural gas prices have spurred U.S. LNG exports so far in 2021

- Natural gas prices in Europe and Asia recently neared $18.00 per mmBtu in Asia – their highest since winter 2013 and a record high for summer months
- Natural gas price disparities can motivate U.S. LNG exports, which already achieved record levels of over 10 bcf/d so far in 2021

**Global natural gas prices**

$2021 per mmBtu, monthly

- **Henry Hub**
- **UK Benchmark (NBP)**
- **Dutch Benchmark (TTF)**
- **Asian Benchmark (JKM)**

**U.S. LNG exports**

Billion cubic feet per day

- **EIA estimates**

(source: Bloomberg)

(source: EIA)
U.S. LNG exports grew to record highs in H1 2021, and the next wave of projects could more than double export capacity by 2030

With more than 10 bcf/d of U.S. LNG export capacity constructed since 2015, future projects must compete for new global markets

Despite some delays in final investment decisions and construction, U.S. LNG export capacity could exceed 25 bcf/d by 2030

North American LNG projects
Billion cubic feet per day (bcf/d)

<table>
<thead>
<tr>
<th>Plant name</th>
<th>Consensus view of likelihood</th>
<th>Final Investment Decision (FID) Status</th>
<th>Export capacity (Bcf/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monkey Island (SCT&amp;E)</td>
<td>Unlikely</td>
<td>Under regulatory review</td>
<td>1.60</td>
</tr>
<tr>
<td>Corpus Christi (Stage 3)</td>
<td>Unlikely</td>
<td>Under regulatory review</td>
<td>1.32</td>
</tr>
<tr>
<td>Kilimant LNG</td>
<td>Unlikely</td>
<td>Planning FID</td>
<td>1.3</td>
</tr>
<tr>
<td>Goldboro LNG</td>
<td>Unlikely</td>
<td>Planning FID</td>
<td>1.3</td>
</tr>
<tr>
<td>Delfin FLNG</td>
<td>Unlikely</td>
<td>Planning FID</td>
<td>1.71</td>
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<tr>
<td>Alaska LNG</td>
<td>Unlikely</td>
<td>Planning FID</td>
<td>2.63</td>
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<tr>
<td>Lake Charles</td>
<td>Unlikely</td>
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<tr>
<td>Magnolia LNG</td>
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<td>Texas LNG</td>
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<tr>
<td>Rio Grande LNG</td>
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<td>Port Arthur LNG</td>
<td>Unlikely</td>
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<td>1.78</td>
</tr>
<tr>
<td>Plaquemines</td>
<td>Unlikely</td>
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<td>2.63</td>
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<tr>
<td>Cameron Tr. 4</td>
<td>Unlikely</td>
<td>Planning FID</td>
<td>0.8</td>
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<tr>
<td>Freeport LNG Tr. 4</td>
<td>Likely</td>
<td>FID Planned - delayed</td>
<td>0.67</td>
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<tr>
<td>Driftwood</td>
<td>Likely</td>
<td>FID Planned - delayed</td>
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<tr>
<td>Woodfibre LNG</td>
<td>Likely</td>
<td>Construction delayed</td>
<td>0.3</td>
</tr>
<tr>
<td>Costa Azul</td>
<td>Likely</td>
<td>FID Taken - Nov 2020</td>
<td>0.4</td>
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<tr>
<td>LNG Canada Tr. 1-2</td>
<td>Likely</td>
<td>Under construction</td>
<td>1.6</td>
</tr>
<tr>
<td>Calcasieu Pass</td>
<td>Highly Likely</td>
<td>Under construction</td>
<td>1.70</td>
</tr>
<tr>
<td>Golden Pass</td>
<td>Highly Likely</td>
<td>Under construction</td>
<td>2.38</td>
</tr>
<tr>
<td>Sabine Pass Tr. 6</td>
<td>Highly Likely</td>
<td>Under construction</td>
<td>0.64</td>
</tr>
<tr>
<td>Corpus Christi</td>
<td>Definite</td>
<td>Operational (T 1-3)</td>
<td>1.78</td>
</tr>
<tr>
<td>Elba Island</td>
<td>Definite</td>
<td>Operational</td>
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<td>Freeport LNG</td>
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<td>Cameron LNG</td>
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<td>Sabine Pass</td>
<td>Definite</td>
<td>Operational (T 1-5)</td>
<td>3.22</td>
</tr>
</tbody>
</table>

sources: API Team analysis; FERC; Bloomberg NEF; S&P Global Platts; O&G Journal
Natural gas-dedicated drilling has sustained strong productivity and historically low breakeven prices

- For dedicated dry gas drilling, producers sustained near-record rig productivity in Q2 2021 per EIA
- Estimated natural gas breakeven prices remained below recent natural gas futures prices

### Natural gas well productivity – production per rig

**Million cubic feet per day nat. gas-equivalent**

- **Appalachia**
- **Haynesville**

Source: EIA Drilling Productivity Report

### Natural gas estimated breakeven prices

<table>
<thead>
<tr>
<th>Region</th>
<th>Dollars per million Btu (mmBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haynesville</td>
<td>0</td>
</tr>
<tr>
<td>Appalachia - NorthEast PA</td>
<td>1</td>
</tr>
<tr>
<td>Appalachia - Southwest PA</td>
<td>2</td>
</tr>
<tr>
<td>Appalachia - Ohio</td>
<td>3</td>
</tr>
<tr>
<td>Henry Hub</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

**Sources:** BTU Analytics; CME Group

*Half cycle breakevens assuming 10% discount factor and play-specific costs

*Henry Hub futures price for delivery one month ahead: $5.31 per mmBtu Sep. 14, 2021*
API economics resources available at www.api.org