We thank our sponsors:
| 1  | Introduction & Uncertainties  |
| 2  | Oil & Gas Production         |
| 3  | Mid-stream Constraints       |
| 4  | Power Sector                 |
| 5  | Energy Exports               |
| 6  | Energy Manufacturing Activity|
| 7  | Employment                  |
| 8  | Conclusions                 |
Uncertainties

1. Inflationary Pressure & Economic Performance
2. Russian Invasion of Ukraine
3. Supply Chain Constraints
4. Decarbonization
5. Uncertainty Resolved? Offshore Leasing
Worst month - April 2020 down 14.4% below pre-pandemic peak. Reached pre-pandemic employment in August. Most recent month (October): 0.5% above pre-pandemic employment.

Inflationary Pressure and Economic Performance

(1) The U.S. is currently at “full employment” from traditional measures:
  • Unemployment rate below 4%.
  • U.S. employment surpassed pre-pandemic peak.

(2) But, labor force participation rate and employment-population ratio still below pre-pandemic peak.
  • Labor force participation rate:
    • Feb. 2020, 63.4%.
    • October 2022, this is 62.2%
  • Thus, although employment has re-bounded, some people likely permanently exited the labor force due to the pandemic (i.e. early retirements, joint income households, etc).

(3) Inflation has reared its head for the first time in decades:
  • 1 year inflation rate has not been at levels experienced this past year since 1981.
  • Real hourly earnings decreased by ~2.8% over the last year (Oct 21-Oct 22).
  • Interest rates rising ⇒ making borrowing more expensive and encouraging saving.
  • The stock market is down ~15% over the last year.

With high commodity prices, are there enough workers to fulfill growing global demand? Or perhaps is a recession on the horizon, leading to demand reduction and also alleviation of hard to find workers?
Over the past decade (pre-Covid):
Diesel and Jet Fuel sales have grown faster than employment.
Gasoline and electricity sales have not grown on average.
Inflationary Pressure and Economic Performance

This year’s GCEO modeling will assume that inflation begins to slow, and regional economic activity will gradually expand over the forecast horizon. This year’s GCEO, much like last year’s, anticipates that long-run energy demand growth will lead to increased U.S. energy exports, especially to the growing developing world. If the global economy enters a recession, this will reduce demand for energy products making these forecasts too optimistic.
Uncertainty 2: Russian Invasion of Ukraine

Russo-Ukrainian War Timeline

- Early February 2022: Brent Crude at ~$97/bbl and TTF natural gas at ~$37/mcf. Futures markets anticipating prices to go down over the next year.
- February 24, 2022: Russia launches a military invasion of Ukraine.
  - Germany suspends certification of Nord Stream 2 pipeline that was anticipated to begin shipping natural gas to Europe in coming months.
- March 2022: Brent crude surpasses $117/bbl and TTF natural gas surpasses $45/mcf.
- August 31, 2022: Russia suspends natural gas supplies to Germany via Nord Stream 1 for three days to perform repairs.
- September 3, 2022: Gazprom announces Nord Stream 1 will be shut down due to maintenance, citing Western sanctions.
- Worries mount over Europe’s natural gas availability as winter looms.
Uncertainty 2: Russian Invasion of Ukraine

This year’s GCEO modeling will assume that the war in Ukraine continues, as does Western economic sanctions on Russia. The ongoing nature of the conflict will force global energy supply adjustments. Crude oil prices will gradually attenuate over the next several years, while Gulf Coast natural gas prices will likely remain elevated (relative to post-2008 historic trends) due to LNG export pressures.
Uncertainty 3: Supply Chain Constraints

Four sources of supply chain constraints:

1. Economic recovery from COVID
2. Full employment economy + economic stimulus
3. Russian invasion of Ukraine and resulting sanctions
4. “Deglobalization”

The current GCEO modeling assumes that supply chain constraints continue to bind for the next year or so before beginning to attenuate gradually. These supply chain constraints likely come from a combination of four sources: (1) the economic recovery from COVID-19; (2) an economy that is currently at full employment alongside significant stimulus; (3) the war in Ukraine and the resulting sanctions, and (4) a continuation of Trump-era trade policies with China.
Uncertainty 4: Decarbonization

• This year, the tension between decarbonization and energy security has been front and center.

• Last year, most of the focus on decarbonization as to meet company specific ESG goals and in preparation for a potential future of carbon border adjustments.

• This year, two pieces of legislation passed that will impact the energy industry:
  • Infrastructure Investment and Jobs Act (IIJA) - $1.2 trillion.
  • The Inflation Reduction Act (IRA) of 2022 was signed by President Biden in August. Despite its name, the bill was largely a stimulus bill for the energy industry.
Infrastructure Investment and Jobs Act (IIJA)

Relevant Spending on Energy

• $7.5 billion for EV charging.
• $65 billion in electric grid upgrades.
• $21 billion for Superfund and brownfield site cleanup.
  • Includes $4.7 billion for oilfield site restoration.
Inflation Reduction Act

- Extension of tax credits for wind and solar.
- Increase in 45Q from **$50 per ton** to **$85 per ton**.
- $1/gal federal biomass-based diesel blending credit extended.
  - $1.25/gal sustainable aviation fuel (SAF) blending credit with increase possible.
- $2.9 billion in loans and subsidies for transmission.
- $7,500 tax credit for EVs with caveats for domestic manufacturing.
- Expand deduction for qualifying energy efficiency improvements in commercial buildings.

<table>
<thead>
<tr>
<th>TOTAL REVENUE RAISED</th>
<th>$737 billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>15% Corporate Minimum Tax</td>
<td>222 billion*</td>
</tr>
<tr>
<td>Prescription Drug Pricing Reform</td>
<td>265 billion***</td>
</tr>
<tr>
<td>IRS Tax Enforcement</td>
<td>124 billion**</td>
</tr>
<tr>
<td>1% Stock Buybacks Fee</td>
<td>74 billion*</td>
</tr>
<tr>
<td>Loss Limitation extension</td>
<td>52 billion*</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL INVESTMENTS</th>
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<tr>
<td>Energy Security and Climate Change</td>
<td>369 billion*</td>
</tr>
<tr>
<td>Affordable Care Act Extension</td>
<td>64 billion**</td>
</tr>
<tr>
<td>Western Drought Resiliency</td>
<td>4 billion***</td>
</tr>
</tbody>
</table>

| TOTAL DEFICIT REDUCTION | $300+ billion |

* = Joint Committee on Taxation estimate
** = Congressional Budget Office estimate
*** = Senate estimate, awaiting final CBO score

Risk or Opportunity?

Decarbonization will challenge existing Gulf Coast energy manufacturing, but it will also create an opportunity for regional leadership in the development of the production capacity for liquid fuels, chemicals, plastics, fertilizers, and other products historically derived from fossil fuels, with lower, or even net zero GHG emissions. Industrial decarbonization can also lead to competitive advantages for Gulf Coast industries, particularly if trade policies and global tariffs become tied to environmental attributes. The IRA is likely to speed the region’s industrial decarbonization given the important financial incentives supporting hydrogen and CCS. Over the forecast horizon, the GCEO sees decarbonization creating considerable regional capital investment opportunities.
Offshore Leasing Timeline

- **2020 campaign trail:** Candidate Biden said he would ban “new oil and gas permitting” on public lands and waters.

- **January 2021 executive order:** “pauses new oil and gas leases” on public lands and waters during “comprehensive review and reconsideration” of leasing practices.
  - March Gulf of Mexico Lease Sale cancelled.

- **June 2021:** Preliminary injunction granted in Federal court that the Bureau of Land Management (BLM) and Bureau of Ocean Energy Management (BOEM) continue leasing while review is completed.

- **November 2021:** Gulf of Mexico Lease Sales 257 conducted.
  - ~81 million acres leased for ~$192 million

- **January 2022:** Washington, D.C. Court vacated results of Lease Sale 257.

- **June 2022:** Department of the Interior announces that all lease sales remaining in current five year program are cancelled.
  - Offshore leasing in the Gulf of Mexico effectively discontinued.

- **August 2022:** Inflation Reduction Act signed into law.
  - Lease Sale 257 reinstated.
  - Offshore leasing resumed and tied to offshore wind developments.

GCEO modeling will consider that **offshore leasing has been reinstated** and that the offshore industry is returning to a “business as usual” scenario, driven by the economics of offshore oil and gas activity.
Oil: 7.9% below pre-pandemic peak
Natural Gas: 2.1% above pre-pandemic peak
Oil: 7.8% below pre-pandemic peak
Natural Gas: 5.7% above pre-pandemic peak
U.S. Rig Count and WTI Spot Price

Source: U.S. Energy Information Administration, Baker Hughes Rig Count Overview
United States Rig Count

Source: Baker Hughes Rig Count Overview
Texas Rig Count

Source: Baker Hughes Rig Count Overview

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Permian had the largest reduction in rig count during the pandemic, but is accounting for a large share of the pickup in drilling activity.
Crude Oil Production Forecast

Gulf Coast Share of U.S.

Source: Enverus, DrillingInfo Podcast.

@LSUEnergy
Natural Gas Production Forecast

Gulf Coast Share of U.S.

Year

Share of Total: [Bars]
Gulf Coast: [Line]
Total U.S.: [Line]
Rest of U.S.: [Line]

Source: Enverus, DrillingInfo Podcast.

LSU Center for Energy Studies
~40 Bcf/d of new capacity potential.
Gulf Coast Industrial Electricity Sales
Share of Industrial Sales in United States

Source: U.S. Energy Information Administration

LSU Energy Studies
CO₂ Emissions per MWh of Generation
Gulf Coast & United States

Note: The emissions data presented include total emissions from both electricity generation and the production of useful thermal output. Source: U.S. Energy Information Administration, Form EIA-923 Power Plant Operations Report, Form EIA-860 Annual Electric Generator Report
Historical & Future Power Plant Capacity

United States

New Capacity Potential (2022-25)

~20 GW gas
~44 GW wind
~137 GW solar

12 GW of planned coal retirements
New Capacity Potential (2021-25)
~7 (20) GW gas
~8 (44) GW wind
~55 (137) GW solar
Historical and Future Solar Capacity in Interconnection Queue in MISO States

Note: 2022 includes both completed projects and projects in interconnection queue. Projects listed by expected completion year.
Total U.S. Operating Refining Capacity = 18.5 MMBbl/d

PADD 1:
- 7 refineries
- 0.9 MMBbls/d
- 5% of U.S. Total

PADD 2:
- 25 refineries
- 4.2 MMBbls/d
- 22% of U.S. Total

PADD 3:
- 57 refineries
- 9.9 MMBbls/d
- 54% of U.S. Total

PADD 4:
- 16 refineries
- 0.7 MMBbls/d
- 4% of U.S. Total

PADD 5:
- 26 refineries
- 2.9 MMBbls/d
- 15% of U.S. Total
United States & Gulf Coast Refining Utilization

- PADD 3 Utilization
- U.S. Utilization

Date:
- Jan 2019
- Jul 2019
- Jan 2020
- Jul 2020
- Jan 2021
- Jul 2021
- Jan 2022
- Jul 2022

Utilization:
- 60%
- 65%
- 70%
- 75%
- 80%
- 85%
- 90%
- 95%
- 100%
U.S. Exports of Liquefied Natural Gas

Source: U.S. Energy Information Administration
World trade in LNG has grown considerably over the past decade. Lastly, three years has been considerable (over 24 percent).
European natural gas prices are astronomical but expected to return to more normal levels over longer run (?).

Still elevated levels until post-2026.

Note: Spot-LNG refers to LNG that are traded on a cargo to cargo basis and does not mean term contracts of LNG (so-called long, medium, short-term contracts). In addition, for spot-LNG, the price of which is linked to a particular price index (for example the Henry Hub link, and the JKM link) is excluded from these statistics. Objects of these statistics are spot-LNGs the prices of which are determined at the time of contract (so-called “fixed price”).

Source: Bloomberg.
U.S. LNG exports rebounded quickly and strongly post COVID reached a high of 8 Bcf per day in the beginning of 2020. (recent decreases due to Freeport outage)
Asian v. European Exports from U.S.

Large recent surge in European exports.
Outline

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$180 billion through 2021) and $175 billion in announcements remaining.

To date, ~48% in LA and 52% in TX.

Remaining: 70% in LA and 30% in TX.
Prior to 2022, LNG investment accounted for $74 billion (41 percent) of capital investments. Olefins (cracker) and other petrochemical based investments accounts for $107 billion (59 percent).
# GOM Energy Manufacturing Investment Announcements

<table>
<thead>
<tr>
<th>Year</th>
<th>LNG</th>
<th>Non-LNG</th>
<th>Transition</th>
<th>Other</th>
<th>Total</th>
<th>LNG</th>
<th>Non-LNG</th>
<th>Transition</th>
<th>Other</th>
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<th>LNG</th>
<th>Non-LNG</th>
<th>Transition</th>
<th>Other</th>
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<td>2025</td>
<td>3,825</td>
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<td>1,930</td>
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<td>9,246</td>
<td>11,836</td>
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<td>15</td>
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<td>2026</td>
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<td>5,963</td>
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<td>10,889</td>
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<td>2027</td>
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<td>68</td>
<td>44</td>
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<td>112</td>
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<td>2028</td>
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<td>187</td>
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<td>412</td>
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<td>2029</td>
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<td>2030</td>
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<tr>
<td>Total</td>
<td>$22,073</td>
<td>$15,974</td>
<td>$6,146</td>
<td>$1,990</td>
<td>$46,184</td>
<td>$85,970</td>
<td>$11,556</td>
<td>$22,934</td>
<td>$493</td>
<td>$120,951</td>
<td>$8,000</td>
<td>$-</td>
<td>$-</td>
<td>$250</td>
<td>$8,250</td>
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<td></td>
<td>$116,043</td>
<td>$27,530</td>
<td>$29,080</td>
<td>$2,733</td>
<td>$175,385</td>
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<td></td>
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</tbody>
</table>

- $175 billion in new energy manufacturing activity from 2022-2030.
- Approximately $29 billion in energy transition investments, that include innovate plans and processes to avoid GHG emissions, including carbon capture and storage (CCS), “green” hydrogen, “green” ammonia, and various “blue” hydrogen/ammonia processes.
- Note that utility scale renewable energy generation is not included.
Employment Forecast
Louisiana Upstream Oil and Gas

Thousands of Jobs

Historical Employment
Forecast
Jobs Lost (2019 peak to 2020 trough): ~8,700
Jobs gained back (2020 trough to current): ~2,500
Jobs Lost (2019 peak to 2020 trough): ~8,700

Jobs gained back (2020 trough to current): ~2,500

Louisiana forecast to gain ~3,500 jobs by Q2 2023
Jobs Lost (2019 peak to 2020 trough): ~83,000
Jobs gained back (2020 trough to current): ~44,700
Texas forecast to gain ~12,200 jobs by Q2 2023

Jobs Lost (2019 peak to 2020 trough): ~83,000
Jobs gained back (2020 trough to current): ~44,700
Louisiana Share of Upstream Employment

Dallas Federal Reserve Survey - Company Outlook Index

Company Outlook Index (prior quarter)

Employment Forecast
Louisiana Refining and Chemical Manufacturing

~2,200 jobs
Employment Forecast
Louisiana Refining and Chemical Manufacturing

~1,500 jobs by end of 2023 (4.1%)
~600 jobs in 2024 (1.5%)
~550 jobs in 2025 (1.4%)

~2,200 jobs

Thousands of Jobs

Historical Employment
Forecast

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Employment Forecast
Texas Refining and Chemical Manufacturing

~4,300 jobs by end of 2022 (4.1%)
~700 jobs in 2023 (0.6%)
~500 jobs in 2024 (0.5%)

~5,700 jobs
## Broader Economic Implications

<table>
<thead>
<tr>
<th>Industry</th>
<th>Multiplier</th>
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<tbody>
<tr>
<td><strong>Upstream Oil and Gas</strong></td>
<td></td>
</tr>
<tr>
<td>Oil and Gas Extraction</td>
<td>2.3</td>
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<tr>
<td>Support Activities for Mining</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Oil and Gas Manufacturing</strong></td>
<td></td>
</tr>
<tr>
<td>Petroleum and Coal Products Manufacturing</td>
<td>4.4</td>
</tr>
<tr>
<td>Chemical Manufacturing</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Source: RIMS II Multipliers

Note: Multipliers represent the total change in number of jobs in all industries for each additional job in the industry corresponding to the entry.
# Energy Employment in Context

<table>
<thead>
<tr>
<th></th>
<th>Total Employment</th>
<th>Upstream</th>
<th>Refining and Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Louisiana</td>
<td>Texas</td>
<td>Louisiana</td>
</tr>
<tr>
<td>Peak Employment (2019)</td>
<td>1,998</td>
<td>12,921</td>
<td>33,600</td>
</tr>
<tr>
<td>Trough Employment (2020-21)</td>
<td>1,710</td>
<td>11,519</td>
<td>24,900</td>
</tr>
<tr>
<td>Most Recent Estimate</td>
<td>1,931</td>
<td>13,530</td>
<td>27,400</td>
</tr>
<tr>
<td>Job Losses (Peak to Trough)</td>
<td>288</td>
<td>1,402</td>
<td>8,700</td>
</tr>
<tr>
<td><strong>Percent Jobs Lost</strong></td>
<td>14%</td>
<td>11%</td>
<td>26%</td>
</tr>
<tr>
<td>Jobs Gained Back</td>
<td>221</td>
<td>2,011</td>
<td>2,500</td>
</tr>
<tr>
<td><strong>Percent Jobs Regained</strong></td>
<td>77%</td>
<td>143%</td>
<td>29%</td>
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</table>

| Job Losses (Peak to Trough) | 288       | 1,402   | 8,700     | 83,000   | 2,200     | 5,700 |

**Percent Jobs Lost**

- Louisiana: 14%
- Texas: 11%
- Louisiana: 26%
- Texas: 35%
- Louisiana: 6%
- Texas: 5%

| Jobs Gained Back           | 221       | 2,011   | 2,500     | 44,700   | 400       | 2,700 |

**Percent Jobs Regained**

- Louisiana: 77%
- Texas: 143%
- Louisiana: 29%
- Texas: 54%
- Louisiana: 18%
- Texas: 47%

Conclusions

• **Overall:** Energy economy continues to recover, emphasis rapidly shifting to transition investments and activities.

• **Production:** GOM production expected to grow to close 11.7 MMBbl/d by 2032 representing strong recovery exceeding pre-pandemic trends. Natural gas production very strong in order to support LNG opportunities (GOM: 68 Bcf/d by 2032).

• **Prices:** while prices are up on a relative basis, futures markets are predicting mean-reversion into 2025 and beyond. Crude oil prices influenced by global economic growth; natural gas prices included by weather and (increasingly) LNG demand in Asia. Longer term averages around $57/Bbl; and $3.50/Mcf (much like last year).

• **Refineries:** considerable uncertainty, however, no new closures—European crisis creating strong demand for diesel and distillates – this will like continue near term.

• **Exports:** growth will be driven by Asian which is expected to grow over the next decade, but at a slower clocp than the past decade. Political risk with China trade negotiations, as well as national security issues, still looms. Future Chinese growth and policies are a concern.

• **Power:** steady-growth opportunities. Slower pace of industrial load growth in Gulf Coast that will be driven by Asian export growth. Likely considerable infrastructure investments in power to support resiliency and the energy transition.

• **Capital Expenditures:** investment projections are down slightly from last year (down 8% to $175.4 billion), but this is a transition year as industry re-tools and couples transition investments with traditional productive capacity investments.

• **Economy/Policy:** One political cycle is over, the next “big” one is beginning. Energy and environmental policies will be as divisive as ever. Industry will spend next two years absorbing and taking advantages of tax credits and incentives created by the Bipartisan Infrastructure Bill and the Inflation Reduction Act — excellent environment for renewables and transition investments, particularly carbon capture.