



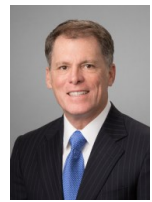
Weekly E&P Update

March 21, 2023

Vol. 11

Rare Earth Metals - A Future Source of Energy Insecurity?

By Steve Hendrickson
President of Ralph E. Davis Associates



A recent [article about declining lithium prices](#) highlighted the potential energy security risks likely to accompany the increased adoption of electric vehicles in the US. The article noted that lithium, cobalt and copper prices, which are essential elements used to make batteries or otherwise support increased electrification, have fallen significantly since the beginning of the year. And while the causes of the commodity price declines are debatable, they have contributed to lower battery costs, reflected in the cost of electric vehicles (EV).

Further price drops are expected because margins for lithium are pretty high, which should lead to increased investment in mining operations. Nevertheless, the amount of lithium needed to meet the administration's climate goals is 42 times current levels, which means it's likely to become an increasingly important commodity in our economy.

According to a [2022 report](#) prepared by the Congressional Research Service, five minerals used in EV battery production have been designated as "critical minerals" by the US Geologic Survey: lithium, cobalt, manganese, nickel and graphite. Unfortunately, we heavily rely on imports to meet our current needs for all of them. The table below, extracted from the report, documents how small our production is compared to the rest of the world. The "NIR%" term is "net import reliance", which is a bit of a complex and confusing statistic (see the report for more detail).

Table 2. Selected Statistics for Five EV Battery Minerals
In metric tons, unless indicated otherwise

	Lithium	Cobalt	Manganese	Nickel	Graphite
NIR (%)	>25	76	100	48	100
U.S. Production	withheld	700	0	18,000	0
Global Production	100,000	170,000	20,000,000	2,700,000	1,000,000
Exports	1,900	4,800	1,000	25,000	8,400
Imports	2,500	9,900	460,000	110,024	53,000

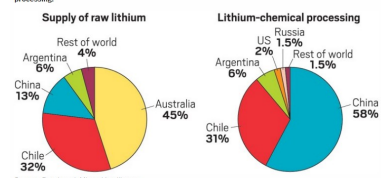
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The US reserves of these materials are meager. According to the USGS, the US has approximately 4% of the world's [lithium](#) reserves. For the other four critical minerals, the percentage is negligible: [cobalt](#) (<1%), [manganese](#) (0%), [nickel](#) (<1%), and [graphite](#) (0%). Moreover, the global reserves of these minerals are often concentrated in countries with unstable political systems and with which we have poor trading relationships.

The US needs more meaningful reserves of these minerals and has minimal processing capacity to turn ore into usable materials. For instance, [China controls 60%](#) of the global capacity for turning lithium ore into EV batteries.

CHINA IN CHARGE

Although most raw lithium comes from Australia and Chile, Chinese producers dominate lithium processing.



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With domestic production, we have made tremendous progress in meeting our energy needs over the last twenty years. But, as EV adoption increases, will we find ourselves once again dependent on foreign sources whose interests may not align with ours?

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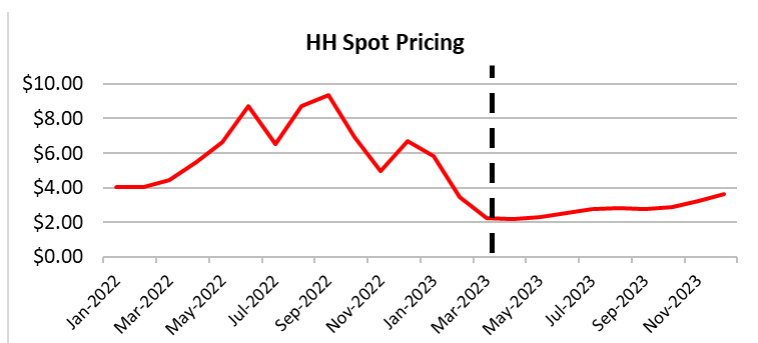
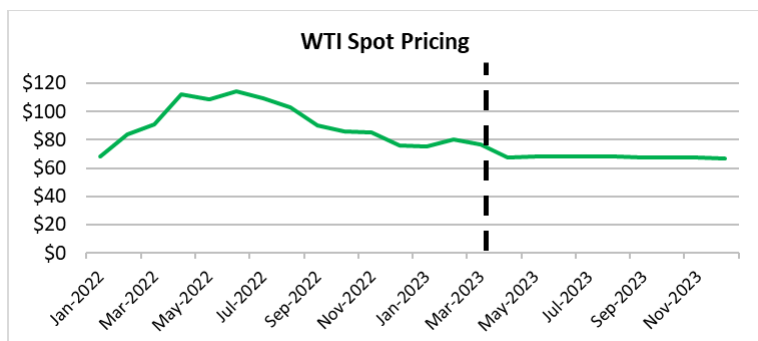
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NYMEX FUTURE PRICING



MONDAY'S MARKET CLOSE

NYMEX WTI CRUDE OIL FUTURES as of March 20, 2023 Close (\$/bbl)

Period	Current	WoW Change	Last Week	1 Yr Ago
2023	\$67.65	(\$6.59)	\$74.24	\$83.42
2024	\$65.86	(\$4.71)	\$70.57	\$76.49
2025	\$64.05	(\$2.83)	\$66.88	\$72.05
2026	\$62.43	(\$1.37)	\$63.80	\$69.23
2027	\$60.85	(\$0.26)	\$61.11	\$67.46

NYMEX HH NATURAL GAS FUTURES as of March 20, 2023 Close (\$/MMBtu)

Period	Current	WoW Change	Last Week	1 Yr Ago
2023	\$2.80	(\$0.39)	\$3.19	\$4.03
2024	\$3.53	(\$0.25)	\$3.78	\$3.50
2025	\$4.13	(\$0.12)	\$4.25	\$3.45
2026	\$4.30	(\$0.03)	\$4.33	\$3.46
2027	\$4.31	\$0.03	\$4.28	\$3.52

INDUSTRY METRICS—QUICK SNAPSHOT

	Current	Last Week	WoW Change	%Change
Crude Oil Near-Month Price (\$/bbl)	\$68.26	\$76.60	(\$8.34)	(11%)
Natural Gas Near-Month Price (\$/MMBtu)	\$2.53	\$2.43	\$0.10	4%
Weekly Upstream-Deal Transaction Value (\$MM)	\$0.00	\$145.00	(\$145.00)	(100%)
Weekly Number of Upstream-Deal Transactions	1	5	(4)	(80%)
Current Total US Rig Count	754	746	8	1%
US Field Crude Oil Production (MMbbl/day)	12.2	12.2	0	-
US Field Dry Natural Gas Production (Bcf/day)	105.9	105.1	0.8	0.8%
Commercial Crude Oil Stocks-Excluding SPR (MMbbl)	480	479	1	0.3%
Natural Gas Stocks-Working Gas Underground Storage (Bcf)	1,972	2,030	(58)	(3%)
Total Drilled But Uncompleted Wells (DUC-Last Month)	4,773	4,671	102	2%

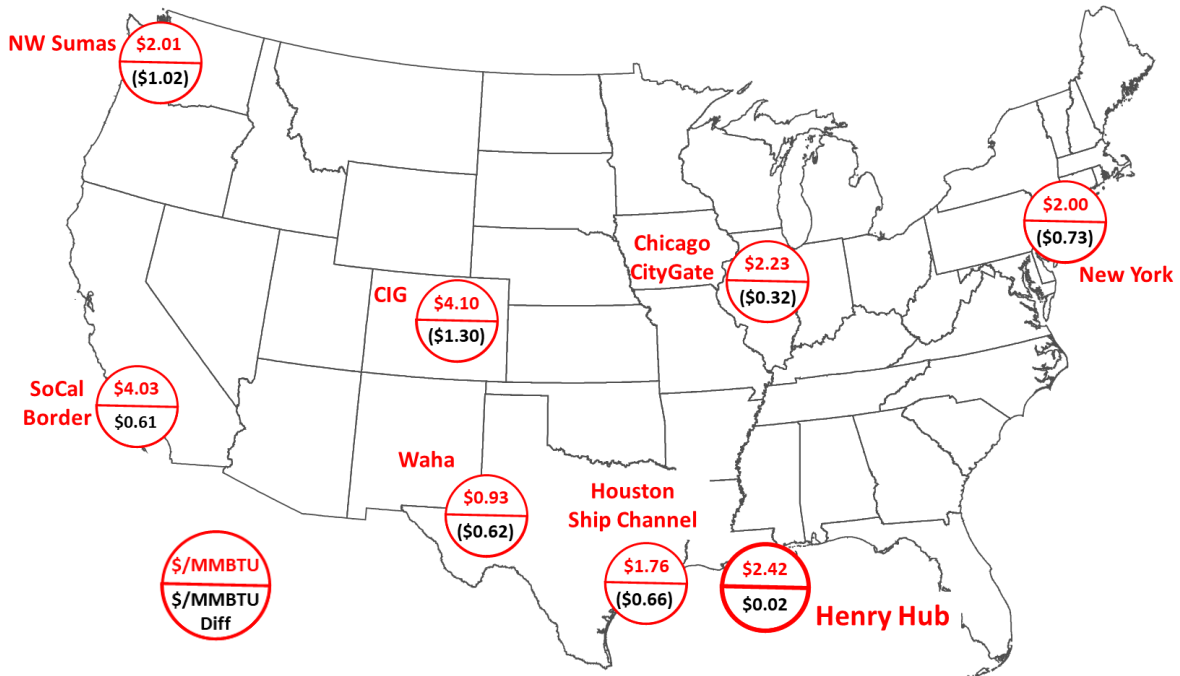
*Source—Energy Information Administration, United States (EIA)

*Source—Baker Hughes North America Rotary Rig Count & PLS M&A Database

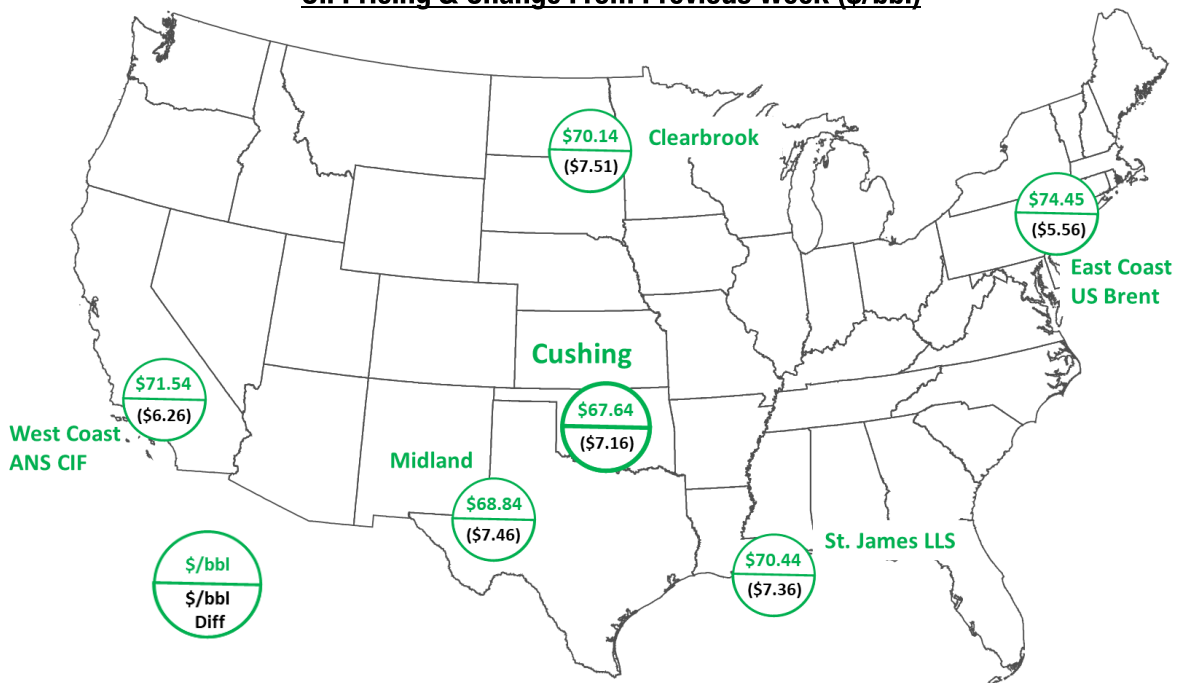


US COMMODITY PRICES CONTINUED

Natural Gas Pricing & Change From Previous Week (\$/MMBtu)



Oil Pricing & Change From Previous Week (\$/bbl)



*Source—Bloomberg LP



SELECTED INDUSTRY HEADLINES

Russia Becomes China's Biggest Oil Supplier

Russia surpassed Saudi Arabia as China's biggest oil supplier with refiners taking advantage of cheap barrels to feed rebounding demand in Asia's biggest economy following the end of Covid Zero.

Oil Rises As Banking Fears Ease For Now

Oil rose as the rescue of Credit Suisse eased worries about global banking sector risks that could hit economic growth and fuel demand.

EU Looks To Extend Natural Gas Consumption Cuts For Another Year

The European Commission, as expected, has proposed to extend the emergency measure to reduce the EU's natural gas consumption by 15% according to recent reports/

U.S. Oil Exports To Europe Hit Record High

U.S. oil exports to Europe have hit a record high, averaging 2.1 million barrels per day on average so far this month, according to recent reports.

Iraq Renews Deal To Provide Egypt With 4 Mln Barrels Of Crude Oil (LOGIN CREDENTIALS REQUIRED)

Iraq's government approved renewing a contract that will allow the Egyptian General Petroleum Corporation (EGPC) to buy 4 million barrels of Iraqi crude oil in June and August, the Iraq government said recently.

The Willow Oil Controversy, Explained

The Biden administration has approved the Willow project in Alaska, a \$8 billion oil and gas development by ConocoPhillips due to the project's expectation to generate revenue for the federal government, create jobs, and provide money for Alaskan Native communities.

Venezuela's Oil Minister Resigns

Venezuela's Tareck el Aissami recently resigned as the nation's oil minister as an investigation escalated into corruption claims inside state-oil company Petroleos de Venezuela SA.

Oil Majors Juggle Cheaper Crude With Lower Emissions

Big Oil is juggling the need to keep producing oil and gas with the imperative to cut emissions in order to keep shareholders on board.

How Does Carbon Capture Work?

The idea of removing carbon dioxide from the atmosphere to turn back the clock on climate change is an appealing one. Can these technologies deliver on their promise?

GE Successfully Demonstrates Scalable Direct Air Capture System for CO2 Removal

Following successful testing of its first Direct Air Capture (DAC) prototype unit for carbon dioxide (CO2) removal in the lab, GE announced it is planning larger scale demonstrations in 2024.



SELECTED RECENT TRANSACTIONS

Principal Solar to Acquire Minerva-Rockdale Leases, Wells, and Assets

Principal Solar, Inc. recently announced that it has executed a Letter of Intent to purchase a controlling working interest in the leases and oil & gas wells along with all of the assets associated with the Minerva-Rockdale Oil Field from Winchester Oil & Gas LLC.

Carrier Energy Partners II Sells Eagle Ford Assets

Carrier Energy Partners II, LLC has closed on the sale of its oil and gas assets in the Eagle Ford Shale in South Texas for total cash consideration of \$145 million.

CPP Investments Partners with IKAV to Acquire Aera Energy

Canada Pension Plan Investment Board (CPP Investments) will partner with international asset management group IKAV to acquire California energy producer Aera Energy LLC.

Riley Permian Announces New Mexico Yeso Trend Acquisition

Riley Exploration Permian, Inc. recently announced that it has entered into a definitive purchase agreement to acquire oil and gas assets from Pecos Oil & Gas, LLC, an affiliate of Cibolo Energy Partners LLC, for cash consideration of \$330 million.

Baytex to Acquire Eagle Ford Operator Ranger Oil, Accelerates Shareholder Returns and Introduces a Dividend with Enhanced Free Cash Flow

Baytex Energy Corp. recently announced that it has entered into a definitive agreement to acquire Ranger Oil Corporation, a pure play Eagle Ford company.

Diamondback Energy, Inc. Announces Fourth Quarter And Full Year 2022 Financial And Operating Results; Increases Base Dividend

Diamondback Energy, Inc. recently announced financial and operating results for the fourth quarter and full year ended December 31, 2022, which includes entering into definitive agreements to divest certain Midland and Delaware Basin assets in Texas.

Chesapeake Energy Corporation Announces Sale Of Second Eagle Ford Package For \$1.4 Billion

Chesapeake Energy Corporation recently announced that it has executed an agreement to sell a portion of its remaining Eagle Ford asset to INEOS Energy for \$1.4 billion.

Verde Bio Holdings, Inc. Announces Acquisition Of Haynesville Shale Mineral And Royalty Interest

Verde Bio Holdings, Inc. recently announced that it has entered into an agreement to acquire revenue producing mineral and royalty interests in the prolific Haynesville Shale of Northern Louisiana, held by a private seller for a purchase price of \$425,000 in cash.

Foothills Exploration Acquires Certain Leases and Wells In Oklahoma

Foothills Exploration recently announced that it had managed to complete the acquisition of some wells and leases in Comanche County in Oklahoma.

Vital Energy Announces Midland Basin Acquisition

Vital Energy, Inc. recently announced the signing of a definitive purchase and sale agreement to acquire the assets of Driftwood Energy Operating, LLC, inclusive of all leasehold interests and hedges, in exchange for 1,578,948 shares of Vital common stock and \$127.6 million of cash.

Surge Energy America Announces Recent Acreage Acquisitions and Finalization of Houston Corporate Office Move

Surge Energy US Holdings Company recently announced it has recently added incremental acreage to the Company's portfolio. Additionally, earlier this month the company finalized the previously announced move of its corporate office.

Alliance Resource Partners, L.P. Announces \$72.3 Million Mineral Acquisition

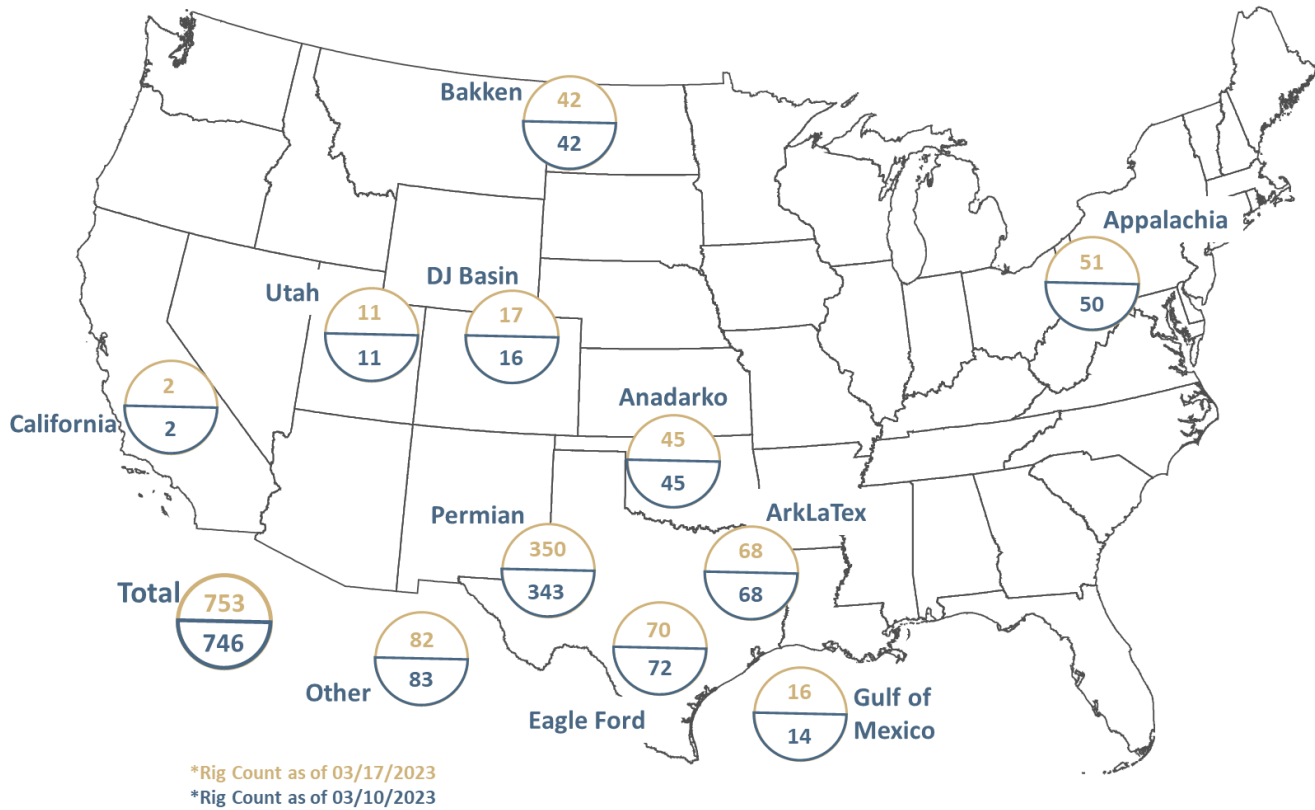
Alliance Resource Partners, L.P. recently announced a \$72.3 million acquisition of oil & gas mineral interests in the Permian Basin from JC Resources LP.

INPEX Sells Eagle Ford Tight Oil Production And Development Assets To Repsol

Japan's INPEX Corporation has sold its Eagle Ford assets to Repsol Oil & Gas USA, a subsidiary of Spanish energy company Repsol.



RIG ACTIVITY BY US REGION

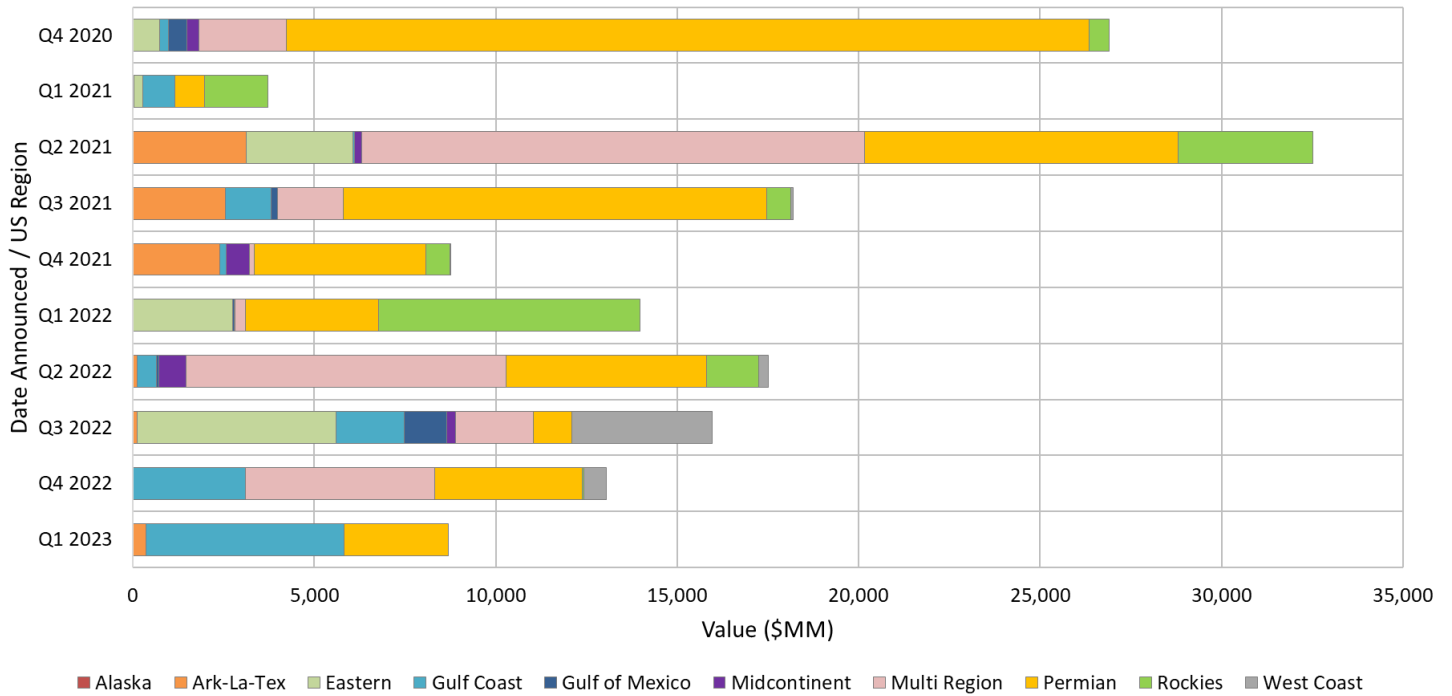


	Week Ending 03/17/2023			Week Ending 03/10/2023		Week Ending 03/18/2022
U.S. Rig Breakouts	Count	+/-	Count	+/-	Count	
Oil	589	(1)	590	65	524	
Gas	162	9	153	25	137	
Not Specified	3	0	3	1	2	
Directional	47	5	42	11	36	
Horizontal	692	0	692	86	606	
Vertical	15	3	12	(6)	21	
Land (Inc Others)	736	5	731	88	648	
Inland Waters	1	0	1	(2)	3	
Offshore	17	3	14	5	12	
US Total	754	8	746	91	663	

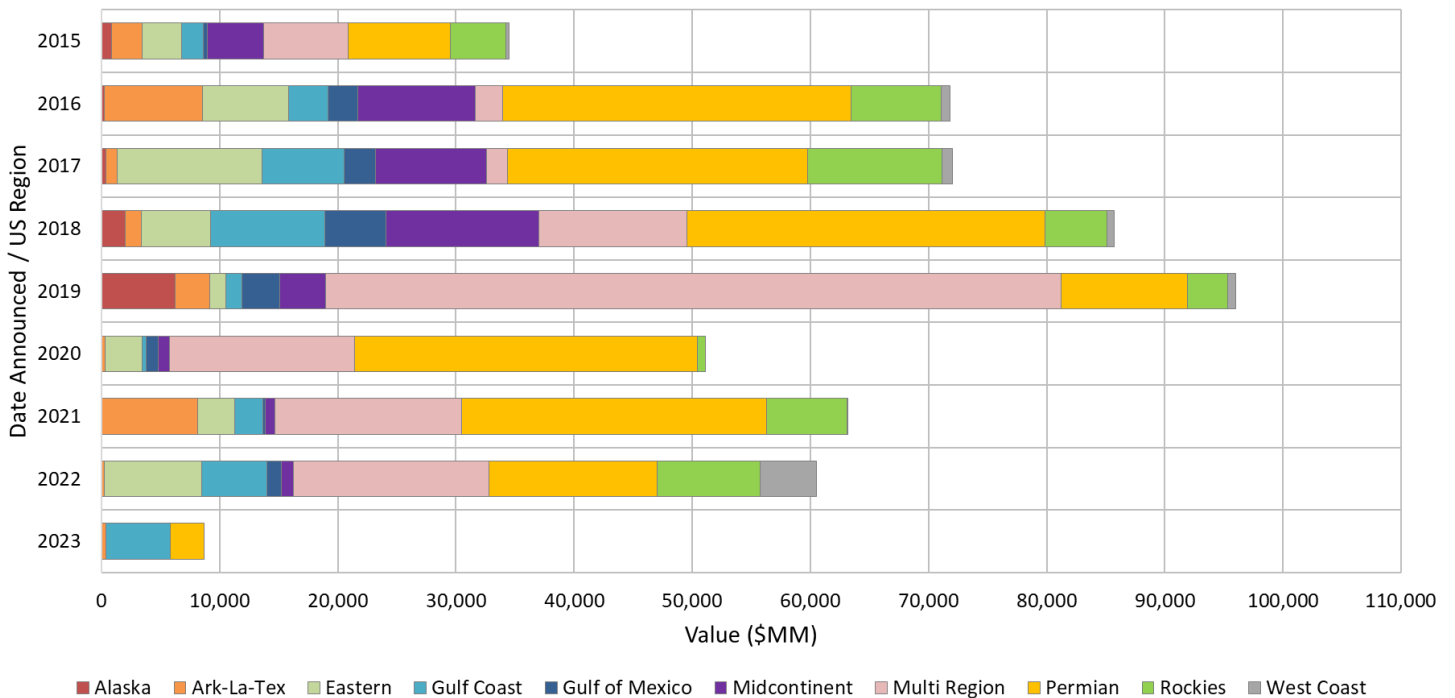
*Source—Baker Hughes Weekly Rig Counts



DEAL VALUE BY US REGION (BY QUARTER)



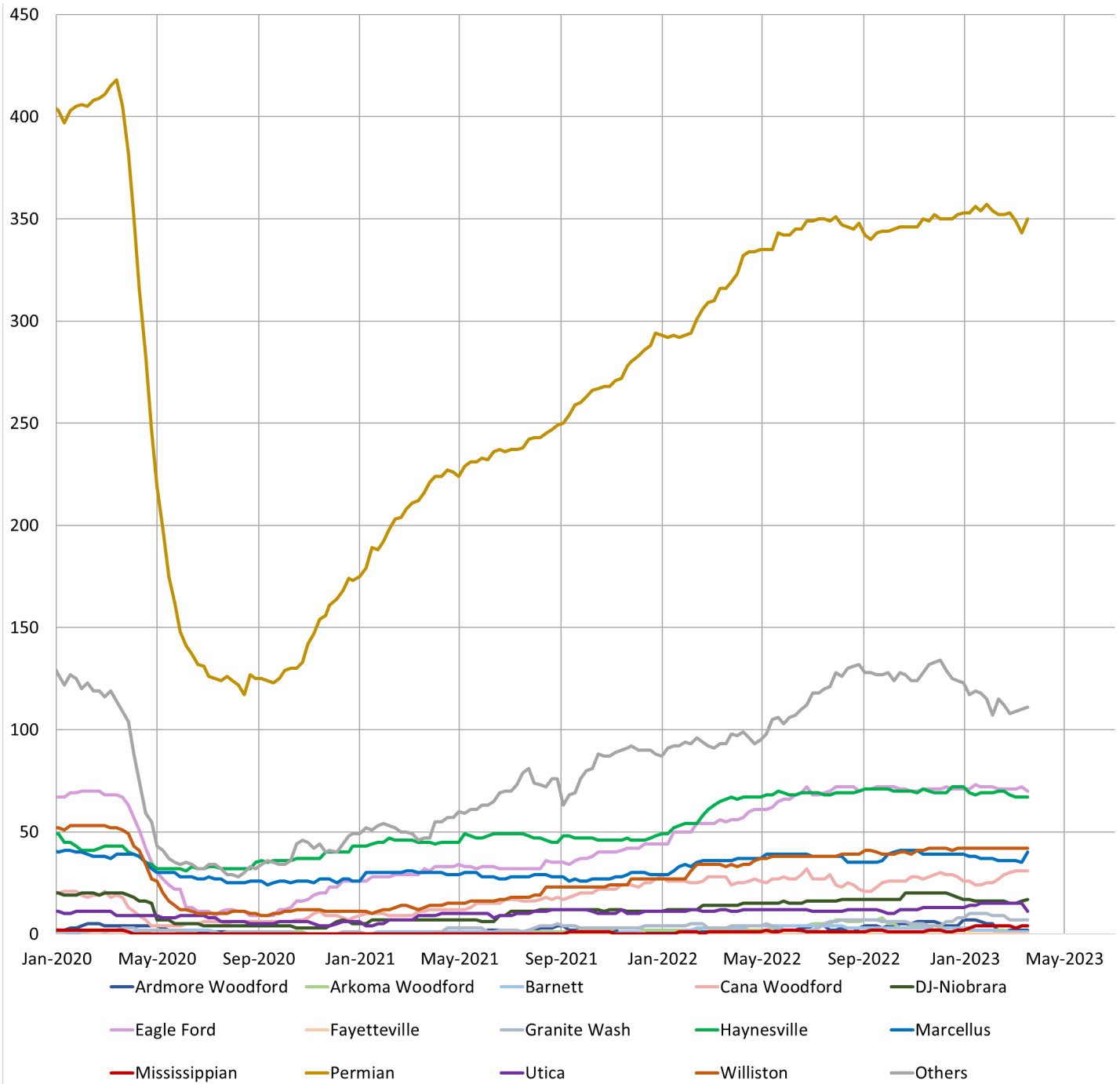
DEAL VALUE BY US REGION (BY YEAR)



*Source—PLS M&A Database (Charts exclude terminated deals)



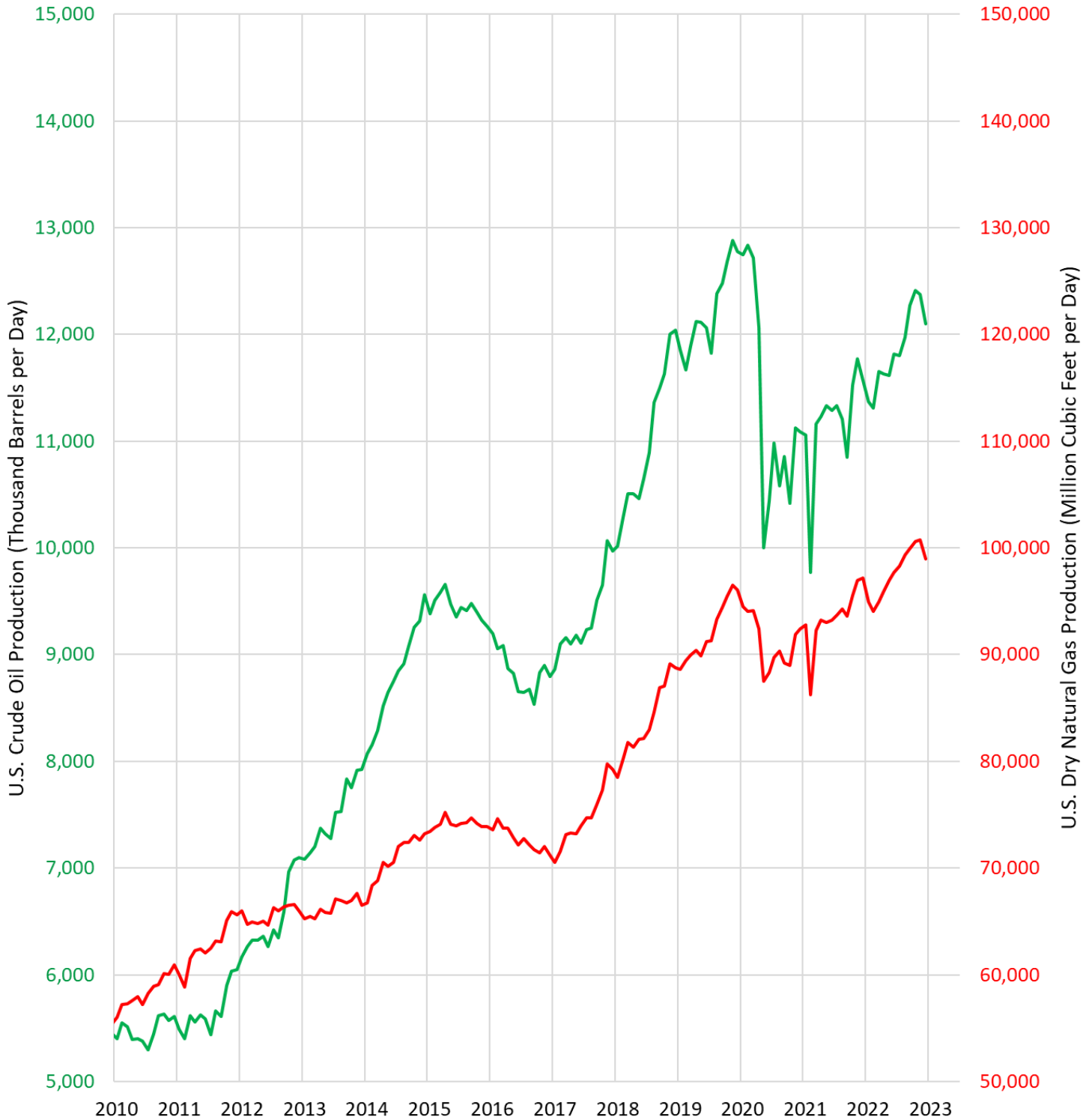
RIG ACTIVITY BY US REGION



*Source—Baker Hughes Weekly Rig Counts



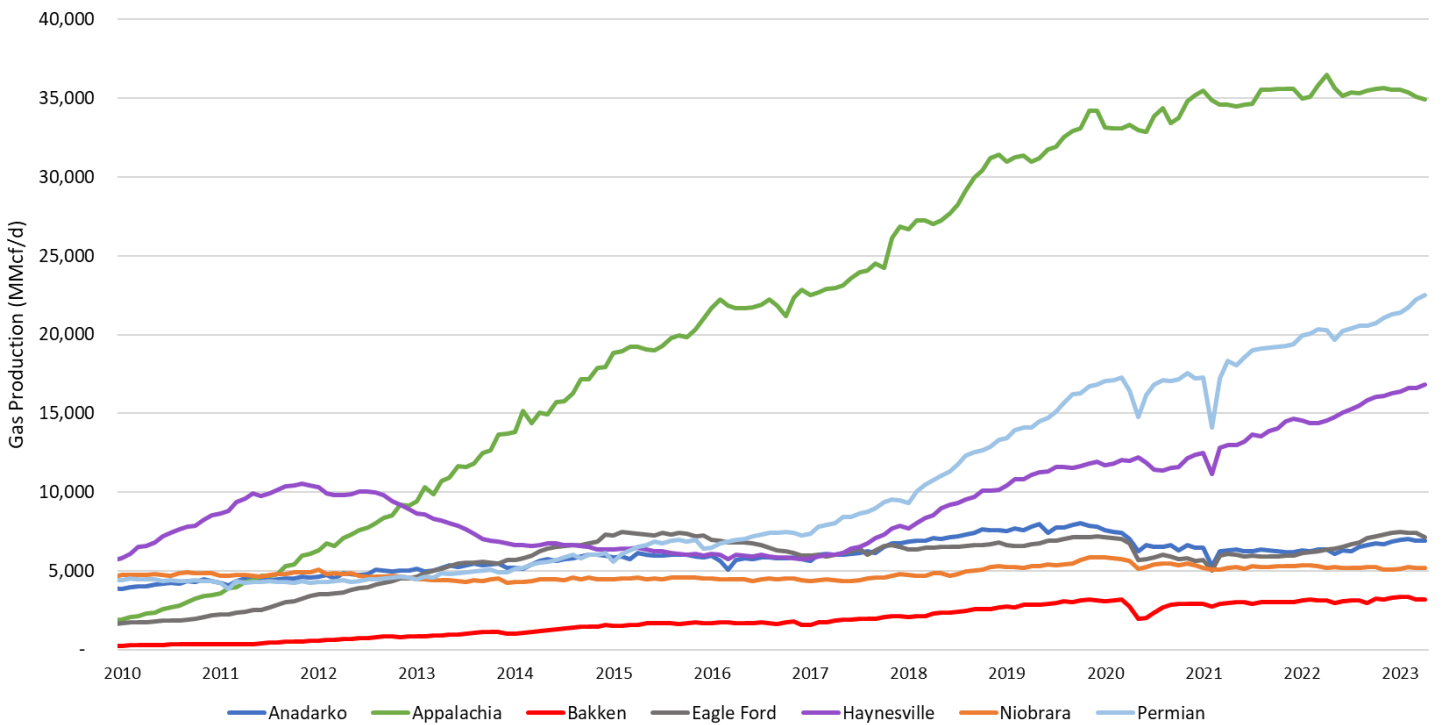
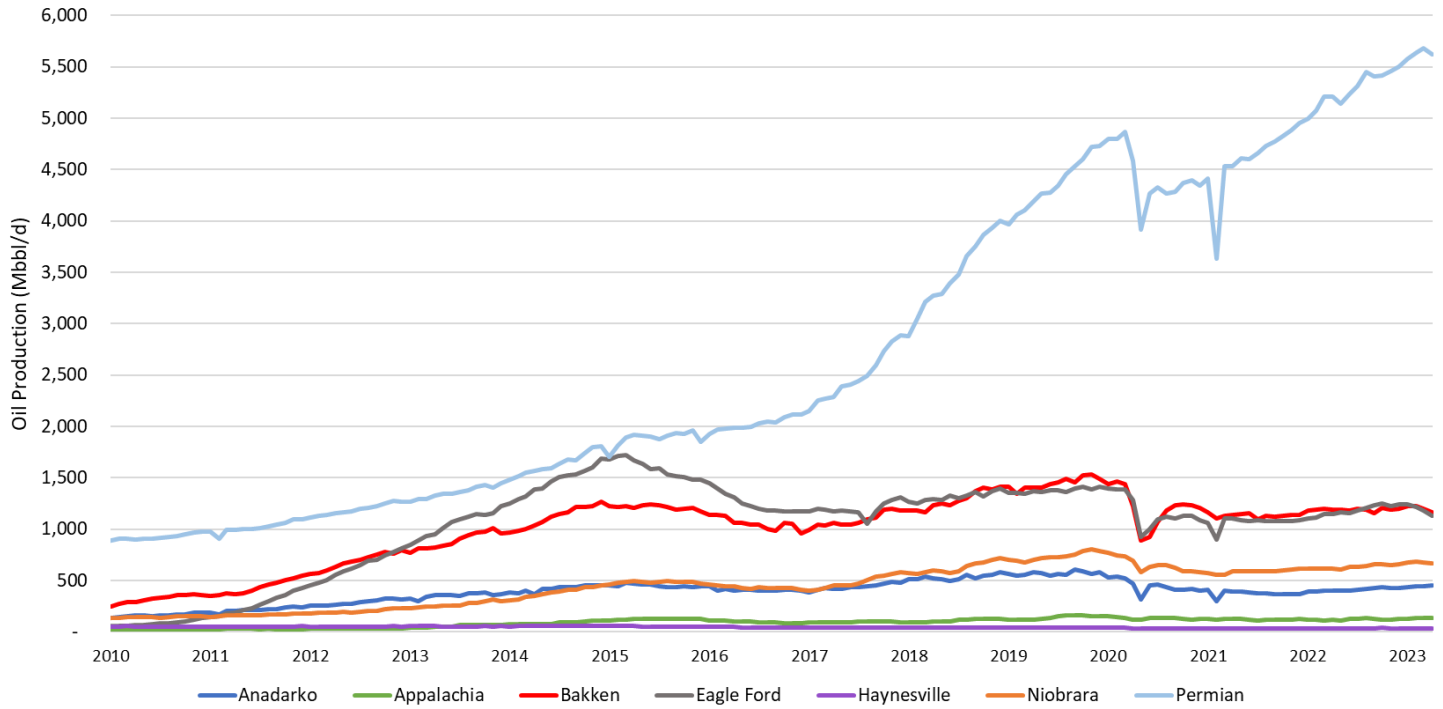
US DAILY CRUDE (MMbbl) & DRY NATURAL GAS PRODUCTION (MMcf)



*Source—Energy Information Administration, United States (EIA)



HISTORICAL PRODUCTION OF SELECTED US SHALE REGIONS



*Source—Energy Information Administration, United States (EIA)



UPCOMING EVENTS

March 2023

Qnections 2023

March 27-29

Las Vegas, NV

DUG Haynesville Conference & Exhibition

March 28-29

Shreveport, LA

April 2023

US Men's Clay Court Championship 2023

April 1-9

Houston, TX

World Oilman's Minerals & Royalty Conference (MARC)

April 10-11

Houston, TX

Small Steps Wine Classic

April 19

Houston, TX

2023 World Oilman's Poker Tournament

April 26-28

Las Vegas, NV

World Oilman's Tennis Tournament (WOTT)

April 26-29

Houston, TX

Houston Producers Forum/SPE Fourth Annual Crawfish Boil

April 27

Houston, TX

May 2023

Offshore Technology Conference 2023

May 1-4

Houston, TX

Energy Valuation Conference

May 11

Houston, TX

North American Petroleum Accounting Conference

May 18-19

Dallas, TX

DUG Permian Basin & Eagle Ford Conference & Exhibition

May 22-24

Fort Worth, TX

June 2023

Society Of Petroleum Evaluation Engineers (SPEE) Annual Meeting

June 17-20

Newport, RI

*Denotes an Opportune Sponsored Event



ABOUT RALPH E. DAVIS ASSOCIATES

Ralph E. Davis Associates LLC (RED) is an industry-leading petroleum engineering and geosciences firm committed to satisfying the individual needs of clients. We accomplish this by holding ourselves to the highest standards of integrity and professionalism to deliver honest, direct and actionable insights to help clients achieve their strategic objectives. We distinguish ourselves by combining reservoir engineering, geoscience evaluation techniques and advanced data analytics with economic analyses to provide our clients with individual, customized solutions.

Banks, bondholders, private equity firms, financial institutions and law firms around the world trust in RED's diverse services and unrivaled upstream oil and gas expertise to deliver comprehensive solutions that help clients make informed decisions. We add value to every engagement by employing a team approach, leveraging Opportune LLP's experienced bench of experts in transactional due diligence, tax advisory, investment banking, restructuring and valuation.

We offer technical and economic analyses to deliver our clients a complete, independent, accurate and detailed assessment of the value of their assets. We apply a robust set of technical capabilities to assist our clients. Our capabilities include:

- Reservoir engineering and geosciences
- Economic forecasting and reporting
- Data analytics and geospatial analysis

KEY CONTACTS



Steve Hendrickson is the President of Ralph E. Davis Associates, an Opportune LLP company. Steve has over 35 years of professional leadership experience in the energy industry with a proven track record of adding value through acquisitions, development and operations. Steve is a licensed professional engineer in the state of Texas, and holds an M.S. in Finance from the University of Houston and a B.S. in Chemical Engineering from The University of Texas at Austin. He recently served as a board member of the Society of Petroleum Evaluation Engineers (SPEE) and is a registered FINRA representative.



John Beaird is Vice President of Ralph E. Davis Associates, an Opportune LLP company. John has 39 years of oil and gas management, reservoir engineering, and petroleum economics evaluation experience. Recent relevant experience includes the Permian, Western Gulf, Tx-La-Miss Salt, Mid-Continent, Denver-Julesburg, Wind River, Williston Basin, and Appalachian Basins. John is a registered Petroleum Engineer in the State of Texas and holds a B.S. in Petroleum Engineering from Louisiana Tech University. He is also an active member of the Society of Petroleum Evaluation Engineers (SPEE).



Yvonne Trujillo is a Senior Petroleum Engineer at Ralph E. Davis Associates, an Opportune LLP company. Yvonne has over 25 years experience in the oil and gas industry with extensive expertise in reserves engineering, SEC and PRMS/SPE reporting and economics and asset evaluation in conventional and unconventional reservoirs in the U.S. Lower 48. Yvonne earned a B.S. in Mechanical Engineering at Simon Bolivar University in Caracas, Venezuela and an M.S. in Petroleum Engineering at the University of Houston.



David Edwards is a Petroleum Engineer at Ralph E. Davis Associates, an Opportune LLP company. David has over three years of reserves engineering experience in conventional and unconventional reservoirs. Before RED, David was a Petroleum Engineer at a lower middle market A&D advisory firm where he handled the technical processes for marketed assets. He began his career with an operator in Dallas, where he contributed to its engineering, operations, and A&D teams. David holds an M.B.A. from The University of Texas Permian Basin and a B.S. in Petroleum Engineering from The University of Oklahoma.

